Environmental Assessment Report including Environmental Management Plan for upgrading of Bewar-Pilibhit Section (km 0.000 to km 183.380) of NH 730 C and 731 K (Package I, II, III and IV) in the state of Uttar Pradesh under GNHCP.

Table of Contents

List of Tables

List of Figures

Annexure:

List of Abbreviations

ADT	Average DailyTraffic
AADT	Annual Average Daily Traffic
AH	Affected Household
AMSL	Above Mean SeaLevel
ASI	Archaeological Survey ofIndia
AP	Affected Person
BDL	Below DetectionLimit
BPL	Below Poverty Line
BOD	Biological Oxygen Demand
BOQ	Bill ofQuantities
CA	Compensatory Afforestation
CaCo3	Calcium Carbonate
CBR	California Bearing Ratio
CD	CrossDrainage
CGWA	Central Ground Water Authority
CGWB	Central Ground Water Board
Ch.	Chainage
CL	Centre line
CO	Carbon Monoxide
CoI	Corridor of Impact
CPCB	Central Pollution Control Board
CPR	Common Property Resources
CRZ	Coastal Regulation Zone
Cr	Chromium
CTE	Consent toEstablish
CTO	Consent toOperate
CE	ChiefEngineer
CGWA	Central Ground Water Authority
CoI	Corridor of Impact
CPCB	Central Pollution Control Board
CO	CarbonMonoxide
CVPD	Commercial vehicles per day
CTSB	Cement Treated Sub-Base
dB	Decibel
DC	District Collector
DEIAA	District Level Environmental Impact Assessment Authority
DFO	Divisional ForestOfficer
DPR	Detailed ProjectReport
DO	Dissolved Oxygen
E	Easting
EC	EnvironmentalClearance

EHS	Environmental, Health and Safety
EIA	Environmental ImpactAssessment
EMF	Environment Management Framework
EMP	Environment ManagementPlan
ENVIS	Environmental Information System
EPA	Environment Protection Act
FRA	Forest Right Act
GHG	Green HouseGas
G.I.	Galvanized Iron
GNHCP	Green National Highways Corridor Project
GoI	Government of India
GSB	Granular Sub-base
GPS	Global Positioning System
GW	Ground water
HFL	High Flood Level
HH	House holds
HS	Homogeneous Section
IE	Independent Engineer
IMD	Indian Meteorological Department
INR	Indian Rupee
IRC	Indian RoadsCongress
IS	IndianStandards
LCV	Light CommercialVehicle
LHS	Left HandSide
Km	Kilometer
MDR	Major District Road
MoEFCC	Ministry of Environment, Forest and Climate Change
MoRTH	Ministry of Road Transport and Highways, Govt. ofIndia
MSA	Million Standard Axles
NBWL	National Board forWildlife
NAAQS	National Ambient Air QualityStandards
NABL	National Accreditation Board for Laboratories
NGHM	National Green HighwaysMission
NGO	Non-GovernmentalOrganization
N	Northing
NH	NationalHighways
NHDP	National Highways Development Program
NOC	No Objection Certificate
NO_2	Nitrogen Dioxide
NPV	Net Present Value
NQ	Noise Quality
NTU	Nephelometric Turbidity Unit
OBC	Other Backward Caste
OD	Origin andDestination

ODR	Other District Road
OP	OperationalPolicies
PAPs	Project Affected Persons
RFCTLARR	Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act
Pb	Lead
PCU	Passenger CarUnits
PMGSY	Pradhan Mantri Gram Sadak Yojana (PMGSY)
PIU	Project ImplementationUnit
PM	Particulate Matter
POL	Petroleum, Oil and Lubricants
PPE	Personnel Protective Equipment
PMC	Project Management Cell
PROW	Proposed Right of Way
PUC	Pollution under Control
PUP	Pedestrian underPass
R&R	Resettlement and Rehabilitation
RAP	Recycled Asphalt Pavement
RCC	Reinforced CementConcrete
RHS	Right HandSide
RoW	Right of Way
ROB	Rail OverBridge
Rs.	Rupees
RWH	Rain Water Harvesting
SAR	Sodium Absorption Ratio
SC	Schedule Caste
SEAC	State Expert AppraisalCommittee
SEIAA	State Level Environmental Impact Assessment Authority
SH	State Highway
SO_2	Sulphur Dioxide
SOI	Survey of India
SIA	Social ImpactAssessment
SOI	Survey ofIndia
SPL	Sound Pressure Level
SQ	Soil Quality
ST	Schedule Tribe
TCS	Typical CrossSection
TDS	Total Dissolved Solids
ToR	Terms of Reference
TOEM	Tapered element oscillating microbalance
UP	Uttar Pradesh
UPPCB	Uttar Pradesh Pollution Control Board
V:H	Vertical to Horizontal ratio
VDF	Vehicle Damage Factor

VOC	Vehicle Operating Cost
WB	The WorldBank
WHH	Women Headed Households
WMM	Wet MixMacadam

WEIGHTS AND MEASURES

°C	Degree Celcius
%	Percent
Cm/hr	Centimeter per hour
Cum	Cubic Meter
dB(A)	A Weighted Decibel
gm/cm3	Gram per Centimeter Cube
g/km	Gram Per Kilometer
ha	Hectare
km	Kilometer
Km2	Square Kilometer
Leq	Equivalent Continuous Noise Level
µg	Microgram
µg/m3	Microgram Per Cubic Meter
m	Meter
mg/kg	Milligram per Kilogram
m/km	Meter per kilometer
mg/l	Milligram per Liter
mg/m3	Milligram Per Cubic Meter
mbgl	Meter Below Ground Level
PM2.5	Particulate Matter of 2.5 Micron size
PM10	Particulate Matter of 10 Micron size
ppm	Parts Per Million
Sq. m.	Square Meter

Executive Summary

0.1 Project Background

The Ministry of Road transport & Highways (MoRT&H) intends to develop and maintain National Highway 730 C and 731 K in the Uttar Pradesh connecting Bewar - Fatehgarh- Jalalabad- Miranpur Katra – Bisalpur - Pilibhit as part of the proposed Green National Highways Corridor Project. The objective of the project is to rehabilitate and upgrade the existing road to two lanes/four lanes with paved shoulders.

M/s Chaitanya Projects Consultancy Pvt. Ltd. in Association with Agnitio Infrastructure Project Pvt. Ltd. was appointed as technical consultants vide MoRT&H letter no. RO/LKO/DPR/I.P.NH/2016-17 dated 3rd January 2017 for preparation of Detailed Project Report for Bewar -Miranpur Katra- Pilibhit Section of NH 730 C and 731 K.

The project road starts at Bewar, passes through Fatehgarh, Jalalabad, Miranpur Katra, Bisalpur and ends at Pilibhit. The length of proposed alignment is 183.380 Km.

0.2 Project Description

The project road starts from Bewar at Chainage 0.000, coordinates 27^{0}13'10.93"N, 79^{0}17'59.45"E and ends at Pilibhit at km 183.380, coordinates 28^{0}36'31.05"N 79^{0}48'09.83"E. Package wise details of the project road are given below:

NH	Pkg. No.	Project Road Stretch	Existing Chainage		Design Chainage		Districts en-route	Design Length (km)
			To	From	To	From		
NH-730C	I	Bewar to Allahganj	0.000	52.820	0.000	52.770	Mainpuri & Farrukhabad	52.770
	II	Allahganj to MiranpurKatra	52.820	114.100	52.770	114.000	Shahjahanpur	61.230
	III	MiranpurKatra to Radhaita	114.100	137.100	114.000	137.250	Shahjahanpur	22.740
NH-731K	IV	Radhaita to Pilibhit	137.100	183.680	137.250	183.380	Pilibhit	46.640
							Total length (km)	**183.380**

Justification and Need for the Project

The existing road passes through Mainpuri, Farukhabad, Shahjahanpur and Pilibhit districts of Uttar Pradesh. Existing road is two / single lane under the category of State Highway, MDR, ODR, PMGSY and even earthen at some stretches. Condition of existing roads is poor and need widening / upgradation to serve as better connectivity routes to enhance trade movements and tourism. The proposed project upgradation is intended to address the above constraints for better connectivity and efficient movement of logistics following the aspects of resource efficiency, climate resilience, and safety.

Need and Benefits of the Project

The proposed road upgradation is necessary for better connectivity and efficient movement of logistics. It will prove to be effective for resource efficiency and will serve as climate resilientgreenand safe highway for traffic movement.

The project stretch starts from Bewar on NH-34, which is a major economic corridor connecting Delhi, Aligarh, Bewar, Kanpur to Lucknow from east to west direction. All the towns are major industrial zones of Uttar Pradesh.

The project stretch crosses NH-30 at MiranpurKatra. NH-30 connects Delhi, Ghaziabad, Hapur, Bareilly, Sultanpur and Lucknow from east to west direction and all the towns are major economic / industrial hubs of Uttar Pradesh.

The project stretch terminates at NH-730 at Pilibhit, which connects Bareilly, Pilibhit, Lakhimpur-Khiri and Bahraich, the direction of NH-730 is also from east to west direction. The road from Pilibhit to Khatima has been declared as part of NH-731K and it terminates at NH-09 at Khatima. The NH-09 is also known as AH-2 which ends at Askote in District Pithoragarh of Uttrakhand. NH-09 also connects East-West Highway of Nepal (H01) via Banbasa & Bhimdatta in Nepal.

The project stretch will also be the first major road connecting three parallel economic corridors i.e. NH-34, NH-30, and NH-730 (all of them catering to traffic moving in the east to west direction), in the north to south direction in India. The road has limited width in certain sections and poor asset condition and also has a missing link of 4.50 km after Khudaganj before meeting the road connecting to Bisalpur at Radhaita. After upgradation and construction of the missing link the project road (PR) will become the shortest route to connect Gwalior to Pilibhit.

The current movement of cargo (potatoes, sugarcane, and rice) to Northern India takes alternate longer routes, such as the 60 km longer route on SH-29 via Kannauj, Hardoi, and Shahajahanpur, significantly affecting the cost of transport as well as increasing wastage. Improvement of the existing road geometry would add to the speed and carrying capacity of vehicles significantly, thus reducing the per tonne cost of cargo being transported.

The proposed road would also help improve tourism in the influence area, by improving connectivity for tourists visiting the popular pilgrimage destinations of Sankissa, a major centre for Buddhist pilgrims from both India and abroad, located 10 km away from Mohammadabad on the PR, and the Hindu pilgrimage site of NeemKaroli Baba temple which is on the same route.

Other benefits include increased safety, resource efficiency and climate resilient measures that have been proposed for the project.

Salient Features of Project Road

The Project road starts from T-Junction with NH- 92 near Bus stand at Bewar (Dist. – Mainpuri) and passes through Madanpur, Mohammdabad, Farrukhabad, Jalalabad, MiranpurKatra, Khudaganj, Bisalpur and ends at Pilibhit (Junction with NH 730). The design length of the project road is 183+380 km. The salient features of project road.

S.N.	Description of Item	Details
1.	Road Sections	Package 1:Bewar to Allahganj (km 0.000 to 52.770) Package 2:Allahganj to MiranpurKatra (km 52.770 to 114.000) Package 3:MiranpurKatra to Radhaita (km 114.000 to 137.250) Package 4:Radhaita to Pilibhit (km 137.250 to
2.	Location	Uttar Pradesh
3.	Major Villages/Towns	Farrukhabad, Allahganj, Jalalabad, Meeranpurkatra, Khudaganj, Bisalpur, Barkhera and Pilibhit
4.	Terrain	Plain
5.	Land use	The land along the project road is mostly agricultural land, followed bybuilt up areas, where there is normally barren land.
6.	Type of soil	LoamySilt, Silty clay, Sandy Silty clay and clay
7.	Way Side Amenities	Bus Bays- 92 Truck Lay Byes-3

The improvement/up-gradation proposals of Existing Road to two lane Paved shoulder include the provisions Geometric Improvements, realignments, widening proposals and reconstruction, Grade separators, Pavement, Road Junctions, Bridges and Cross-Drainages, Special Problems and Road Appurtenances. The adopted cross sectional elements as per the design standards are presented below

S.N.	Particulars	Existing	Proposal
1	Project Stretch	Km 0.000 to Km 183.650	Km 0.000 to Km 183.380
2	Project Length	183.650 km	183.380 km
3	Carriageway	3.50 to 7.0 m	7.0 m + paved shoulders+ earthen shoulders
4	ROW (m)	20 to 35 m	As shown in typical cross sections
5	Realignment	Nil	Nil
6	Junctions	10 major and 243 minor	All are improved as per IRC SP:41

S.N.	Particulars	Existing	Proposal
7	Major Bridges	3 (Two in Pkg.1 and One in Pkg. 2)	3 Retained
8	Minor Bridges	12	6 Reconstruction, 6 Retained with minor repairs
9	Culverts	261	Reconstruction – 261 New Construction – 118
10	Road Side Drain	--	95.670 km
11	Pontoon Bridge	Nil	1 in Pkg. 3
12	Toll Plaza	NIL	3
13	Bypass	NIL	NIL
14	ROB	1 in Pkg. 1	1 No. Retained
15	Way side amenities		Bus bays: 92 Nos. Truck lay byes: 3Nos.
16.	Foot Path	--	47.680 Km
17.	Rain Water Harvesting Structures	--	27 Locations
18.	Solar Streets Lights	--	2x 27 Locations both sides

0.4 Baseline Environmental Conditions

Topography and Physiography: The project is located mostly in Gangetic plain. The terrain along the project road is mostly flat and level plain. The project road traverse mostly through drainage area of river Ganga, Yamuna, Gomti and main tributaries of these revers.

Geology: The project road is located in ganga alluvial plain which is sub-divided in older and newer alluvial plains.

Soil: Soil are basic in nature and the moisture retention capacity is less than 11%. The soil are loamy sand or sandy loam clay in nature. Electrical conductivity was found to be in range of 132 to 217 µmhos/cm. Water holding capacity of soil is between 24.5 to 37.4%. The soil quality analysis shows that at all the locations soil quality is basic in nature and the moisture retention capacity is less than 11%. The soils are loamy sand or sandy loam clay in nature. Electrical conductivity has been found to be in range of 132 to 217 µmhos/cm.

Hydrogeology: The project road section from Km 0+000 to Km 3+500 in Mainpuri district is underlain by Quaternary alluvium comprising mainly clay, Kankar, sand and gravel over the basement of Pre-Cambrai Vindhyan formation. Different grades of sand and gravel form the multi aquifer system in the area. Ground water occurs under water table condition in phreatic zones and under semi-confined condition in deeper zones.

Surface Water Resource: The project road crosses a number of streams and rivers. Main source of drainage in the project area passing through Mainpuri district is Yamuna and some other streams are Kali Nadi, Isan, Arind (Rind), Senger, Sirsa rivers. Mainpuri abounds in swambs and marshes particularly in the central portion. The principal rivers and streams of the Farrukhabad and Shahjahanpur districts are Ganga, Ram Ganga, Kali Nadi, Old Ganga and some other small streams. In Pilibhit District, Deoha is the main river which drains mostly the western part of the area. The Sharda river drains on the boundary line form north-west to south east direction. Other streams are Mala, Karta, Kailas and Khanaut etc. Besides, there are numerous rivulets which drain the region for a shorter distance. The water bodies crossed by the road are given below:

S.N.	Chainage	Type	Name
1	3+500	River	Kali Nadi
2	39+800	River	Ganga
3	53+150	River	Ramganga
4	123+800	Tributary	Shahjahanpur branch of Devha River
5	129+250	Lake / pond	Khudaganj
6	133+350	River	Deora or Garra river
7	144+250	Distributary	Tikri Distributary
8	179+150	Distributary	Takia Distributary

There are 34 ponds along the project road.

Surface water samples taken from rivers located at Bewar, Bahadurpur, Daudapur and Bhunda Harbanspur have good water quality and fall into Category B (Designated best use : Outdoor bathing) as per criteria provided by Central Pollution Control Board. The criteria for outdoor bathing designated best use is Total Coliforms Organism MPN/100ml shall be 500 or less, pH between 6.5 and 8.5, Dissolved Oxygen 5mg/l or more and Biochemical Oxygen Demand 5 days 20 °C, 3mg/l or less.

For the sample taken from canal / drain crossing the project road at Km 179+100 comes under the Category C with designated best use “Drinking water source after conventional treatment and disinfection” as per CPCB criterion. The CPCB criterion for Category C is Total Coliforms Organism MPN/100ml shall be 5000 or less, pH between 6 and 9, Dissolved Oxygen 4mg/l or more and Biochemical Oxygen Demand 5 days 20 °C, 3 mg/l or less.

Floods: Flood is the most commonly occurring disaster in Uttar Pradesh, affecting almost every year some part of the state or the other. Important rivers, which create floods in the State, are the Ganga, the Yamuna, the Ramganga, the Gomti, the Sharda, the Ghaghra, the Rapti and the Gandak, etc. The Ganga River basin of Uttar Pradesh experiences normal rainfall in the region from 60 cm to 190 cm of which more than 80% occur during the southwest monsoon. The rainfall increases from west to east and from south to north. Similar is the pattern of floods, the problem increases from west to east and south to north.

Ground Water: Ground water is an important source for catering to the needs of water consumption in the rural and urban areas. Therefore, any kind of deterioration in the quality of ground water owing to the developmental activities will pose threat to the local population and attention needs to be paid towards maintaining the quality of water using all possible tools. Since the ground water is used without treatment by a large portion of population for drinking purpose and domestic use, the quality of ground water is important.

Seismicity: The project districts of Philbit and Shahjahanpur fall under Zone IV and the project districts of Mainpuri and Farrukhabad fall under Zone III.

Climate: The primary temperature, rainfall and wind features of the three Distinct Seasons of the state are:

- Summer (March–June): Hot & dry (temperatures rise to 45 °C, sometimes 47–48 °C); low relative humidity (20%); dust laden winds.
- Monsoon (June–September): 85% of average annual rainfall of 990 mm. Fall in temperature 40–45° on rainy days.
- Winter (October–February): Cold (temperatures drop to 3–4 °C, sometimes below −1 °C); clear skies; foggy conditions in some tracts.

Ambient Air Quality: Ambient air quality monitoring was conducted at five locations in respect of PM_{10}, $PM_{2.5}$, NO_2, SO_2 and CO. The test results indicate that 24 hourly mean concentration of PM_{10} in ambient air varied between 82.3 µg/m^3 and 99.8 µg/m^3 along the project alignment, which is within the permissible limit of 100 µg/m^3 as per the National Ambient Air Quality Standards. The concentration of $PM_{2.5}$ concentrations varied between 47.8 µg/m^3 to 59.7 µg/m^3 with no value exceeding the NAAQS of 60 µg/m^3.Other parameters SO_2, NO_2 and CO were also found to be within the National Ambient Air Quality Standards.

Ambient Noise Quality: To assess the background noise levels in the study area ambient noise monitoring was conducted at five locations. The maximum daytime noise levels were 54.1 dB(A) in residential area of Khudaganj and 64.3 dB(A) in commercial area of Pilibhit, which is very close to permissible level prescribed by CPCB. Night time maximums are 40.1 dB(A) and 48.2 dB(A) in residential and commercial areas respectively and are well within permissible levels by CPCB.

Land use : The land use along the project corridor is predominantly agricultural (80%), followed by built-up area (12%), plantation (6%) and water bodies (2%) respectively.

Ecology and Biodiversity

Forest Land: The road side plantations along the Right of Way (ROW) of Highways in Uttar Pradesh have been declared as Protected Forest by the State's Department of

Forest (Van Vibhag). The project require diversion of 192.777 ha forest land under the provisions of Forest (Conservation) Act, 1980.

Roadside plantation from km 0+000 to km 114+000, km 147+600 to km 183+380 will be diverted as Protected Forest. The predominant tree species along roads are Papdi (Terminaliacatappa), Eucalyptus (Eucalyptus globulus), Siris (Albizialebbeck), Shisham (Dalbergiasissoo), Paakad (Ficusvirens), Neem (Azadirachtaindica) and Sagaun (Tectonagrandis). Apart from these Amaltas (Cassia fistula), Babul (Vachellianilotica), Bakain (Meliaazedarach), Gular (Ficusracemosa), Mango (Mangiferaindica), Peepal (Ficusreligiosa), etc. Approximately 32437 trees are likely to be felled for upgradation of the project. All efforts will be made to minimise cutting of trees.

No rare, threatened or endangered flora or fauna is found along the project corridor.

There is no wetland along the project road as per Wetland (Conservation and Management) Rules 2017 and list of Wetlands of International Importance (Ramsar Sites).

Protected Area: The Project stretch does not pass through any 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. The Saman Bird Sanctuary which lies is Mainpuri district, is at an aerial distance of approx.25 km from the start point (Km.0+000) of the project road in South-West (SW)direction. Pilibhit Tiger Reserve in Pilibhit district is at an aerial distance of approx. 28km from the end point (Km183+380) of the project road in North East (NE) direction

Fauna: The project districts of Mainpuri, Farrukhabad, Shahjahanpur and Pilibhit do not abound in wild animals. Among carnivorous animals the wolf wild dog (*Cuondukhunensis*), jackal (*Coniaureus*) and Fox (*Vulpesbengalensis*) are fairly common. Other animals found are the monkey (*Innus rhesus*), hare (*Lepusruficandatus*) and Lomri (*Indian fox*). Avean fauna found are Partridge, quail, pigeon and peacock. Many varieties of snakes are also found.

5.0 Anticipated Project Environmental Impacts and Mitigation Measures

The general environmental impacts expected due to the proposed up-gradation of the project roads along with their suggested mitigation measures are given below. Impacts have been assessed based on the information collected from the screening & scoping of environmental attributes.

Issues	Impacts
Pre construction Phase	
Tree Cutting Permission	Approximately 32437 trees are likely to be felled for upgradation of the project. Prior permission will be obtained for cutting trees required for construction of the road.

Issues	Impacts
Diversion of Forest Land	The project road passes through protected forest area (road side plantation notified as protected forest area) and 192.777 ha diversion of forest land is required. Prior forest clearance will be obtained before starting the construction in the forest area.
Construction Phase:	
Topography and geology	• Localised change in existing profile of the land due to borrow pits & construction of realignments.
Soil	• Earth works and newly constructed embankment will prone to erosion during rains. Erosion problems may occur on newly constructed slopes and earth fills in realignments depending on soil type, angle of slope, height of slope and climatic factors like wind (direction, speed and frequency) and rain (intensity and duration). Soil erosion will add siltation to the runoff during the monsoon season. • Disruption & loss of productive top soil from agricultural fields due to borrow pits • Loosening of top soil & loss of vegetative cover along the road due to excavation & back filling which will lead to enhanced soil erosion. • Run off from unprotected excavated areas can result in excessive soil erosion. • Contamination of soil is likely due to oil spill from the maintenance and operation of the construction machineries, unplanned disposal of scarified bitumen wastes, Spillage bitumen from operation of hot mix plant. •
Land use	• Generation of solid wastes and Construction & Demolition Wastes from construction sites. • Changes in existing land use pattern of the proposed ROW for construction of the road.
Drainage	• Increased incidence and duration of floods due to obstruction of natural drainage courses by the road embankment. • Chances of filling of existing drainage courses during earth filling.
Water use	• Impact on the local water sources due to use of construction water.
Water quality	• Degradation of surface water quality due to sediment transport with runoff through erosion of soil and earth may occur from activities like removal of trees, clearing and grubbing, removal of grass cover, excavation, stock piling of materials as part of the pre-construction,

Issues	Impacts
	runoff from embankment for realignments, construction of major and minor bridges construction activities, etc. Discharge of sewage and waste from labour and plants, • Increase of sediment load in the run off from construction sites and increase in turbidity in receiving streams/water bodies. • Water pollution due to sewage from construction camps.
Fly Ash	• Utilization of Fly Ash in road construction and chances of related impact on air and water.
Air quality	• Impact on ambient air quality are anticipated due to site clearance and use of construction vehicles and machinery, transport of raw materials, borrow and quarry materials to construction sites, earthworks, stone crushing operations at the crushers, handling and storage of aggregates at the asphalt plants, Concrete batching plants, asphalt mixing plants due to mixing of aggregates with bitumen, etc. • Deterioration of air quality due to fugitive dusts emission from construction activities and vehicular movement. • Deterioration of air quality due to gaseous emissions from construction equipment & vehicular traffic. • Deterioration of air quality due to emission from asphalt and hot mix plants.
Noise level	• Impact on noise environment are anticipated due to operation and movements of construction machineries, DG set operations, operations of stone crushing, asphalt production plant and batching plants, etc. • Increase in noise level due to construction activities, operation of construction equipment & vehicular traffic.
Flora& Fauna	• Felling of trees along the project road. • Cutting of trees by laborers for using wood as fuel. • Labors may poach on wildlife roaming in the area.
Construction camp	• Influx of construction work-force & suppliers who are likely to construct temporary tents in the vicinity. • Likely sanitation & health hazards & other impacts on the surrounding environment due to inflow of construction labourers.
Occupational health & safety	• Occupational health and safety risks is anticipated to workers due to inadequate housekeeping and unsafe work practices at work sites.

Issues	Impacts
	• Health problems to workers are likely due to inadequate sanitation and un-healthy environment at labour camps/plant sites.
Road safety	• Increase of incidence of accidents is anticipated due to disruptions of traffics movements in construction work zones on the project road. • Increase on incidence of road accidents due to disruptions caused in existing traffic movements.
Operation Phase	
Land use and Encroachment	• Change of land use by squatter/ encroachment within ROW and induced development outside the ROW.
Drainage	• Filthy environment due to improper maintenance of drainage.
Water quality	• Chances of contamination of water bodies from road surface run off containing oil spills due to traffic movement & accidents.
Air quality	• Air pollution due to vehicular emission from road traffic.
Noise level	• Noise pollution due to traffic noise.
Flora & fauna	• Illegal felling of road side plantation. • Effect on aquatic fauna in case of accidental spill of oil, fuel & toxic chemicals into water bodies

0.6 Analysis of Alternatives

The analysis of alternatives was carried for two lane upgradation with paved shoulders of the subproject. Analysis of alternatives was carried out for “With” and “Without” project scenarios. The minimization of environmental impacts by considering design alternatives determines the extent of mainstreaming of the environmental components. An evaluation of the various alignment options for realignments for Bewar -Pilibhit Section of NH 730C and Km 731K was carried out for arriving at the most promising alignment.

0.7 Public Consultation

Key stakeholders consultations were carried out in affected villages and key stakeholders. The comments received from participants have been incorporated in the DPR as necessary. Efforts were made to select both small and big habitations along the project road in order to get representation of all the segments of affected population. Prior intimation of at least 15 days before the planned consultation meeting was given to village office /sarpanch /villagers, so that the villagers were aware of date and location of meeting before hand for active participation. All relevant aspects of subproject design, details of land required and impact to private property were discussed with the affected communities.

0.8 Green Initiatives

The project has been designed by adopting the Green Highway Approach, which has led to substantial reduction in amount in raw material required for the project. Use of flyash in lieu of borrow soil, Cement Treated Sub-Base (CTSB) pavement, Recycled Asphalt Pavement (RAP) and mixing plastic in bitumen for bituminous coating have been proposed to overall reduce the requirement of virgin material.

The proposed project includes the following specific interventions towards the ‘green highway’ concept:

- 3 existing major bridges have been retained.
- 6 minor bridges will be reconstructed while 6 existing minor bridges have been retained with minor repairs.
- Provision of slope protection by plantation of vegetation in place of stone pitching to avoid erosion.
- 934 cum quantity of fly ash will be used in high embankment locations.
- 108 nos. of rainwater harvesting units have been proposed.

Climate Resilience: The proposed project highway would incorporate the following measures for enhanced climate resilience:

- Provision of drainage arrangements throughout the project stretch to avoid stagnation of water on the road surface.
- Construction of 118 culverts and reconstruction of 261 culverts are proposed improve the cross-drainage to resilient standards based on results from climate change studies.
- In the project road 95.670 km road side drain (both sides) have been provided in design.

0.9 Environmental Management Plan

Environmental management plan has been prepared for the pre-construction, construction and operation phase which mainly centered on the understanding of the interactions between the environmental settings and the project activities and the assessment of the anticipated impacts. Mitigation measures for anticipated environmental impacts have been elaborated as specific actions which would have to be implemented during the project implementation.

The timing and frequency of monitoring along with the supervision responsibility and reporting requirements are also provided in the Environmental Management Plan. Overall responsibility will be of Contractor for effective implementation of EMP and adherence to all the mitigation measures as outlined in this EMP associated with their respective activities.

The PIU will be responsible to ensure implementation of EMP by the contractors with the overall accountability resting with the GNHCP-PMU. Whereas, the PIU/ Independent Engineer will ensure periodic quality audit/ guidance to the PIU and by imparting regular training, monitoring and ensuring that all EMP provisions and requirements are translated into ‘contract documents and that these requirements are implemented to their full intent and extent.

The EMP has been prepared for three stages of project road construction activities as: (i) Pre-construction Stage; (ii) Construction Stage; and (iii) Demobilization Stage. The Contractor will implement necessary mitigation measures for which responsibility is assigned to him as stipulated in the EMP. Any lapse in implementing the same will attract the damage clause.

The environmental monitoring plan has been prepared construction, operation and maintenance phases. It consists of performance indicators, reporting formats and necessary budgetary provisions also.

Environmental monitoring plan has been prepared for ambient air quality monitoring, ambient noise levels, ground and surface water quality, quality of waste water discharge from labour camp during construction phases. Air quality monitoring and ambient noise levels monitoring during operation and maintenance phase.

Performance indicators parameters for each of the component have been identified and reported during various stages of the implementation.

The environmental reporting system for the monitoring programme will function at two levels (i) reporting for environmental condition indicators and environmental management indicators and (ii) reporting for operational performance indicators at the PMU/PIU level. The Contractor, Independent Engineer /PMC and PMU/PIU will operate the reporting system for environmental conditions and environmental management indicators. The reporting system will start with the Contractor who is the main executor of the implementation EMP activities. The Contractor will report to the Independent Engineer /PMC, who in turn will report to the PMU/PIU. Reporting will be weekly, monthly and quarterly.

Institutional mechanism and operational arrangements are important for EMP implementation. Within the institutional framework proposed for the project, preparation, implementation, supervision and monitoring of environment functions, particularly the Environment Management Plans (EMP), will be carried out at the three levels - national center, state level and the project/community level with an inbuilt mechanism for coordinating activities between the said levels. The Externally-Aided Projects Cell (EAP-Cell) at MoRTH, supported by a Project Management Consultants (PMC), will have the overall project implementation responsibility.

At the central level, the Chief Engineer, Externally Assisted Projects (CE, EAP), MoRTH, Govt. of India will be responsible for the over-all implementation of EMF and EMP. The CE, EAP will have all delegated administrative and financial decisions regarding the implementation of the project as well as environment management and safeguard related functions. CE (EAP) will be assisted by a team comprising Executive Engineer (EE) designated as an Environment and Social Officer (ESO) and a suitable number of technical and secretarial staff. The EE will ensure that all project activities are complied with as per the EMF and EMP.

MoRTH will engage a Project Management Consultant (PMC), which will include an Environment Specialist, to work with the CE, EAP's team. The PMC will be responsible for training, guidance, and recommendations for handling policy and implementation issues at the state and sub-project levels to comply with the EMF and requirements laid out in the EMP.

Supervision consultant/ Independent Engineer to be engaged by MORTH will provide the regular supervision and administration services. The Construction Supervision Consultant/Independent Engineer's team will have Environment and Safety personnel for day-to-day supervision and monitoring. The Environmental and Safety Officer on the Contractor's team must ensure compliance with the environmental contractual clauses and will report on progress or challenges to the Construction Supervisory team, as per the requirements/obligations stated in the Contract Document.

The environmental budget for implementation of various environmental management measures proposed for preconstruction, construction and operation of the project road has been estimated and given in EMP. There are several other environmental issues that have been addressed as part of good engineering practices, the costs for which have been accounted for in the engineering cost.

Grievance Redressal Mechanism (GRM) arrangements to address workers' and public grievances have been prepared and functional during implementation of the project.

CHAPTER 1: INTRODUCTION

1.1 Background

The Ministry of Road transport & Highways (MoRT&H) intends to develop and maintain National Highway 730 C and 731 K in the Uttar Pradesh connecting Bewar-Fatehgarh-Jalalabad- Miranpur Katra-Bisalpur-Pilibhit as part of the proposed Green National Highways Corridor Project. The objective of the project is to rehabilitate and upgrade the existing road to two lanes/four lanes with paved shoulders.

M/s Chaitanya Projects Consultancy Pvt. Ltd. in Association with Agnitio Infrastructure Project Pvt. Ltd. was appointed as technical consultants vide MoRT&H letter no. RO/LKO/DPR/I.P.NH/2016-17 dated 3rd January 2017 for preparation of Detailed Project Report for Bewar -Miranpur Katra- Pilibhit Section of NH 730 C and 731 K.

1.2 Project Highway

The project road starts at Bewar, passes through Fatehgarh, Jalalabad, Miranpur Katra, Bisalpur and ends at Pilibhit. The length of proposed alignment is 183.380 Km. Details of project stretches are stated below in **Table 1.1**.

Table 1.1: Details of Project Stretches

NH No.	State	Pkg. No.	Project Road Stretch	Design Chainage		Districts en-route	Design Length (km)
				To	From		
NH-730C	Uttar Pradesh	I	Bewar to Allahganj	0.000	52.770	Mainpuri & Farrukhabad	52.770
		II	Allahganj to MiranpurKatra	52.770	114.000	Shahjahanpur	61.230
		III	MiranpurKatra to Radhaita	114.000	137.250	Shahjahanpur	23.250
NH-731K		IV	Radhaita to Pilibhit	137.250	183.380	Pilibhit	46.130
						Total	**183.380**

The project road starts from Bewar at Chainage Km 0.000, (27°13'10.93"N, and 79°17'59.45"E) and ends at Pilibhit at Km 183.380 (28°36'31.05"N, 79°48'09.83"E). The package wise road alignments marked on SOI toposheets and google maps are given in **Annexures 1.1** and **1.2**. The index map of the project road is shown below in **Figure 1.1**:

1.3 Existing Conditions of the Project Road

The existing road passes through Mainpuri, Farrukhabad, Shahjahanpur and Pilibhit districts of Uttar Pradesh. Existing road is two / single lane under the category of State Highway, MDR, ODR, PMGSY and even earthen at some stretches. The existing RoW on the project corridor varies from minimum of 18 m and maximum of 32 m as per the village revenue maps. The additional land will be required at toll plaza and truck lay bye locations. Details of existing road conditions are given in **Table 1.2.**

Figure 1.1: Index Map of the Project

Table 1.1: Existing Road Conditions

Sl. No.	Section	Chainage (from-to)	Lane Configuration	Category of Road	Existing ROW
1	Bewar to Jalalabad	Km 0 to km 78	Two Lane	SH-29	25-35 m
2	Jalalabad to M P Katra	Km 78 to Km 114	Two Lane	MDR	25-35 m
3	M P Katra to Bhundi	Km 114 to km 133	Single Lane	PMGSY	20-30 m
4	Bhundi to Radhaita	Km 133 to km 137	Earthen Road	Earthen	20-30 m
5	Radhaita to Bisalpur	Km 137 to km 147	Single/ Intermediate	ODR	20-30

1.4 Packages and Major Settlements Along the Project Road

The proposed alignment passes through the districts Mianpuri, Farukhabad, Shahjahanpur and Pilibhit whose details are given in **Table 1.3.**

Table 1.2: Chainagewise Details of Districts Crossed by the Project Road

District	Package	From Chainage	To Chainage	Length (Km)
Mainpuri	Package-I	Km 0+000	Km 3+500	3.500
Farukhabad	Package-I	Km 3+500	Km 52+770	49.270
Shahjahanpur	Package-II	Km 52+770	Km 114+000	61.230
Shahjahanpur	Package-III	Km 114+000	Km 135+150	21.150
Pilibhit	Package-III	Km 135+150	Km 137+250	2.100
Pilibhit	Package-IV	Km 137+250	Km 183+380	46.130
Total Length				**183.380**

Source: Detailed Project Report

The major settlements along the proposed project road are given in **Table 1.4**.

Table 1.3: Chainagewise List of Settlements Along the Alignment

S.N	Built-up Stretch (Township)	Design Chainage		Length (Km)
		From	To	
1.	Bewar	0.000	1.500	1.500
2.	Madanpur	6.300	7.100	0.800
3.	Khimsepur	8.300	9.300	1.000
4.	Khimsepur	10.400	11.150	0.750
5.	Pansnigpur	12.000	12.480	0.480
6.	Mohammdabad	15.680	17.980	2.300
7.	Sakwai	21.000	21.500	0.500
8.	Nishai	23.475	23.700	0.225
9.	Nishai Gaisingpur	24.350	24.900	0.550
10.	Pipargav, Murhas	26.950	28.050	1.100
11.	Narayanpur	32.650	36.390	3.740
12.	Bagalkhula	37.250	39.900	2.650
13.	Allahganj	59.250	60+000	0.75
14.	Koila Gayanpur	63.680	64+630	0.95
15.	Kundauli	66+280	67+380	1.1
16.	Saipur	69+630	69+970	0.34
17.	Gora Mahua Gad	70+620	71+900	1.28
18.	Bajhera Mahua Dandi	76+350	76+650	0.3
19.	Jalalabad	77+900	79+800	1.9
20.	Jalalabad	79+800	81+750	1.95

S.N	Built-up Stretch (Township)	Design Chainage		Length (Km)
		From	To	
21.	KhaiKhera	86+280	86+680	0.4
22.	Kudaiya	91+600	91+850	0.25
23.	Madnapur	95+900	97+200	1.3
24.	BarkheraJaipal	102+800	103+080	0.28
25.	SalempurKhurd	108+800	109+130	0.33
26.	Meeranpur	112+880	115+550	2.67
27.	Karsak, Bhojpur	117+850	118+650	0.800
28.	Kamalpur Urf Bakhtwarganj	122+850	123+450	0.600
29.	Khanpur Khurma, Khudaganj, Deeppur, Lakshmipur&Diuras	128+100	131+450	3.35
30.	GobalPatipura	145+550	146+200	0.650
31.	Gyaspur	146+900	147+650	0.750
32.	Gyaspur–Dugipur Baragaon, Khamaria Navdia	147+650	149+650	2.00
33.	Jasauli Diwari	153+140	153+950	0.810
34.	Parasi Urf Parasia	154+850	155+300	0.450
35.	Jgithera, Tikarimafi	158+150	159+350	1.20
36.	Mohammadganj Amkharia, BarkhedaKla	165+050	166+900	1.85
37.	Nakta Urf Muradabad	167+350	168+100	0.75
38.	GuldaMachvapur	168+450	169+000	0.55
39.	Johrakalyanpur	170+250	171+000	0.75
40.	Simria, Gazipur	171+650	172+000	0.35
41.	PautaKla	174+150	175+500	1.35
42.	JangroliPul	178+150	178+700	0.55
43.	RuppurKaripa, RupourKamalu	181+000	181+850	0.85
44.	RuppurKaripa, PakdiyaNogva	182+750	183+380	0.630

Source: Detailed Project Report

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1.5 Justification and Need for the Project

The objective of the project road development is to enhance and improve transport connectivity through adopting green and climate resilient construction methods for the project National Highway network.

The proposed road upgradation is necessary for better connectivity and efficient movement of logistics. It will prove to be effective for resource efficiency and will serve as climate resilient green and safe highway for traffic movement.

The project stretch starts from Bewar on NH-34, which is a major economic corridor connecting Delhi, Aligarh, Bewar, Kanpur to Lucknow from east to west direction. All the towns are major industrial zones of Uttar Pradesh.

The project stretch crosses NH-30 at Miranpur Katra. NH-30 connects Delhi, Ghaziabad, Hapur, Bareilly, Sultanpur and Lucknow from east to west direction and all the towns are major economic / industrial hubs of Uttar Pradesh.

The project stretch terminates at NH-730 at Pilibhit, which connects Bareilly, Pilibhit, Lakhimpur-Khiri and Bahraich, the direction of NH-730 is also from east to west direction. The road from Pilibhit to Khatima has been declared as part of NH-731 K and it terminates at NH-09 at Khatima. The NH-09 is also known as AH-2 which ends at Askote in District Pithoragarh of Uttrakhand. NH-09 also connects East-West Highway of Nepal (H01) via Banbasa & Bhimdatta in Nepal.

1.6 Benefits of the Project

a) Connectivity and Logistics

The proposed project road passes through Farrukhabad, Allahganj, Miranpur Katra, Khudaganj and Bisalpur and is part of the old Lepulekh-Bhind road from Gwalior to Etawah to Pilibhit connecting Madhya Pradesh, Uttar Pradesh, Uttarakhand in India, and Nepal. This road is a **major and the shortest route** connecting central India to Uttarakhand and Nepal, serving a population of more than 78,000. As the road from Pilibhit to Khatima has been declared as part of NH-731K, which terminates at NH-09 at Khatima, and also connects to the East-West highway of Nepal (H01) via Banbasa and Bhimdatta, the project road would improve connectivity to **Nepal**.

The project stretch will also be the first major road connecting three parallel economic corridors *i.e.* NH-34[1], NH-30[2], and NH-730[3] (all of them catering to traffic moving in the east to west direction), in the north to south direction in India.

The road has limited width in certain sections and poor asset condition and also has a missing link of 4.50 km after Khudaganj before meeting the road connecting to Bisalpur at Radhaita. After upgradation and construction of the missing link the project road will become the shortest route to connect Gwalior to Pilibhit.

The current movement of cargo (potatoes[4], sugarcane, and rice[5]) to Northern India takes alternate longer routes, such as the 60 km longer route on SH-29 via Kannauj, Hardoi, and Shahajahanpur[6], significantly affecting the cost of transport as well as increasing wastage. Improvement of the existing road geometry would add to the speed and carrying capacity of vehicles significantly, thus reducing the per tonne cost of cargo being transported.

The project road would also help improve tourism in the influence area, by improving connectivity for tourists visiting the popular pilgrimage destinations of Sankissa, a major centre for Buddhist pilgrims from both India and abroad, located 10 km away from Mohammadabad on the project road, and the Hindu pilgrimage site of Neem Karoli Baba temple which is on the same route.

Better connectivity would also improve the employment potential of the area.

b) Resource Efficiency

The project road includes the following measures towards increasing resource efficiency:

- Milling of the existing pavement and its utilization by adding aggregates to achieve proper gradation through use of Recycled Asphalt Pavement (RAP) after undergoing recycling.
- Treating the existing subgrade with cement and admixtures to increase the CBR where reconstruction is proposed, thus reducing the proposed thickness of the road compared to conventional methods for pavement design.
- Re-using cut material in the construction of pavement, structure and slope protection work after proper testing and gradation.
- Utilizing municipal/plastic waste in bituminous course by approaching private organizations that provide plastic waste materials.

[1]A major economic corridor connecting Delhi, Aligarh, Bewar, Kanpur to Lucknow(all major industrial towns of U.P.) in the east to west direction. The PR starts at Bewar on NH-34.
[2]NH-30 connects Delhi, Ghaziabad, Hapur, Bareilly, Sultanpur and Lucknow (all major economic industrial hubs of U.P.)in the east to west direction.The PR crosses NH-30 at MiranpurKatra.
[3]NH-730 connects Bareilly, Pilibhit, Lakhimpur-Khiri and Bahraich, from east to west. The PR ends at Pilibhit.
[4]Farrukhabad-Fatehgarh is the largest potato producing area of the country. Bewar is another major potato production centre.
[5]Shahjahanpur, Jalalabad, Bisalpur, Bareilly, Khatima, and Pilibhitare major sugarcane and rice producing areas on the PR.
[6]Or routes via Badaun and Bareilly (15 km longer) or via Guhasganj, Farukhabad, and Shahjahanpur (27 km longer).

c) Green Highway

The proposed project highway includes the following specific interventions:

- Reducing the requirement of quantities of natural resources (soil, aggregates) in pavement construction by using stabilization techniques (cement and/or lime), using waste products in pavement construction (fly ash), and utilizing cut materials.
- Reducing the transportation requirements of pavement construction materials because of the reduction in required quantities of these materials.
- Reducing requirement in quantity of bitumen and its transportation by using recycling of existing asphalt/bituminous wearing course and use of cement concrete pavement.
- Water conservation through redevelopment/enhancement of 34 ponds (involving de-siltation of ponds to increase storage capacity, channelizing rain water to reach ponds, plantation of trees on the boundary of ponds, and protection of slopes of ponds by grass), and development of 27 rainwater harvesting structures.
- Utilizing renewable energy sources (solar lighting) on all built-up areas (27 locations).

d) Climate Resilience

The proposed project road has incorporate the following measures for enhanced climate resilience:

- Hydrology, drainage plan and protective works to be carried out for the project area. Several drainage structures will be added, and existing ones will be repaired/rehabilitated/reconstructed.
- Increasing the capacity of natural storage ponds to increase underground water levels.
- Providing roadside drainage in habitation sections of the project road. Stored water will be discharged in a channelized way by means of drains, for use by localities for harvesting and other daily needs.
- Bioengineering along the project stretch, as required.

e) Safety

The project road would incorporate the following measures to improve road safety:

- A lot of accidents on this road have occurred due to insufficient carriageway width.
- Improvement of all major and minor junctions.
- Bypasses/realignments for areas with habitations, villages/settlements.
- Uniformity in project cross-section and elements.
- Measures for pedestrian safety including at-grade pedestrian facilities with all safety measures, footpath cum drains in towns/urban areas, over-drains/paver tiles in urban/built-up areas.
- Solar lighting in habituated stretches (27 locations).
- Traffic signs and markings (road studs, road signs, delineators).
- 4,800 m of crash barriers, parapets, toe-walls, other speed calming measures.

- Bus laybys and truck laybys which are properly designed so that buses and trucks are not haphazardly stopped/parked on the highway.
- Safety aspects including road junction improvement as per latest IRC manuals/codes.

1.7 Need of Environment Impact Assessment

The EIA and EMP Report for the project road development from Bewar (Km 0.000) to Pilibhit (Km 183.380) is being prepared with the objective to establish present environmental conditions along the project corridor through available data/information supported by field studies, wherever necessary; to predict impacts on relevant environmental attributes during the design, construction and operation phases of the 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 purpose of this EIA report is stated as under:

- 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
- Preparation of an Environmental Management Plan (EMP) for timely implementation of the mitigation measures

1.7.1 Scope of the Environment Impact Assessment

The scope for the environmental impact assessment study has been decided in accordance with the World Bank's Guidelines for Environmental Assessment, EIA Notification 2006 of Ministry of Environment, Forest & Climate Change (MoEFCC) and amendments thereafter, Guidelines and Terms of Reference (TOR) specified in EIA Guidance manual for highway projects by MoEFCC, Government of India. This report covers the following:

- Project details, as provided in the Detailed Project Report,
- Policy framework and applicability of environmental regulations,
- Baseline environmental conditions,
- Identification and assessment of significance of impacts associated with the project activities,
- Alternative analysis,
- Consultation with key stakeholders,
- Development of project specific management plan, environmental monitoring plan, reporting, institutional arrangement and budgetary requirements for environmental protection measures and Grievance Redressal Mechanism.

1.8 Approach and Methodology of EIA

The World Bank safeguards policies and EIA Guidelines by MoEF&CC provide basis to carry out EIA study for the project. The study includes both onsite as well as desktop assessment of the project activities. The methodology adopted for conducting the EIA study comprises of various steps as illustrated in **Figure 1.2.**

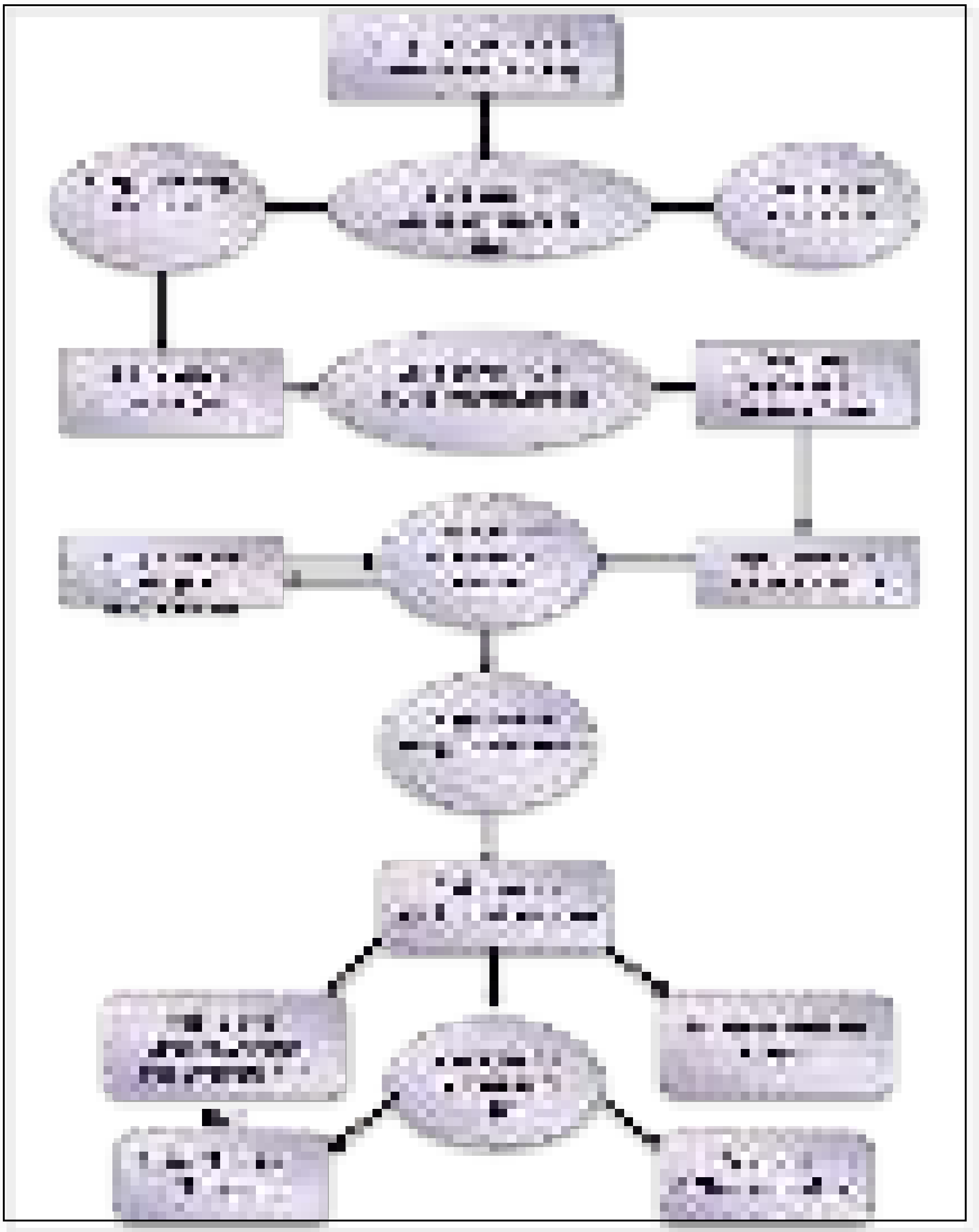


Figure 1.2: Methodology Undertaken for conducting EIA study

The primary and secondary data were analyzed and project impacts were assessed on the various components of environment. Accordingly, an Environmental Management Plan has been prepared to suggest mitigation measures, performance indicators, cost components, implementation and monitoring responsibilities.

The findings of the assessment gave imperative feedback to the design team, particularly in terms of the sensitive receptor and utility/facilities impacted. It helped alter the designs at locations where possible and incorporate mitigation measures wherever the impacts were inevitable due to other constraints. The methodology undertaken for conducting the

EIA study is given in chronologies of the activities undertaken for the study of the project road are:

A. Environmental Screening and Scoping

A reconnaissance survey for the project road was taken to identify environmental sensitive areas/issues/hot spot (water bodies, forests, school & hospitals and archaeological/ historical structures) within the corridor of impact and project influence area along the project road.

Desktop Study:

Study of Project Documents: The project documents were studied to understand the project objectives, its main components and boundaries of sensitive receptors etc along the project road.

Study of Laws and regulations: Laws and regulations enacted by Government of India and Uttar Pradesh State relevant to road construction and environment were studied.

Study of Guidelines, Standards etc.: Various circulars, guidelines and standards published by Ministry of Environment, Forest and Climate Change (MoEF& CC) and Indian Roads Congress were studied for impact assessment exercise and for preparation of management plan.

Field study includes identification of important environmental components including, water bodies, bio-diversity hotspots, public utilities, community resources, cultural sites etc. along the project corridor, establishment of environment characteristics by ambient air quality monitoring, water quality monitoring, soil analysis, noise monitoring, etc. Data on social conditions along the project road was also collected. Important environment components as studied for the project road are elaborated in **Table 1.5.**

Table 1.4: Environment Component Studied for the Project

S. No.	Environmental Attributes	Environmental Components
1	Topography	Terrain
2	Land use	Agriculture, settlements, forest, industrial areas etc.
3	Water resources	Rivers, canals and ponds in study area
4	Forests & Wildlife	• Designated Protected Areas like Biosphere Reserves, National Parks and Sanctuaries etc.) within 10 Km from the proposed project location boundary • Presence of Wildlife Corridor along the project stretch • Presence of Protected Forest and other forests within study area
5	Road side Plantations	Green Tunnels, Plantation in RoW
6	Settlements	• Towns and villages abutting the road corridor • Details of affected structures

S. No.	Environmental Attributes	Environmental Components
		• Stakeholder Consultation
7	Sensitive Receptors	Sensitive receptors such as educational and health facilities etc.
8	Drinking water sources	Hand pumps, water tank, community water points / taps etc.
10	Religious Structures	Religious and community structures etc.
11	Cultural Properties	Protected / unprotected archaeological monuments
12	Major Pollution Generating Sources	Industries and other sources of pollution
13	Common Property Resources	Meeting areas of the community; cremation / burial grounds etc.
14	Environment Conditions	• Ambient Air Quality • Ambient Noise Level • Ground and Surface Water Quality • Soil Characteristics

B. Delineation of Project Impact Zone

Project Impact Zone is the 10 km area on either side along the alignment. For land use study, area within 500 m on either side of the project road has been considered.

C. Corridor of Impact

Corridor of impact has been considered as the proposed Right of Way (ROW).

D. Collection of Primary and Secondary Environmental Data

As part of EIA study, primary data are required to establish current base line environmental conditions in the study area. These data broadly cover the information collected through the field survey / monitoring of physical, biological, cultural and socio-economic environment. Environmental monitoring was carried out to assess and collect the base line data of ambient air quality, surface/ground water quality, soil quality, and noise levels along the project road. A detailed survey for tree enumeration, followed by joint verification with forest department will be conducted within existing and proposed RoW. Details regarding existing project area features including details of existing habitations, infrastructure (education, health and commercial), public utilities (hand pump, wells, tube wells, religious structures) and natural resources (river, pond, drain) were also collected.

Data that are not generated through filed survey / monitoring, but collected from published sources and various government department are called secondary data. Generally secondary data are the records of the data collected in the past by the various government departments such as India Meteorological Department, Forest Department, Botanical Survey of India, Wildlife Department, Census of India, Economic and Statistics Department, Survey of India, Archaeological Survey of India, etc. or published by other organizations / researchers through their reviews and research papers. Socio-economic data and existing flora and fauna, forests etc. were collected from various secondary sources. The sources from which baseline information gathered, are presented in **Table 1.6** below:

Table 1.5: Secondary Data Collected for EIA Studies

Environmental and Social Aspect	**Parameters of Concern**	**Source of Information**
Climatic Conditions in the Project Influence Area	Temperature and Rainfall	IMD (Indian Metrological Department)
Soil & Geology	Soil type and its stability, Fertility of the Soil potentiality for soil erosion	Geological Survey of India, State Mining Department
Slopes	Direction of slope and gradient,	Contour Survey, Satellite Image and Survey of India topographic sheets
Drainage/ Flooding	• Existing drainage and flooding level including its extent of water spread. • Identification of drainage channel and its catchments area around the Project stretch	Satellite Imagery/ Toposheet /Hydrology study/State Water Resource Department.
Water Bodies and Water Quality	• Identification of water bodies/canal/drainage channels where the run off surface water will flow Status of surface water and ground water quality	Toposheets/field study. Hydrological data from the CGWA Reports
Forest Within Proposed ROW Legal Status – Protected Areas, Endangered Plant and Animal, Ecological Sensitive Area, Migratory Corridor/ route	Status of the forests, Conservation of forest area, & endangered plant and animal and any other species	Department of Forest, Govt. of Uttar Pradesh, DFOs, Discussion with local community and local FRO
Trees and Vegetation Cover	Identification of existing tree species and the project influence area	Forest Department and Field Survey.
Settlements within the PROW	Settlements & its population along the corridor. Its location &	Population/ District Census report 2011. Topographic survey data.

	numbers	
Cultural / Heritage and Ancient Structures.	Conservation areas if any. Protected structures, monuments and heritage structures.	Archaeological Survey of India, State Archaeological Department

E. Prediction of Impacts

The collected baseline data was analyzed to establish the existing environmental conditions and identify the potential environmental impacts due to the proposed project on land environment, water environment, air & noise environment, biological environment and socio-economic and health environment.

The principal impact assessment (IA) steps comprise of the following:

- Impact prediction: to determine what could potentially happen to resources/ receptors as a consequence of the project and its associated activities.
- Impact evaluation: to evaluate the significance of the predicted impacts by considering their magnitude and likelihood of occurrence, and the sensitivity, value and/or importance of the affected resource/ receptor.
- Mitigation and enhancement: to identify appropriate and justified measures to mitigate negative impacts and enhance positive impacts.
- Residual impact evaluation: to evaluate the significance of impacts assuming effective implementation of mitigation and enhancement measures.

F. Analysis of Alternatives

Since the project is the widening of existing road with no bypass, therefore, alternative assessment has been undertaken for with and without project alternatives scenario, construction technology only, green initiatives adopted in the project, etc.

G. Public Consultation with key Stakeholders

Stakeholders were consulted for identification of environmental and social issues prevailing in the area and incorporate their opinion while designing the alignment.

During the EIA process, a preliminary identification of key stakeholders was carried out. An inventory of actual / potential stakeholders, including local groups and individuals, local institutions which may be directly or indirectly affected by the project or with interest in the development activities in the region was made at a preliminary stage. This inventory was arrived through discussions with local PWD official and also in consultation with members of the local community.

Consultation with the community is a continual process that was carried out during the EIA study and would also be continued during the construction and operation phases of the project. The consultations with community and local institution like panchayat also helped in developing preliminary understanding of the requirement of people in the area and identification of the enhancement proposals.

H. Environmental Management Plan (EMP)

The EMP envisages the plans for the proper implementation of management measures to be adopted during design, construction and operation stages of the proposed project to reduce the adverse impacts arising out of the project activities.

The final stage in the EIA Process is preparation of the management and monitoring measures that are needed to ensure:

a) Environmental Impacts and their associated Project components remain in conformance with applicable regulations and standards; and
b) Mitigation measures are effectively implemented.

An Environmental Management Plan, which is compilation of control and mitigation measures to be implemented with respect to environmental performance for the project road. The Environmental Management Plan includes mitigation measures, budgetary estimates, performance indicators, reporting and monitoring activities.

The EMP shall address the following: **Stage-wise Environmental Management Measures:** This includes a list of all project-related activities at different stages of project (pre-construction stage, construction stage and operation & maintenance stage), remedial measures, reference to laws/ guidelines, monitoring indicators & performance target and institutional responsibility.

Institutional Arrangements: Responsibilities for implementing the mitigation and management measures suggested in EMP shall be defined in this section.

Environmental Monitoring Program: To ensure the effective implementation of the EMP, it is essential that an effective monitoring program be designed and carried out. Monitoring schedule during construction and operation stages is to be prepared covering parameters to be monitored, location of the monitoring sites, frequency and duration of monitoring and institutional responsibilities for implementation and supervision.

Monitoring and Reporting Procedure: The procedures shall be designed to ensure early detection of conditions that require corrective action. It shall provide information on the progress and results of mitigation and institutional strengthening measures.

EMP Budget: The budgetary provision for the implementation of the environmental management plan is to be worked out, which shall be integrated into the total project costs.

1.9 Limitations of EIA Study

The EIA report is based on the preliminary designs which were prepared for the road. The final design would be developed by the Contractor before the initiation of construction.

Even though no major changes are expected in the design the EIA report against the final engineering design. Further, the report has been developed on certain information available at this point of time, scientific principles and professional judgement to certain facts with resultant subjective interpretation. Professional judgement expressed herein is based on the available data and information.

1.10 Structure of the EIA Report

The EIA report for the project road has been prepared complying country regulations and The World Bank Guidelines for Environmental Assessment. The EIA report has been structured in the following Chapters:

Executive Summary: Summary of the EIA report providing overall justification for project implementation along with explaining how the adverse effects are proposed to be mitigated.

Chapter 1 - Introduction: The present chapter detailed out the background of the project and methodology adopted for the EIA study.

Chapter 2 - Project Description: This chapter deals with describes existing road conditions and facilities, traffic projections, right of way, proposed roadway improvements, bridge and cross drainage structures, junctions improvement, community facilities, construction materials requirement and sources, way side amenities, road safety improvement proposal, etc.

Chapter 3- Policy, Legal and Administrative Framework: This chapter presents the legal and administrative framework of World Bank, Government of India and Government of Uttar Pradesh. This section underlines various clearances, permissions, consents involved for the project road at the State level and at the Central level.

Chapter 4- Baseline Environmental Conditions: This Chapter presents the existing environmental conditions along the corridor, which were ascertained by conducting a field survey along with collection of secondary information pertaining to the corridor. Primary data for various environmental parameters was generated using suitable monitoring devises. The methodology was strictly adhered to the stipulated guidelines by MOEF&CC and CPCB.

Chapter 5- Anticipated Environmental Impacts: This chapter describes identification and evaluation of anticipated environmental impacts caused on various environmental parameters by the various activities proposed for the upgradation of the project corridor.

Chapter 6- Analysis of Alternatives: This chapter presents analysis of alternatives carried out during EIA studies considering with and without project, pavement technologies, construction materials, etc.

Chapter 7- Consultation with Key Stakeholders: This chapter provides details of consultation carried out in order to know the feedbacks of local population and the project affected people (PAP). Public consultation meetings were held with the stake holders to record their views on the environmental issues pertaining to the road and the suggested remedies to be adopted for the proposed project corridor.

Chapter 8-Green Initiatives: This chapter summarizes the green initiatives adopted for the project as a part of GNHCP.

Chapter 9-Environment Management Plan: This chapter describes mitigation measures to avoid or minimization of anticipated environmental impacts during design, preconstruction, construction and de-mobilization phases. Environmental Management Plan that include institutional aspects of the project implementation and cost estimates for implementation of EMP.

Annexure referred in the EIA report have been enclosed at the end of EIA report as Annexure.

CHAPTER 2: PROJECT DESCRIPTION

2.1 Project Road

The project road starts from T - Junction with NH- 92 near bus stand at Bewar (District – Mainpuri) and passes through Madanpur, Mohammdabad, Farrukhabad, Jalalabad, Miranpur Katra, Khudaganj, Bisalpur and ends at Pilibhit. The project stretches from Bewar to Bisalpur via Farrukhabad, Jalalabad, MiranpurKatra, Khudaganj, Radhaita has been designated as National Highway. 730 C while from Bisalpur to Pilibhit via Barkhra as National Highway 731K. The existing road is bituminous and varies from two lane to single lane with fair to poor riding quality. The features of existing alignment showing the important structures along the road, forest and non-forest areas, river / canals, ponds, industries, etc., are shown on a strip plan given in **Annexure 2.1**.

2.2 Alignment Description

Terrain

The entire length of the project road is passing through plain terrain.

Existing Carriageway Width

The existing project road is bituminous and varies from two lane to single lane with fair to poor riding quality. The details of existing carriageway and improvement proposal are given below in **Table 2.1** and **Table 2.2**, respectively.

Table 2.1: Details of Existing Carriageway

Sr. No.	Section	Chainage (km)	Lane Configuration	Category of road	Existing ROW
1.	Bewar to Jalalabad	Km 0 to Km 80	Two Lane	SH-29	25-35 m
2.	Jalalabad to M P Katra	Km 80 to Km 114	Two Lane	MDR	25-35 m
3.	M P Katra to Bhundi	Km 114 to Km 33	Single Lane	PMGSY	20-30 m
4.	Bhundi to Radhaita	Km 133 to Km 137	Earthen Road	Earthen	-
5.	Radhaita to Bisalpur	Km 137 to Km 147	Single/ Intermediate	ODR	20-30 m
6.	Bisalpur to Pilibhit	Km 147 to Km 184	Two Lane	SH-29	20-35 m

Source: Detailed Project Report

Table 2.2: Details of Existing Carriageway at Bridges and Their Proposal

S.N.	Location (Km.)	Design Chainage	Existing Details				Proposal Details		
			No.	Span (Exp. to Exp.) (m)	Carriage way width	Type of structure	(Recons./Widen./ New Cons./ Retained)	Span (Exp. to Exp.) (m)	Type of structure
1.	3+500	03+500	4	29.4+30.2+29.2+29.6	7.40	RCC Girder	Retained	29.4+30.2+29.2+29.6	RCC Girder
2.	8+100	08+110	2	5.85+5.85	9.50	Slab	Reconstruction	1x15	RCC Girder
3.	12+600	12+570	4	3.80+2.30+4.70+3.10(CL)	6.30	Arch Bridge	Reconstruction	1x25	RCC Girder
4.	31+500	31+425	3	5.25+6.30+5.40(CL)	10.10	Slab	Retained	5.25+6.30+5.40(CL)	RCC Slab
5.	31+760	31+710	2	5.60+1x5.4	11.10	Slab	Retained	5.60+5.40	RCC Slab
6.	39+900	39+840	18	18x35.6	7.50	RCC Girder	Retained	18x35.6	RCC Girder
7.	44+725	44+665	1	29.3	7.60	RCC Girder	Retained	29.3	RCC Girder
8.	53+250	53+180	19	19x35.6	7.50	RCC Girder	Retained	19x35.6	RCC Girder
9.	60+310	60+250	4	3.6+3.8+3.8+3.4	9.10	Slab	Reconstruction	1x15	RCC Girder
10.	71+690	71+575	3	3.2+3.5+3.7	8.00	Slab	Reconstruction	1x10	RCC Box
11.	73+435	73+340	3	3X5(CL)	10.90	Multicell Box	Retained	3X5(CL)	Multicell Box
12.	76+900	76+800	4	5.2+5.8+8.0+6.0(CL)	5.60	Arch Bridge	Reconstruction	1x25	RCC Girder
13.	82+000	81+910	2	2X4.8(CL)	11.00	Multicell Box	Retained	2X4.8(CL)	Multicell Box
14.	85+730	85+600	2	2X4.8(CL)	11.00	Multicell Box	Retained	2X4.8(CL)	Multicell Box
15.	112+540	112+440	5	4.40+5.70+4.80+4.80+4.80(CL)	10.80	Multicell Box	Retained	4.40+5.70+4.80+4.80+4.80(CL)	Multicell Box

Source: Detailed Project Report

2.3 Right of Way / Corridor of Impact

The details of package wise RoW with village names are given below in **Table 2.3**:

Table 2.3: Details of RoW

S.N.	Name of Village	Chainage (Km)	Row (m)
Package-1			
1	Bewar Grameen	0+000 - 0+400	26 - 37
2	Bewar Khash	0+400 - 1+200	24 - 32
3	ShakatBewar	1+200 - 2+900	28 - 35
4	Gajiyapur	2+900 - 3+400	30 - 41
5	Husanpur Mashmula Dariyapur	3+400 - 3+500	25
6	Madanpur	3+500 - 8+100	25 - 40
7	Khimshepur	8+100 - 11+300	27 - 44
8	Nadsah	11+300 - 11+700	35 - 39
9	Pansnigpur	11+700 - 12+900	27 - 40.5
10	Alavalpur	12+900 - 14+700	35 - 40
11	Mohomadabad	14+700 - 19+500	34 - 40
12	Sakwai	19+500 - 22+700	27 - 38
13	Nishai	22+700 - 24+600	30 - 40
14	Gaisingpur	24+600 - 25+600	36 - 45
15	Pipar Goan	25+600 - 25+700	39.16
16	JallaPur	25+700 - 27+900	31 - 41
17	Murhas	27+900 - 28+700	35 - 39
18	Daheliya	28+700 - 29+600	35 - 39
19	Jaitpur	29+600 - 29+800	37 - 38
20	Bahidpur	29+800 - 30+700	36 - 39
21	Sengan Pur	30+700 - 31+000	38 - 39
22	Barna Bujurg	31+000 - 31+200	38
23	Dhilawal	31+200 - 31+400	38
24	Bhaupur	31+400 - 32+900	37 - 39
25	Papihapur	32+900 - 34+500	39 - 46
26	Bijadhar Pur	34+500 - 35+500	33 - 39
27	Narayan Pur	35+500 - 36+000	25 - 34
28	Nekpur	36+000 - 37+300	25 - 30
29	Bagalkhula	37+300 - 37+900	30 - 31
30	Mseni Chauraha	37+900 - 38+400	30 - 31
31	Amethi Kohna	38+400 - 38+800	30 - 31
32	Bhagua Nagla	38+800 - 39+600	30 - 31
33	Sota Bahadur Pur	39+600 - 39+800	30 - 31

S.N.	Name of Village	Chainage (Km)	Row (m)
34	KatriSota Bahadur Pur	39+800 - 40+500	22 - 31
35	Chachupur Jatpura	40+500 - 42+100	26 - 30
36	Patti Badanpur	42+100 - 42+500	40 - 46
37	Badanpur	42+500 - 43+600	29 - 41
38	Kanka Pur	43+600 - 44+400	30 - 83
39	Mohomadpur Gathiya	44+400 - 45+500	30 - 31
40	Chitrakut	45+500 - 45+600	30
41	Gandhi	45+600 - 48+600	30 - 31
42	Ujaramau Nayagaon	48+600 - 50+200	27 - 30
43	Jainapur Maheshpur	50+200 - 51+200	24 - 29
44	Dabari	51+200 - 52+700	30 - 40
	Package-2		
1	Raghunath Pur	52+800 - 57+700	28 - 31
2	Ishlamganj	57+700 - 59+500	29 - 31
3	Allahganj	59+500 - 59+700	31.5 - 32
4	Samapur	59+700 - 61+300	32.5 - 39
5	Tatiyari	61+300 - 62+800	33 - 36
6	Kewal Rampur Chilaua	62+800 - 63+800	31 - 46
7	Koila Gayanpur	63+800 - 66+200	34 -41
8	Chourasi	66+200 - 66+600	37 - 39
9	Kundauli	66+600 - 68+700	34 - 40
10	Dahena	68+700 - 70+300	33 - 46
11	Saipur	69+900 - 70+300	31 - 35
12	Gora Mahua Gad	70+300 - 72+700	26 - 51
13	Tingri	72+700 - 74+300	38 -42
14	Chilauli	74+300 - 74+900	45 - 52
15	Katiuli	74+900 - 76+000	30 - 52
16	Bajhera Mahua Dandi	76+000 - 78+100	46 - 56
17	Noorpur Karhi	78+100 - 78+200	49
18	Rouli Bouri	78+200 - 79+200	42 - 48
19	Nagaria Bujurg	79+200 - 79+700	31 - 54
20	Gunara	79+700 - 80+000	37 - 46
21	Jalalabad Town	80+000 - 81+800	41 - 56
22	Sujavalpur	81+800 - 83+100	32 - 50
23	Malhupur	83+100 - 84+300	49 - 54
24	BaruAari	84+300 - 85+600	42 - 49
25	Chanoura Bahadurpur	85+600 - 85+700	55
26	Karsu Khera	85+700 - 85+900	50 - 51
27	Khai Khera	85+900 - 86+800	44 - 49

S.N.	Name of Village	Chainage (Km)	Row (m)
28	Nagla Suraj	86+800 - 86+900	46
29	Khajuria	86+900 - 87+500	38 -49
30	UdraPur	87+500 - 88+000	52 - 55
31	Saijna Talluqua Gramkhenda	88+000 - 88+700	51 - 63
32	Atiwra	88+700 - 89+500	50.5 - 55
33	Akbarpur Triya	89+500 - 90+400	42 - 73
34	Pratappur Gahwara	90+400 - 90+800	51 - 65
35	Kudaiya	90+800 - 92+300	58 - 79
36	Pratappur Gahwara	92+300 - 92+600	54 - 55
37	Baruka Pahi Sanayak	92+600 - 92+700	54
38	Shivpuri East Dukri	92+700 - 93+400	44 - 52
39	Baruka Pahi Sanayak	93+400 - 94+400	47 - 52
40	Miragpur	94+400 - 95+400	39 - 44
41	Ismailpur	95+400 - 95+800	43 - 53
42	Madnapur	95+800 - 97+700	46 - 54
43	Chandaukha	97+700 - 99+300	49 - 52
44	Nasirpur	99+300 - 99+800	49.5 - 53
45	Nglavantu	99+800 - 101+000	49.5 - 56
46	Devtara	101+000 - 101+100	50
47	Kabilpur	101+100 - 102+000	49 - 54
48	Barkhera Jaipal	102+000 - 103+600	48 - 67
49	Haidarpur	103+600 - 104+300	37 - 70
50	Rajpuri	104+300 - 104+800	48 - 57
51	Rajpura	104+800 - 106+300	40 - 59
52	Salempur Khurd	106+300 - 111+300	40 - 58
53	Feel Nagar	111+300 - 113+300	48 - 69
54	Meeranpur	113+300 - 114+000	26 - 51
Package-3			
1	Meeranpur	114+100 - 116+300	20 - 30.5
2	Shalpur Navdia	116+300 - 117+200	22 - 38.5
3	Kasrak	117+200 - 118+400	19 - 30
4	Shahpur Khitaoa	118+400 - 118+500	19
5	Bhojpur	118+500 - 119+800	18 - 51
6	Bhauna	119+800 - 120+400	23.5 - 29
7	Khawajagipur	120+400 - 121+200	19.5 - 24
8	Kapoor Nagla	121+200 - 122+500	19 - 26
9	Kamalpur Urf Bakhtawar Ganj	122+500 - 123+800	19 - 33.5
10	Kapoorpur	123+800 - 125+800	19 - 45
11	Akbarpur	125+800 - 126+600	21.5 - 27

S.N.	Name of Village	Chainage (Km)	Row (m)
12	Akbari	126+600 - 127+300	22 - 27
13	Miyuna	127+300 - 128+100	22 - 30
14	Khanpur Kharmasi	128+100 - 130+800	17.5 - 32
15	Diuras	130+800 - 132+000	22 - 30
16	Bhundi Bangar	132+000 - 133+500	23 - 30
17	Bhunda Harbanshpur	133+500 - 136+800	22 - 30
Package-4			
1	Bhundi Harbanshpur	138+000 - 139+100	21 - 27
2	Akholi Akhola	139+100 - 139+900	21.5 - 27
3	Amrita Khas	139+900 - 141+800	21- 34
4	Nagipur Bhadiya	141+800 - 144+000	19 - 26
5	Bahadurpur	144+000 - 144+600	22 - 27
6	Mundia Karor	144+600 - 145+300	22 - 28
7	Global Patipura	145+300 - 147+200	18 - 28
8	Gyaspur	147+200 - 148+200	18 - 24
9	Dugipr Bara Gaon	148+200 - 149+000	18 - 29
10	Khamria Navdia	149+000 - 150+900	19 - 38.5
11	Kasimpur	150+900 - 152+700	23 - 31
12	Jasauli Diwari	152+700 - 154+600	19 - 27
13	Parasi Urf Parasia	154+600 - 155+900	19 - 31
14	Pakria Mangli	155+900 - 156+400	23 - 26
15	Akbarganj Simra	156+400 - 157+500	25 - 35
16	Bichpuri	157+500 - 157+800	25 - 40
17	Jogi Thera	157+800 - 159+100	17 - 27
18	Tikari Mafi	159+100 - 160+000	20- 25
19	Narayanpur	160+000 - 160+900	20 - 22
20	Patar Siya	160+900 - 162+400	19 - 24
21	Pathrala	162+400 - 163+100	19 - 22
22	Navada Mahesh	163+100 - 164+400	20 - 25
23	Mohammadganj Amkharia	164+400 - 165+500	28 - 31
24	Barkhedakla	165+500 - 167+200	20 -29
25	Nakta Urf Muradabad	167+200 - 168+700	20 - 31
26	Gulda Machvapur	168+700 - 169+300	21 - 26
27	Bidhouliya	169+300 - 169+800	24 - 32
28	Jyohra Kalyanpur	169+800 - 171+600	20 - 36
29	Simria Tarachandra	171+600 - 172+100	24 - 25
30	Gazipur	172+100 - 173+400	20 - 30
31	Pautakla	173+400 - 173+500	24
32	Sathrapur Mustqil	173+500 - 173+600	26
33	Pautakla	173+600 - 176+100	19- 27.5

S.N.	Name of Village	Chainage (Km)	Row (m)
34	Jinonia	176+100 - 177+800	20 - 40
35	Jangroli Pul	177+800 - 179+500	21 - 31
36	Sandia Mustqil	179+500 - 180+400	21 - 25
37	Ruppur Kamalu	180+400 - 182+000	23 - 29
38	Ruppur Kripa	182+000 - 183+300	25 - 34
39	Pakdiya Nogva Chawk	183+300 - 183+700	29 - 31.5

Source: Detailed Project Report

2.4 Existing Conditions of Road

The details of existing conditions of the road are given below in **Table 2.4.**

Table 2.4: Details of Existing Conditions of the Road

S.N.	Section	Existing Chainage	Width of Carriageway (m)	Condition
1.	Bewar to Farrukhabad	Km 0.00 to Km 40+000	7.00	Poor
2.	Farrukhabad to MiranpurKatra	Km 40.00 to Km 114.20	7.00	Fair
3.	MiranpurKatra to Bhundi village	Km 114.200 to Km 133.00	3.50	Poor
4.		Km 133.00 to Km 137.00	Nil	Earthen Road
5.	End of Earthen section to Bisalpur	Km 137.00 to Km 147.90 km	3.50-5.50	Poor
6.	Bisalpur to Pilibhit	Km 147.90 to Km 183.65	7.00	Fair

2.5 Existing Traffic on the Project Road

The study aims at obtaining the existing traffic and travel characteristics on the project corridor and forecasting the same for the project horizon year considering various constituent streams and various scenarios. The results of this analysis will form inputs for developing capacity augmentation proposals, designing the pavement, design of intersections, decisions regarding grade separators, pedestrian facilities and carrying out economic and financial analysis. The average daily traffic (ADT) has been converted to average annual daily traffic (AADT) using seasonal correction factors. The AADT is the input for various analyses like traffic forecast, capacity augmentation, pavement design, economic and financial analysis etc. Traffic surveys have been conducted at six (6) locations along the project road. The details are provided in **Table 2.5**. The projected traffic is given in **Table 2.6.**

Table 2.5: Traffic Count Survey Locations

S.N.	Homogenous Section	Chainage (Km)	Location	Remarks to Capture
Package-1				
1.	Section I : Km 0 to Km 40.000 (Bewar – Farrukhabad)	Near Km 27.900	Between in the homogenous Section I	Traffic coming from Kanpur, Jaipur, Mainpuri, Etawah & moving towards Farrukhabad, Shahjahanpur, Bareilly etc. (both ways)
Package-2				
1.	Section II :: Km 40.0 to Km 114.200 (Farrukhabad – MP Katra)	1) Near Km 54.750, 2) Near km 78.00 3) Near km 105.10	Between in the homogenous Section II	Traffic moving among Farrukhabad, Kanpur, Badaun, Hardoi, Shahjahanpur, Bareilly etc.
Package-3				
1.	Section III :: Km 114.000 to Km 147.900 (MP Katra – Bisalpur)	Near km 126.950	Between in the homogenous section III	Km 133.00 to Km 137.00 is missing link (Earthen road)
Package-4				
1.	Radhaita to Bhutta	Km 137.250 to Km 144.400	Widening and Strengthening	
2.	Bhutta to Bisalpur	Km 144.400 to Km 147.650	Widening and Overlay	
3.	Bisalpur to Pilibhit	Km 147.650 to Km 183.380	Widening and Overlay	

Source: Detailed Project Report

Table 2.6: Projected Traffic

S.N.	Locations	AADT	PCU	CVPD
Package 1				
1.	Km 27.900 (near MurhaasKanhaiya)	8976	9757	1658
Package 2				
1.	Km 54.750 (near Hullapur)	7554	9508	1638
2.	Km 78.000 (RolliBauri)	8651	12342	2103
3.	Km 105.100 (near Rajpura)	4426	6166	1052
Package 3				
1.	Km 126.950 (Akbariya)	3807	3247	208
Package4				
1	Km 159.700 (near Jogither)	6990	7313	810
2	Km 175.800 (near PautaKalan)	5686	5679	531

Source: Detailed Project Report

As per the projected traffic, it is proposed to develop the project road as two lane with paved shoulder facility.

2.6 Design Speed/Parameters

The following design standards have been adopted as per Indian Roads Congress (IRC) guidelines, contained in IRC: 73, IRC: 86, IRC: 38, IRC 58-2011 and IRC: SP: 23 and is given in **Table 2.7**:

Table 2.7:Design Parameters

Item	Plain / Rolling Terrain
Design Speed (kmph)	Ruling -100 Kmph Min.- 80 kmph
Sight distance (minimum)	180 m
Proposed Land width (ROW)	Open areas - 30m Built-up areas - 30 m
Lane configuration	2-lane with paved shoulders
Formation width	As per Typical cross sections
Camber/cross fall	2.5 %
Shoulders	2.5 % for paved shoulder and 3.0 % for earthen shoulder
Side Slope	1 (V): 2 (H) Fill (Fill height upto 3.0 m) 1 (V): 1.5 (H) Fill (Fill height 3 m to 6.0 m) 1 (V): 1 (H) Cut
Maximum super-elevation	7.0 %
Radii of horizontal curves in plain/hilly terrain (m)	Ruling Min – 400 m / 150m Absolute Min – 250 m / 75m
Drains	“Rectangular “shape on - either side where warranted depending on Site Condition.

Source: Detailed Project Report

2.7 Widening Proposal with Typical Cross Section

The widening proposals for different packages are given below:

Package – 1

i) **Road Width -** Road width for plain and built-up areas have been shown in Typical Cross Sections provided in subsequent sections.
ii) **Carriageway Width -** Two Lane Carriage way (3.5m for each lane) has been proposed,
iii) **Shoulders -** Unpaved shoulders of 2.00 wide and paved shoulder of 1.50m have been proposed on either side of the Carriage way
iv) **Widening Scheme-** The widening scheme is provided in **Table 2.8.**

Table 2.8: Widening Scheme of Project Road (Package-1)

S.N.	Design Chainage (Km)		Length (m)	TCS Type	Remarks
	From	To			
1	0+000	1+500	1500	TCS-6F	TCS Drawings given in Annexure 2.2
2	1+500	6+300	4800	TCS-2B	TCS Drawings given in Annexure 2.2
3	6+300	7+100	800	TCS-6D	TCS Drawings given in Annexure 2.2
4	7+100	8+300	1200	TCS-2B	TCS Drawings given in Annexure 2.2
5	8+300	9+300	1000	TCS-6D	TCS Drawings given in Annexure 2.2
6	9+300	10+400	1100	TCS-2B	TCS Drawings given in Annexure 2.2
7	10+400	11+150	750	TCS-6D	TCS Drawings given in Annexure 2.2
8	11+150	12+000	850	TCS-2B	TCS Drawings given in Annexure 2.2
9	12+000	12+480	480	TCS-6C	TCS Drawings given in Annexure 2.2
10	12+480	15+680	3200	TCS-2A	TCS Drawings given in Annexure 2.2
11	15+680	17+980	2300	TCS-6E	TCS Drawings given in Annexure 2.2
12	17+980	21+000	3020	TCS-2A	TCS Drawings given in Annexure 2.2
13	21+000	21+500	500	TCS-6C	TCS Drawings given in Annexure 2.2
14	21+500	23+475	1975	TCS-2A	TCS Drawings given in Annexure 2.2
15	23+475	23+700	225	TCS-6C	TCS Drawings given in Annexure 2.2
16	23+700	24+350	650	TCS-2A	TCS Drawings given in Annexure 2.2
17	24+350	24+900	550	TCS-6C	TCS Drawings given in Annexure 2.2
18	24+900	26+950	2050	TCS-2A	TCS Drawings given in Annexure 2.2
19	26+950	28+050	1100	TCS-6C	TCS Drawings given in Annexure 2.2
20	28+050	32+650	4600	TCS-2A	TCS Drawings given in Annexure 2.2
21	32+650	36+390	3740	TCS-6E	TCS Drawings given in Annexure 2.2
22	36+390	36+930	540	-	TCS Drawings given in Annexure 2.2
23	36+930	39+800	2870	TCS-6E	TCS Drawings given in Annexure 2.2
24	39+800	40+440	640	-	TCS Drawings given in Annexure 2.2
25	40+440	52+770	12330	TCS-2	TCS Drawings given in Annexure 2.2

Source: Detailed Project Report

Package-2

i) Roadway width -

For Plain areas - Roadway width of 14.00 (7.0+2x1.5+2x2.0) is proposed for sections with 2 lane plus paved shoulders of 1.50m and unpaved shoulder of 2.00m on either side in plain areas and,

For Built-up areas - Roadway width of 28.00 (7.0x2+2x2.0+2x2.0+2x1.75+2.5) is proposed

ii) Carriageway Width - Two Lane Carriage way (3.5m for each lane) is proposed,

iii) Shoulders - Unpaved shoulders of 2.00 wide and paved shoulder of 1.50m are proposed on either side of the Carriage way

iv) Widening Scheme- Provided in **Table 2.9**

Table 2.9: Widening Scheme of Project Road (Package-2)

S.N.	Design Chainage (km)		Length (m)	TCS Type	Remarks (TCS Drawings given in Annexure 2.2)
	From	To			
1	52+770	59+250	6480	TCS-2	Concentric widening and strengthening of two lane with paved shoulder in open area for plain
2	59+250	60+000	750	TCS-6	4 lane in Built-up Area
3	60+000	63+680	3680	TCS-2	Concentric widening and strengthening of two lane with paved shoulder in open area for plain
4	63+680	64+630	950	TCS-6A	2 lane paved shoulder with paver block in built-up area
5	64+630	66+280	1650	TCS-2	Concentric widening and strengthening of two lane with paved shoulder in open area for plain
6	66+280	67+380	1100	TCS-6A	2 lane Paved shoulder with paver block in Built-up Area
7	67+380	69+630	2250	TCS-2	Concentric widening and strengthening of two lane with paved shoulder in open area for plain
8	69+630	69+970	340	TCS-6A	2 lane Paved shoulder with paver block in Built-up Area
9	69+970	70+620	650	TCS-2	Concentric widening and strengthening of two lane with paved shoulder in open area for plain
10	70+620	71+900	1280	TCS-6A	2 lane Paved shoulder with paver block in Built-up Area
11	71+900	76+350	4450	TCS-2	Concentric widening and strengthening of two lane with paved shoulder in open area for plain
12	76+350	76+650	300	TCS-6A	2 lane paved shoulder with paver block in built-up area
13	76+650	77+900	1250	TCS-2	Concentric widening and strengthening of two lane with paved shoulder in open area for plain
14	77+900	79+800	1900	TCS-6	4 lane in built-up area
15	79+800	81+750	1950	TCS-6B	4 lane in built-up area with crash barrier
16	81+750	86+280	4530	TCS-2	Concentric widening and strengthening of two lane with paved shoulder in open area for plain
17	86+280	86+680	400	TCS-6A	2 lane paved shoulder with paver block in built-up area
18	86+680	91+600	4920	TCS-2	Concentric widening and strengthening of two lane with paved shoulder in open area for plain

S.N.	Design Chainage (km)		Length (m)	TCS Type	Remarks (TCS Drawings given in Annexure 2.2)
	From	To			
19	91+600	91+850	250	TCS-6A	2 lane paved shoulder with paver block in built-up area
20	91+850	95+900	4050	TCS-2	Concentric widening and strengthening of two lane with paved shoulder in open area for plain
21	95+900	97+200	1300	TCS-6A	2 lane paved shoulder with paver block in built-up area
22	97+200	102+800	5600	TCS-2	Concentric widening and strengthening of two lane with paved shoulder in open area for plain
23	102+800	103+080	280	TCS-6A	2 lane paved shoulder with paver block in built-up area
24	103+080	108+800	5720	TCS-2	Concentric widening and strengthening of two lane with paved shoulder in open area for plain
25	108+800	109+130	330	TCS-6A	2 lane paved shoulder with paver block in built-up area
26	109+130	112+880	3750	TCS-2	Concentric widening and strengthening of two lane with paved shoulder in open area for plain
27	112+880	114+000	1120	TCS-6	2 lane paved shoulder with paver block in built-up area

Source: Detailed Project Report

Package-3

(i) **Roadway width -**

For Plain Areas - Roadway width of 14.00 (7.0+2x1.5+2x2.0) is proposed for sections with 2 lane plus paved shoulders of 1.50m and earthen shoulder of 2.00 m on either side in plain areas and,

*For Built-up areas -*Roadway width of 17.50 (1x7.0+2x1.5+2x1.75+2x2.0) is proposed for sections with 2 lane plus paved shoulders of 1.50m and RCC covered drain of 1.75 m wide on either side of Road way and 2.0 m for utility services on both sides.

(ii) **Carriageway Width -** Two Lane Carriage way (3.5m for each lane) is proposed

(iii) **Shoulders -** Paved shoulder of 1.50m and earthen shoulders of 2.00 wide are proposed on either side of the carriageway

(iv) **Widening Scheme-**Provided in **Table 2.10.**

Table 2.4: Widening Scheme of Project Road (Package-3)

S.N.	Design Chainage (km)		Length (m)	TCS Type	Remarks (TCS Drawings given in Annexure 2.2)
	From	To			
1	114+000	115+550	1550	TCS - 6D	Concentric widening and strengthening with two in built up area

S.N.	Design Chainage (km)		Length (m)	TCS Type	Remarks (TCS Drawings given in Annexure 2.2)
	From	To			
2	115+550	116+596	1046	TCS-1	Concentric widening and strengthening of two lane with paved shoulder in open area
3	116+596	117+360	764	-	Railway over bridge
4	117+360	117+850	490	TCS-1	Concentric widening and strengthening of two lane with paved shoulder in open area
5	117+850	118+650	800	TCS-6D	Concentric widening and reconstruction with two in built up area
6	118+650	122+850	4200	TCS-1	Concentric widening and strengthening of two lane with paved shoulder in open area
7	122+850	123+450	600	TCS-6D	Concentric widening and reconstruction with two in built up area
8	123+450	125+150	1700	TCS-1	Concentric widening and strengthening of two lane with paved shoulder in open area
9	125+150	128+100	2950	TCS-1	Concentric widening and strengthening of two lane with paved shoulder in open area
10	128+100	131+450	3350	TCS-6D	Concentric widening and reconstruction with two in built up area
11	131+450	132+600	1150	TCS-1	Concentric widening and strengthening of two lane with paved shoulder in open area
12	132+600	133+850	1250	-	New bridge on Garra/Devah River with approach
13	133+850	137+250	2890	TCS-1	Concentric widening and reconstruction of two lane with paved shoulder in open area

Source: Detailed Project Report

Package – 4

(i) **Roadway width -**
For Plain areas - Roadway width of 14.00 (7.0+2x1.5+2x2.0) is proposed for sections with 2 lane plus paved shoulders of 1.50m and unpaved shoulder of 2.00m on either side in plain areas and,
For Built-up areas -As per typical cross section

(ii) **Carriageway Width -** Two Lane Carriage way (3.5m for each lane) is proposed

(iii) **Shoulders -**Unpaved shoulders of 2.00m wide and paved shoulder of 1.50m are proposed on either side of the Carriage way

(iv) **Widening Scheme –** Provided in **Table 2.11**

Typical cross sections (TCS) for the project alignment are given **Annexure 2.2.**

Table 2.5: Widening Scheme of Project Road (Package-4)

S.N.	Design Chainage (km)		Length (m)	TCS Type	Remarks
	From	To			
1	137+250	144+400	7660	TCS - 2F	TCS Drawings given in Annexure 2.2
2	137+250	145+550	1150	TCS - 2C	TCS Drawings given in Annexure 2.2

3	145+550	146+200	650	TCS - 6H	TCS Drawings given in Annexure 2.2
4	146+200	146+900	700	TCS - 2C	TCS Drawings given in Annexure 2.2
6	146+900	147+650	750	TCS - 6H	TCS Drawings given in Annexure 2.2
7	147+650	149+650	2000	TCS - 6B	TCS Drawings given in Annexure 2.2
8	149+650	153+140	3490	TCS - 2	TCS Drawings given in Annexure 2.2
9	153+140	153+950	810	TCS - 6B	TCS Drawings given in Annexure 2.2
10	153+950	154+850	900	TCS - 2	TCS Drawings given in Annexure 2.2
11	154+850	155+300	450	TCS - 6B	TCS Drawings given in Annexure 2.2
12	155+300	158+150	2850	TCS - 2	TCS Drawings given in Annexure 2.2
13	158+150	159+350	1200	TCS - 6B	TCS Drawings given in Annexure 2.2
14	159+350	165+050	5700	TCS - 2	TCS Drawings given in Annexure 2.2
15	165+050	166+900	1850	TCS - 6	TCS Drawings given in Annexure 2.2
16	166+900	167+350	450	TCS - 2	TCS Drawings given in Annexure 2.2
17	167+350	168+100	750	TCS - 6B	TCS Drawings given in Annexure 2.2
18	168+100	168+450	350	TCS - 2	TCS Drawings given in Annexure 2.2
19	168+450	169+000	550	TCS - 6B	TCS Drawings given in Annexure 2.2
20	169+000	170+250	1250	TCS - 2	TCS Drawings given in Annexure 2.2
21	170+250	171+000	750	TCS - 6B	TCS Drawings given in Annexure 2.2
22	171+000	171+650	650	TCS - 2	TCS Drawings given in Annexure 2.2
23	171+650	172+000	350	TCS - 6B	TCS Drawings given in Annexure 2.2
24	172+000	174+150	2150	TCS - 2	TCS Drawings given in Annexure 2.2
25	174+150	175+500	1350	TCS - 6B	TCS Drawings given in Annexure 2.2
26	175+500	178+150	2650	TCS - 2	TCS Drawings given in Annexure 2.2
27	178+150	178+700	550	TCS - 6B	TCS Drawings given in Annexure 2.2
28	178+700	181+000	2300	TCS - 2	TCS Drawings given in Annexure 2.2
29	181+000	181+850	850	TCS - 6B	TCS Drawings given in Annexure 2.2
30	181+850	182+750	900	TCS - 2	TCS Drawings given in Annexure 2.2
31	182+750	183+380	630	TCS - 6	TCS Drawings given in Annexure 2.2

Source: Detailed Project Report

2.8 Realignments and Bypass in the Project Road

The realignments proposed in the project road are given in **Table 2.12.** There is no bypass proposed in the project road.

Table 2.12: Realignments and Bypass in the Project Road

S. No.	Start Design Chainage	End Design Chainage	Design Length (km)	Width (m)	Remarks
Package 1					
1	3.600	3.940	0.340	30	Curve Improvement
2	6.400	6.600	0.200	30	Curve Improvement
Package 2					
3	59.350	59.550	0.200	30	Curve Improvement
4	71.250	71.600	0.350	30	Curve Improvement
Package 3					
5	114.020	114.125	0.105	30	Realignment

S. No.	Start Design Chainage	End Design Chainage	Design Length (km)	Width (m)	Remarks
6	114.210	114.280	0.070	30	Realignment
7	114.570	114.670	0.100	30	Realignment
Package 4					
8	147.600	147.670	0.070	30	Realignment
9	148.300	148.500	0.200	30	Realignment

Proposed Bypass Locations - Nil

2.9 Pavement

Flexible pavement has been proposed as per IRC 37:2018 except at toll plaza location where rigid pavement as per IRC 58 has been proposed. Low heat emission cement (Portland pozzolana cement) should be used for construction of road. Pavement Design consideration is given in **Table 2.13.**

Table 2.13: Pavement Design Considerations

1	Design MSA	20 MSA (*)
2	Design Life	15 year (upto Year 2038)
3	Growth Rate	5%
4	Vehicle Damage Factor	As mentioned in para 0.11.2
5	Lane Distribution Factor	0.75
6	CBR	8%

(*) The design MSA for **Package 2** is 30 MSA

The improvement proposals of pavement for the project road are given in **Table 2.14**:

Table 2.14: Improvement Proposals of the Pavement

S.No	Homogeneous section	Chainage	Proposals			
Package – 1						
1.	Bewar to Farrukhabad	Km 0.000 to Km 12.000	Reconstruction of Two Lane With Paved Shoulder			
2.		Km 12.000 to Km 40.000	Widening and strengthening Two Lane with Paved Shoulder			
3.	Farrukhabad to Allahganj	Km 40.000 to Km 52.770	Widening and Strengthening of Two Lane with Paved Shoulder in Open Area			
Package – 2						
4.	Allahaganj to Miranpur Katra	Km 52.770 to Km 114.000	Widening and Strengthening of Two Lane pave shoulder in open area			
Package – 3						
5.	Reconstruction (As two lane with paved shoulder Facility)	NH-730C	114+100	133+250	114+000	133+100
6.	New construction (on earthen road) (As two lane with paved shoulder Facility)	NH-730C	133+250	137+000	133+100	137+250
Package – 4						
7.	Widening and strengthening	NH-730C	137+250	144+350	137+250	144+400
8.	Widening and Overlay	NH-730C	144+350	147+900	144+400	147+650
9.	Widening and Overlay	NH-731K	147+900	183+680	147+650	183+380

Source: Detailed Project Report

The summary of all pavement options is given in **Table 2.15.**

Table 2.15: Summary of All Pavement Options

Pavement Composition	Pavement Thickness (in mm)
1. Bituminous Concrete - BC	30
2. Dense Bituminous macadam - DBM	90
3. Wet Mix Macadam - WMM	250
4. Granular Sub base - GSB	200
5.Total Thickness of the pavement	570
6. Subgrade	500

2.10 High Embankment Locations

The provision of slope protection on high embankment has been proposed as per IRC-SP-56:2011 by providing plantation of vetiver grass on slopes and turfing of grass. The provision of chute drains has also been proposed.

The high embankment locations along the project road are given in **Table 2.16.**

Table 2.6: High Embankment Locations.

S.N.	Design Ch. (km)		Description
	From	To	
Package-1			
1.	36+390	36+930	ROB
2.	40+000	52+770	High embankment
Package-2			
1.	52+770	59+250	High embankment
Package-3			
1.	132+600	133+850	Bridge
2.	133+850	137+250	High embankment

Source: Detailed Project Report

2.11 Proposed Structures and Improvement Proposals

2.11.1 Drainage Structures

Details of drainage structures proposed in the project road are given below:

A. Bridges : Details of existing bridges and development proposals are given below:

Type of Structure	Existing	Proposed	Details
Package-1			
Major Bridge	2 Nos.	2 Nos. retained with minor repair due to overall good condition	Refer Table 2.17
Minor Bridge	4 Nos.	2 are reconstructed and 2 are retained with repair	Refer Table 2.17
Package-2			
Major Bridge	1 No.	Retained	Refer Table 2.18
Minor Bridge	7 Nos.	3 are reconstructed and 4 are retained with repair	Refer Table 2.18
Package-3			
Minor Bridge	1 No.	Reconstruction	Refer Table 2.19
Pontoon Bridge	-	1 No.	Refer Table 2.19
Package-4			
Nil			

Package wise details of existing bridges and their development proposals are given in **Table 2.17** to **2.19**.

Table 2.17: Details of Existing Bridge and Their Proposals (Package-1)

SN	Design Ch.	Existing Details				Proposal Details		
		No. of Spans	**Span (Exp. to Exp.) (m)**	**Carriage -way width**	**Type of structure**	**Proposal**	**Span (Exp. to Exp.) (m)**	**Type of structure**
1	03+500	4	29.4+30.2 +29.2+29. 6	7.40	RCC Girder	Retained	29.4+30.2+ 29.2+29.6	RCC Girder
2	08+110	2	5.85+5.85	9.50	Slab	Reconstruction	1x15	RCC Girder
3	12+570	4	3.80+2.30 +4.70+3.1 0(CL)	6.30	Arch Bridge	Reconstruction	1x25	RCC Girder
4	31+425	3	5.25+6.30 +5.40(CL)	10.10	Slab	Retained	5.25+6.30+ 5.40(CL)	RCC Slab
5	31+710	2	5.60+1x5.4	11.10	Slab	Retained	5.60+5.40	RCC Slab
6	39+840	18	18x35.6	7.50	RCC Girder	Retained	18x35.6	RCC Girder
7	44+665	1	29.3	7.60	RCC Girder	Retained	29.3	RCC Girder

Source: Detailed Project Report

Table 2.7: Details of Existing Bridge and Their Proposals (Package-2)

S.N	Design Ch.	Existing Details				Proposal Details		
		No. of Spans	**Span (Exp. to Exp.) (m)**	**Carriage way width**	**Type of structure**	**(Recons./ Widen./ New Cons/ Retained)**	**Span (Exp. to Exp.) (m)**	**Type of structure**
1	53+180	19	19x35.6	7.50	RCC Girder	Retained	19x35.6	RCC Girder
2	60+250	4	3.6+3.8+3. 8+3.4	9.10	Slab	Reconstruc -tion	1x15	RCC Girder
3	71+575	3	3.2+3.5+3. 7	8.00	Slab	Reconstruc -tion	1x10	RCC Box
4	73+340	3	3X5(CL)	10.90	Multicell Box	Retained	3X5(CL)	Multicell Box
5	76+800	4	5.2+5.8+8. 0+6.0(CL)	5.60	Arch Bridge	Reconstruc -tion	1x25	RCC Girder
6	81+910	2	2X4.8(CL)	11.00	Multicell Box	Retained	2X4.8(CL)	Multicell Box
7	85+600	2	2X4.8(CL)	11.00	Multicell Box	Retained	2X4.8(CL)	Multicell Box
8	112+44 0	5	4.40+5.70+ 4.80+4.80+ 4.80(CL)	10.80	Multicell Box	Retained	4.40+5.70+ 4.80+4.80+ 4.80(CL)	Multicell Box

Source: Detailed Project Report

Table 2.8: Details of Existing Bridge and Their Proposals (Package-3)

S.N	Design Ch. (Km.)	Existing Details			Proposed details		
		No. of Spans	Span (Exp. to Exp.) (m)	Type of structure	Recons./ Widen. / New Cons./ Retained	Span (Exp. to Exp.) (m)	Type of structure
1.	123+850	3	3x7.1	Arch Bridge	Reconstruction	1x25	RCC Girder
2.	133+215		-	Pontoon Bridge	New Construction	13x36	PSC Girder

Source: Detailed Project Report

Culverts

Package-1

Existing: 62 Nos.
Proposed: Reconstruction – 62 Nos. (to increase the water way of cross drainage structures)
New Construction – 22 Nos. (precast)
The details of existing and proposed culverts are given in **Annexure 2.3**.

Package-2

Existing: 60 Nos.
Proposed: Reconstruction – 60 Nos. (to increase the water way of cross drainage structures)
New Construction – 44 Nos. (precast)
The details of existing and proposed culverts are given in **Annexure 2.3**.

Package-3

Existing:34 Nos.
Proposed : Reconstruction – 34 Nos. (to increase the water way of cross drainage structures)
New Construction – 29 Nos. (precast)
The details of existing and proposed culverts are given in **Annexure 2.3**.

Package-4

Existing: 105 Nos.
Proposed : Reconstruction – 105 Nos. (to increase the water way of cross drainage structures)
New Construction – 30 Nos. (precast)

The details of existing and proposed culverts are given in **Annexure 2.3**.

2.12 Underpasses in the Project Road

In the project road, no provision of vehicular, pedestrian and animal underpass.

2.13 Road Side Drains

In the project road 95.670 km road side drain (both sides) have been provided in design, The road sections where roadside drains have been provided are given **Table 2.20**:

Table 2.20: Locational Details of Road Side Drains

Sl. No.	Design Chainage		Length in (m)	Road Side
	From	To		
Package – I				
1	0.000	1.500	1.500	Both
2	6.300	7.100	0.800	Both
3	8.300	9.300	1.000	Both
4	10.400	11.150	0.750	Both
5	12.000	12.480	0.480	Both
6	15.680	17.980	2.300	Both
7	21.000	21.500	0.500	Both
8	23.475	23.700	0.225	Both
9	24.350	24.900	0.550	Both
10	26.950	28.050	1.100	Both
11	32.650	36.390	3.740	Both
12	37.250	39.900	2.650	Both
		Total Drain Length in Package 1	**15.595*2=**	**31.190**
Package - II				
13	59.250	60.000	0.750	Both
14	63.680	64.630	0.950	Both
15	66.280	67.380	1.100	Both
16	69.630	69.970	0.340	Both
17	70.620	71.900	1.280	Both
18	76.350	76.650	0.300	Both
19	77.900	79.800	1.900	Both
20	79.800	81.750	1.950	Both
21	86.280	86.680	0.400	Both
22	91.600	91.850	0.250	Both
23	95.900	97.200	1.300	Both
24	102.800	103.080	0.280	Both
25	108.800	109.130	0.330	Both
26	112.880	114.000	1.120	Both
		Total Drain Length in Package 2	**12.250*2=**	**24.500**

Package - III				
27	114.000	115.450	1.450	Both
28	117.700	118.500	0.800	Both
29	122.700	123.600	0.900	Both
30	127.950	131.300	3.350	Both
		Total Drain Length in Package 3	**6.500*2=**	**13.000**
Package - IV				
31	145.550	146.200	0.650	Both
32	146.900	147.650	0.750	Both
33	147.650	149.650	2.000	Both
34	153.140	153.950	0.810	Both
35	154.850	155.300	0.450	Both
36	158.150	159.350	1.200	Both
37	165.050	166.900	1.850	Both
38	167.350	168.100	0.750	Both
39	168.450	169.000	0.550	Both
40	170.250	171.000	0.750	Both
41	171.650	172.000	0.350	Both
42	174.150	175.500	1.350	Both
43	178.150	178.700	0.550	Both
44	181.000	181.850	0.850	Both
45	182.750	183.380	0.630	Both
		Total Drain Length in Package 4	**13.490*2=**	**26.98**
		Total Project Drain Length in km	**47.835*2=**	**95.670**

2.14 Junctions Along the Project Road

Package wise details of the junction improvement along the project road are given below:

Package-1

There are 3 major junctions and 80 minor junctions existing along the project road. Details of the junction improvement are given in **Annexure 2.4.**

Package-2

There are 4 major junctions and 48 minor junctions existing along the project road and the details of junction improvement are given in **Annexure 2.4.**

Package-3

There are 46 minor junctions existing along the project road and details of junction improvement are given in **Annexure 2.4.**

Package-4

There are 3 major junctions and 69 minor junctions that exists along the project road and details of junction improvement are given in **Annexure 2.4.**

2.15 Railway Track

Package-1

One ROB exists at Km 36.700 (Farrukhabad, Delhi- Kanpur Track). It is proposed to retain the ROB at km 36+700 but 2 lane with paved shoulder approach of ROB will be constructed.

Detail of existing ROB in Package-1 is given in **Table 2.21.**

Table 2.21: Detail of existing ROB (Package-1)

SN	Ch. (Km)	Existing Details			Proposal
		No. of Spans	Span Arrangement (Exp. to Exp.) (m)	Type of structure (RCC Box/ Slab /Pipe/Masonry Arch	(Reconstruction/Widening/New Construction/ retained)
1	36+700	3	10+15.8+10.2	RCC Slab over Steel beam	Retained

Source: Detailed Project Report

Package-2

One Railway level crossing at km 117.100 (Near MP Katra, Delhi – Lucknow Railway Track) exist, which shall be retained.

2.16 Bus Lay byes

Package-1

2 x 23 (46) bus bays with shelters are proposed along the project road in this package.

Package-2

2x3 (6) bus bays with shelters are proposed along the project road in this package.

Package-3

11 Bus shelters are proposed along the project road in this package.

Package-4

30 bus bays and shelters are proposed along the project road in this package. The locations of the bus bays are given in **Table 2.22.**

Table 2.22: Locations of Bus Shelters Along the Project Road

S.N.	Design Chainage	Side	S.N.	Design Chainage	Side
Package-1					
1	0+000	Both	13	20+780	Both
2	2+100	Both	14	21+080	Both
3	5+280	Both	15	22+050	Both
4	6+980	Both	16	25+000	Both
5	9+080	Both	17	26+650	Both
6	11+880	Both	18	38+000	Both
7	13+580	Both	19	44+000	Both
8	14+380	Both	20	48+340	Both
9	15+980	Both	21	49+940	Both
10	17+380	Both	22	51+370	Both
11	17+490	Both	23	52+740	Both
12	18+180	Both			
Package-2					
1	53+600	Both	3	87+650	Both
2	55+920	Both			
Package-3					
1	114+150	RHS	7	125+200	LHS
2	115+520	RHS	8	125+450	RHS
3	117+900	LHS	9	128+200	LHS
4	118+600	RHS	10	131+300	RHS
5	122+900	LHS	11	136+850	LHS
6	123+400	RHS			
Package-4					
1	145+500	RHS	16	168+400	LHS
2	146+250	LHS	17	169+050	RHS
3	146+850	LHS	18	170+200	LHS
4	149+150	RHS	19	171+050	RHS
5	153+050	LHS	20	171+600	LHS
6	154+000	RHS	21	172+050	RHS

S.N.	Design Chainage	Side	S.N.	Design Chainage	Side
7	154+800	LHS	22	174+100	LHS
8	155+400	RHS	23	175+550	RHS
9	158+100	RHS	24	178+100	LHS
10	159+400	RHS	25	178+750	RHS
11	163+050	LHS	26	180+950	LHS
12	165+000	LHS	27	181+900	RHS
13	166+950	RHS	28	182+700	LHS
14	167+300	LHS	29	183+370	LHS
15	168+150	RHS			

Source: Detailed Project Report

2.17 Truck Lay-Bye

Paved rest areas for truck drivers have been provided keeping in mind availability of space where multiple trucks can be parked. Package wise details of truck lay-byes are given below:

Package 1: km 28+900 both side
Package 2: km 89+900 both side
Package 3: Nil
Package 4: km 154+200 (design chainage) both side

2.18 Toll Plaza

The package-wise details of Toll Plazas proposed are given below:

***Package 1*:** Km 30+000 before Farrukhabad near Murhaskanhaiya
Package 2: Km 90+800 near Jalalabad
Package 3: Nil
Package 4: Km 152+380 (design chainage) near Bisalpur

Toll plaza may have facilities of user fare display, digital traffic lights, overhead lane signs, toll collection cabins, automatic barriers, data loggers and computer systems, weighbridge, toll office, ambulance, accident help vehicles, toe vehicle, crane, rest room, sanitary facilities for toll collection staff, etc

2.19 Slope Protection on High Embankment

The provision of slope protection on high embankment conforming to IRC-SP-56:2011 has been provided at the locations given in **Table 2.23** by plantation of vetiver grass on slopes, turfing of grass and provision of chute drains.

Table 2.23: Slope Protection on High Embankment

S.No	Package	Design CH from	Design Ch. to	Description
1	Package-1	36.390	36.930	ROB
		40.000	52.770	High embankment
2	Package-2	52.770	59.250	High embankment
3	Package-3	132.600	133.850	Bridge
		133.850	136.740	High embankment
4	Package-4	Nil		

2.20 Rain Water Harvesting

Rainwater harvesting has been provided in the project road as per details given below:

***Package 1*:** 7 nos. of RWH pits proposed
***Package 2*:** 11 Nos. of RWH pits proposed
***Package 3*:** 3 Nos. of RWH pits proposed
***Package 4*:** 6 No. of RWH pits proposed

The package-wise details of rain water harvesting (RWH) pits proposed along the project stretch are given in **Table 2.24.**

Table 2.9: Details of Proposed RWH pits

S.N.	Chainage(km.)	Side	Number of locations	Remarks
Package-1				
1.	30+000	RHS	4	Building at Toll Plaza
2.	30+000 to 30+700	RHS	3	Rigid Pavement at Toll Plaza
3.	06+140	RHS	1	Culvert
4.	20+090	RHS	1	Culvert
5.	22+620	RHS	1	Culvert
6.	22+760	RHS	1	Culvert
7.	26+650	RHS	1	Culvert
Package-2				
1.	90+800	RHS	4	Building at Toll Plaza
2.	90+800 to 91+500	RHS	3	Rigid Pavement at Toll Plaza
3.	61+060	RHS	1	Culvert
4.	82+750	RHS	1	Culvert
5.	87+350	RHS	1	Culvert
6.	101+400	RHS	1	Culvert
7.	103+100	RHS	1	Culvert
8.	103+830	RHS	1	Culvert
9.	104+225	RHS	1	Culvert
10.	107+410	RHS	1	Culvert

S.N.	Chainage(km.)	Side	Number of locations	Remarks
11.	109+380	RHS	1	Culvert
Package-3				
1.	115+620	RHS	1	Culvert
2.	124+850	RHS	1	Culvert
3.	125+070	RHS	1	Culvert
Package-4				
1.	152+380	RHS	4	Building at Toll Plaza
2.	152+380 to 153+100	RHS	3	Rigid Pavement at Toll Plaza
3.	138+510	RHS	1	Culvert
4.	176+530	RHS	1	Culvert
5.	169+190	RHS	1	Culvert
6.	164+320	RHS	1	Culvert

Source: Detailed Project Report

2.21 Solar Street Lights

Solar street lights have been proposed at habitation area, truck lay bye and major bridge locations as per IRC SP 73:2015. The locations of solar street lights are given in **Table 2.25.**

Table 2.10: Details of Proposed Solar Street Lights

S.N.	Chainage		Side
	From	To	
Package-1			
1.	0+000	1+500	Both
2.	15+680	17+980	Both
3.	28+900	29+210	Both
4.	32+650	36+390	Both
5.	36+930	39+800	Both
6.	39+900	40+600	Both
Package-2			
1.	59+250	60+000	Both
2	77+900	81+750	Both
3	112+880	114+000	Both
Package-3			
1.	114+000	115+550	Both
2.	117+850	118+650	Both
3.	122+850	123+450	Both
4.	128+100	131+450	Both
Package-4			
1.	145+550	146+200	Both

S.N.	Chainage		Side
	From	To	
2.	146+900	149+650	Both
3.	153+140	153+950	Both
4.	154+850	155+300	Both
5.	158+150	159+350	Both
6.	165+050	166+900	Both
7.	167+350	168+100	Both
8.	168+450	169+000	Both
9.	170+250	171+000	Both
10.	171+650	172+000	Both
11.	174+150	175+500	Both
12.	178+150	178+700	Both
13.	181+000	181+850	Both
14.	182+750	183+380	Both

Source: Detailed Project Report

2.22 Proposed Road Safety

2.22.1 Accident Prone Locations

As per data collected from UP Government in year 2018-19, no black spot has been identified on the project road.

2.22.2 Safety

Proper safety precautions are recommended on roadway width, the safety items to be provided are:

i) W Beam Crash Barrier/ Concrete Crash Barrier on either side of carriageway,
ii) Pavement Marking on Centre and edges lines,
iii) Provide adequate warning of hazards,
iv) Providing Bio-turfing for Slope protection,
v) Retaining wall in approach of ROB
vi) Toe wall where embankment height is more than 3 m.

The details are given below in **Table 2.26.**

Table 2.26: Road Safety Features

S.N.	Provisions	Details
1.	Crash barrier	4800 m
2.	Road studs	800 Nos.
3.	Road signs	600 Nos.
4.	Delineators	2382 Nos.
5.	Footpath cum drain	47.680 Km

2.22.3 Highway Lighting

Street lighting have been proposed in accordance with para 13.3 of Section 13 of the Manual of Specification and Standards for two laning of highways through PPP.

2.22.4 Road Side Furniture

Road side furniture shall be provided in accordance with Section 11 of the Manual of Specification and Standards for two laning of highways through PPP. Details are given in **Table 2.27** below:

Table 2.11: Road Side Furnitures

S.N.	Description	Unit	Quantity
Package-1			
1	Providing and fixing RCC boundary pillars including cost of reinforcement and two coats of painting with ready mix oil bound paint complete as per drawing and Technical Specifications Clause 806.	Nr.	1,055
2	Providing and fixing PCC/RCC hectometer, kilometer and 5th kilometer stones including cost of reinforcement complete as per Technical Specifications Clause 804.		
	200-metre stone	Nr.	211.00
	Kilometre stone	Nr.	42.00
	5th km. stone	Nr.	10.00
3	Providing and laying Pavement marking with hot applied thermoplastic material complete as per drawing and Technical Specifications Clause 803.		
	a) Lane/ Centre line/ Edge marking/	Sqm	2.00
		Sqm	1.00
4	Transverse marking (no of junctions=112,50 no of strips of 30 cm width and 6.70 m length @ each junction)	Sqm	112*50
5	Directional Arrows, Lettering etc. as per drawing No.61 of MORTH Type Designs for Intersections on National Highways	Sqm	336.00
6	Providing and laying kerb painting with ordinary paints grade-I (IS:164) complete as per drawing and Technical Specifications Clause 803	Sqm	2 x 6455
7	Supplying and fixing sign boards complete as per Technical Specifications Clause 801 and as directed by Engineer, including the cost of posts, fitting and fixing. Sheeting will be retro reflecting type of high intensively grade and messages/borders will be screen printed		
	Informatory signs		
	Route marker signs (450mm x 600mm)	Nr.	50

S.N.	Description	Unit	Quantity
	Cautionary signs, size triangular 900mm side	Nr.	50
8	Supplying and fixing overhead signs complete as per drawing and Technical Specifications Section 800 including cost of posts, truss, erection, fitting and foundations. Sheeting will be retro reflective type of high intensity grade and message/borders will be screen-printed as per drawings.		
	Truss and Vertical Support (Portal type)	MT.	5
	Aluminum alloy plate for over head sign	MT.	10
9	Providing and fixing road delineators complete as per drawing and Technical Specifications Clause 805 as directed by Engineer.		
	Road delineators	Nr.	250
	Hazard Markers	Nr.	250
10	Retro- reflectorised Traffic signs (Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing)		
	90 cm equilateral triangle	each	50
	60 cm x 45 cm rectangular	each	50
11	Direction and Place Identification signs upto 0.9 sqm size board. (Providing and erecting direction and place identification retro-reflectorised sign asper IRC:67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 2 mm thick with area not exceeding 0.9 sqm supported on a mild steel single angle iron post 75 x 75 x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 x 45 x 60 cm, 60 cm below ground level as per approved drawing)	Nr.	30
12	Road Markers/Road Stud with Lense Reflector (Providing and fixing of road stud 100x 100 mm, die cast in aluminium, resistant to corrosive effect of salt and grit, fitted with lense reflectors, installed in concrete or asphaltic surface by drilling hole 30 mm upto a depth of 60 mm and bedded in a suitable bituminous grout or epoxy mortar, all as per BS 873 part 4:1973)	each	2
13	Toll Plaza including High Mast Pole Lighting	LS	1
Package-2			
1	Providing and fixing RCC boundary pillars including cost of reinforcement and two coats of painting with	Nr.	2,450.00

S.N.	Description	Unit	Quantity
	ready mix oil bound paint complete as per drawing and Technical Specifications Clause 806.		
2	Providing and fixing PCC/RCC hectometer, kilometer and 5th kilometer stones including cost of reinforcement complete as per Technical Specifications Clause 804.		
	200-metre stone	Nr.	247.00
	Kilometre stone	Nr.	50.00
	5th km. stone	No.	12.00
3	Providing and laying Pavement marking with hot applied thermoplastic material complete as per drawing and Technical Specifications Clause 803.		
	a) Lane/ Centre line/ Edge marking/	Sqm	2.00
		Sqm	1.00
4	Transverse marking (no of junctions=109,50 no of strips of 30 cm width and 6.70 m length @ each junction)	Sqm	109*50
5	Directional Arrows, Lettering etc. as per drawing No.61 of MORTH Type Designs for Intersections on National Highways.	Sqm	336.00
6	Providing and laying kerb painting with ordinary paints grade-I (IS:164) complete as per drawing and Technical Specifications Clause 803	Sqm	2.00
7	Supplying and fixing sign boards complete as per Technical Specifications Clause 801 and as directed by Engineer, including the cost of posts, fitting and fixing. Sheeting will be retro reflecting type of high intensively grade and messages/borders will be screen printed		
	Informatory signs:		
	Route marker signs (450mm x 600mm)	Nr.	50.00
	Cautionary signs, size triangular 900mm side	Nr.	50.00
8	Supplying and fixing overhead signs complete as per drawing and Technical Specifications Section 800 including cost of posts, truss, erection, fitting and foundations. Sheeting will be retro reflective type of high intensity grade and message/borders will be screen-printed as per drawings.		
	a) Truss and Vertical Support (Portal type)	MT.	5.00
	b) Aluminium alloy plate for over head sign	MT.	10.00
9	Providing and fixing road delineators complete as per drawing and Technical Specifications Clause 805 as directed by Engineer.		
	Road Indicators	Nr.	250
	Hazard Markers	Nr.	250
10	Retro- reflectorised Traffic signs (Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over		

S.N.	Description	Unit	Quantity
	aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing)		
	90 cm equilateral triangle	each	50.00
	60 cm x 45 cm rectangular	each	50.00
11	Direction and Place Identification signs upto 0.9 sqm size board. (Providing and erecting direction and place identification retro-reflectorised sign asper IRC:67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 2 mm thick with area not exceeding 0.9 sqm supported on a mild steel single angle iron post 75 x 75 x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 x 45 x 60 cm, 60 cm below ground level as per approved drawing)	Nr.	30.00
12	Road Markers/Road Stud with Lense Reflector (Providing and fixing of road stud 100x 100 mm, die cast in aluminium, resistant to corrosive effect of salt and grit, fitted with lense reflectors, installed in concrete or asphaltic surface by drilling hole 30 mm upto a depth of 60 mm and bedded in a suitable bituminous grout or epoxy mortar, all as per BS 873 part 4:1973)	each	2.00
13	Toll Plaza including High Mast Pole Lighting	LS	1
Package-3			
1	Providing and fixing RCC boundary pillars including cost of reinforcement and two coats of painting with ready mix oil bound paint complete as per drawing and Technical Specifications Clause 806.	Nr.	906
2	Providing and fixing PCC/RCC hectometer, kilometer and 5th kilometer stones including cost of reinforcement complete as per Technical Specifications Clause 804.		
	200-metre stone	Nr.	91.00
	Kilometre stone	Nr.	18.00
	5th km. stone	Nr.	4.00
3	Providing and laying Pavement marking with hot applied thermoplastic material complete as per drawing and Technical Specifications Clause 803.		
	a) Lane/ Centre line/ Edge marking/	Sqm	6,822.00
		Sqm	758.00
4	Transverse marking (no of junctions=40,50 no of strips of 30 cm width and 6.70 m length @ each junction)	Sqm	4,020.00
5	Supplying and fixing sign boards complete as per Technical Specifications Clause 801 and as directed by Engineer, including the cost of posts,		

S.N.	Description	Unit	Quantity
	fitting and fixing. Sheeting will be retro reflecting type of high intensively grade and messages/borders will be screen printed		
	Informatory signs:		
	Route marker signs (450mm x 600mm)	Nr.	50.00
	Cautionary signs, size triangular 900mm side	Nr.	50.00
6	Supplying and fixing overhead signs complete as per drawing and Technical Specifications Section 800 including cost of posts, truss, erection, fitting and foundations. Sheeting will be retro reflective type of high intensity grade and message/borders will be screen-printed as per drawings.		
	Truss and Vertical Support (Portal type)	MT.	1.00
	Aluminium alloy plate for over head sign	MT.	2.00
7	Providing and fixing road delineators complete as per drawing and Technical Specifications Clause 805 as directed by Engineer.		
	Road delinator	Nr.	632.00
	Hazard Markers	Nr.	632.00
8	Retro- reflectorised Traffic signs (Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing)		
	90 cm equilateral triangle	each	25.00
	60 cm x 45 cm rectangular	each	25.00
9	Direction and Place Identification signs upto 0.9 sqm size board. (Providing and erecting direction and place identification retro-reflectorised sign asper IRC:67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 2 mm thick with area not exceeding 0.9 sqm supported on a mild steel single angle iron post 75 x 75 x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 x 45 x 60 cm, 60 cm below ground level as per approved drawing)	Nr.	15.00
10	Road Markers/Road Stud with Lense Reflector (Providing and fixing of road stud 100x 100 mm, die cast in aluminium, resistant to corrosive effect of salt and grit, fitted with lense reflectors, installed in concrete or asphaltic surface by drilling hole 30 mm upto a depth of 60 mm and bedded in a suitable bituminous grout or epoxy mortar, all as per BS 873 part 4:1973)	each	200

S.N.	Description	Unit	Quantity
11	Solar street light (9 m pole height)	each	420
Package-4			
1	Providing and fixing RCC boundary pillars including cost of reinforcement and two coats of painting with ready mix oil bound paint complete as per drawing and Technical Specifications Clause 806.	Nr.	1866
2	Providing and fixing PCC/RCC hectometre, kilometre and 5th kilometer stones including cost of reinforcement complete as per Technical Specifications Clause 804.		
	200-metre stone	Nr.	191
	Kilometre stone	Nr.	37
	5th km. stone	Nr.	9
3	Providing and laying Pavement marking with hot applied thermoplastic material complete as per drawing and Technical Specifications Clause 803.		
	Lane/ Centre line/ Edge marking/	Sqm	13,992.00
		Sqm	1,554.67
4	Transverse marking (no of junctions=78,50 no of strips of 30 cm width and 6.70 m length @ each junction)	Sqm	4,623.00
5	b) Directional Arrows, Lettering etc. as per drawing No.61 of MORTH Type Designs for Intersections on National Highways.	Sqm	252.00
6	Providing and laying kerb painting with ordinary paints grade-I (IS:164) complete as per drawing and Technical Specifications Clause 803	Sqm	2472.00
7	Supplying and fixing sign boards complete as per Technical Specifications Clause 801 and as directed by Engineer, including the cost of posts, fitting and fixing. Sheeting will be retro reflecting type of high intensively grade and messages/borders will be screen printed		
	Informatory signs:		
	Route marker signs (450mm x 600mm)	Nr.	150.00
	Cautionary signs, size triangular 900mm side	Nr.	150.00
8	Supplying and fixing overhead signs complete as per drawing and Technical Specifications Section 800 including cost of posts, truss, erection, fitting and foundations. Sheeting will be retro reflective type of high intensity grade and message/borders will be screen-printed as per drawings.		
	Truss and Vertical Support (Portal type)	MT.	5.00
	Aluminium alloy plate for over head sign	MT.	10.00
9	Providing and fixing road delineators complete as per drawing and Technical Specifications Clause 805 as directed by Engineer.		
	Road delineators	Nr.	1250.00
	Hazard Markers	Nr.	1250.00

S.N.	Description	Unit	Quantity
10	Retro- reflectorised Traffic signs (Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing)		
	90 cm equilateral triangle	each	50.00
	60 cm x 45 cm rectangular	each	50.00
11	Direction and Place Identification signs upto 0.9 sqm size board. (Providing and erecting direction and place identification retro-reflectorised sign asper IRC:67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 2 mm thick with area not exceeding 0.9 sqm supported on a mild steel single angle iron post 75 x 75 x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 x 45 x 60 cm, 60 cm below ground level as per approved drawing)	Nr.	30.00
12	Road Markers/Road Stud with Lense Reflector (Providing and fixing of road stud 100x 100 mm, die cast in aluminium, resistant to corrosive effect of salt and grit, fitted with lense reflectors, installed in concrete or asphaltic surface by drilling hole 30 mm upto a depth of 60 mm and bedded in a suitable bituminous grout or epoxy mortar, all as per BS 873 part 4:1973)	each	2.00

Source: Detailed Project Report

2.22 Landscaping and Tree Plantation

Landscaping and tree plantation shall be provided in accordance with Section 12 of the manual of specification and standards for two laning of highways through PPP.

2.23 Utilities Shifting

Details of utility shifting required for the project road are given below:

Package-1

During survey it was found that 270 nos. of electric poles, 881 high tension poles ,53 nos. of transformers, 100 hand pumps,15 nos. of temples and 10 high tension towers are to be shifted.

Package-2

During survey it was found that 156 nos. of electric poles, 624 high tension poles, 28 nos of transformers, 104 hand pumps, 6 nos. of temples and 37 high tension towers are to be shifted.

Package-3

During survey it was found that 24 nos. of electric poles, 107 high tension poles, 9 nos of transformers, 20 hand pumps, and 7 nos. of temples and are to be shifted.

Package-4

During survey it was found that 270 nos. of electric poles, 881 high tension poles, 53 nos of transformers, 100 hand pumps,15 nos of temples and 10 high tension towers are to be shifted.

2.24 Construction Materials

The sources of aggregate, sand, borrow earth, cement, steel and bitumen for each package are given below in **Table 2.26**.

Borrow areas have been identified along the project road. The samples will be collected from these sources to carry out the necessary tests to study the adherence to the requirements of the MORTH specifications and to establish the suitability and availability of borrow areas for embankment, sub grade and shoulder construction.

Details of quarry locations are given in **Table 2.28.**

Table 2.28: Details of Quarry Locations

S.N.	Items	Location	Distance (Km)
Package-1			
1.	Aggregate	Haldwani	192 Km
2.	Sand	Haldwani	192 Km
3.	Borrow earth	Local	Approved borrow areas
4.	Cement	Shahjahanpur	80 Km
5.	Steel	Shahjahanpur	80 Km
6.	Bitumen	Mathura IOCL	194 Km
Package-2			
1.	Aggregate	Haldwani	178 Km
2.	Sand	Haldwani	178 Km
3.	Borrow earth	Local	Approved borrow areas
4.	Cement	Shahjahanpur	80 Km
5.	Steel	Shahjahanpur	80 Km
6	Bitumen	Mathura IOCL	255 Km
Package-3			

S.N.	Items	Location	Distance (Km)
1.	Aggregate	Haldwani	151 Km
2.	Sand	Local river	Approved sand quarry
3.	Borrow earth	Local	Approved borrow areas
4.	Cement	Shahjahanpur	80 Km
5.	Steel	Shahjahanpur	80 Km
6.	Bitumen	Mathura IOCL	232 Km
Package-4			
1.	Aggregate	Haldwani	120 Km
2.	Sand	Haldwani	120 Km
3.	Borrow earth	Local	Approved borrow areas
4.	Cement	Shahjahanpur	62 Km
5.	Steel	Shahjahanpur	62 Km
6.	Bitumen	Mathura IOCL	290 Km

Source: Detailed Project Report

The project has been designed by adopting the Green Highway Approach, which has led to substantial reduction in amount in raw material required for the project. Use of flyash in lieu of borrow soil, Cement Treated Sub-Base (CTSB) pavement, Recycled Asphalt Pavement (RAP) and mixing plastic in bitumen for bituminous coating have been proposed to overall reduce the requirement of virgin material. A comparative Statement Conventional Approach v/s Green Highway Approach is briefed below in **Table 2.29**:

Table 2.29: Conventional v/s Green Highway Approach

S.N.	Material	Quantity required as per conventional approach	Quantity required as per Green Highway approach	Savings	Average Lead in km (PKG I/ II/III/IV)
1	Borrow Soil (cum)	1128239	1128239	0	10/10/10/10
2	Flyash (cum)	-	934	(-)934	-/-/50/-
3	Aggregates (cum)	1205215	1058153	147062	240/181/180/160
4	Bitumen (ton)	22203	18841	3362	208/270/290/250 Km (Mathura Refinery)
5	Cement (ton)	-	5345	(-)5345	30/-/50/-
6	Sand (cum)	-	-	-	-
7	Water (KL)	49184	50787	(-)1603	-
8	Plastic waste (ton)	-	38	(-)38	30/-/-/30

2.25 Manpower Requirement for Construction of the Project Road

The estimated manpower requirement for construction of the project road is as given below:

- Road construction works: 250 to 300 persons
- Construction Camp/Plant Site: 80 to 100 persons
- Manpower requirement will depend on construction works at one point of time.

It is estimated that about 70 to 80% workers will be from local area. Remaining skilled workers, operators, supervisors and engineers may be from outside area.

2.26 Construction Methodology

The construction methodology for the project road is given below:

A. Pre-construction Activities

- Clearances / NOCs applicable to the project are required to be obtained by the Contractor
- 3rd party insurances including Contractor's All Risk Insurance, Workman Compensation, insurances for equipment utilized for construction
- Location for construction camp, plant & machinery has to be identified and permissions to be obtained from concerned body for setting up Construction Camp
- Procurement of machinery considering EHS provisions of the Contract
- Land acquisition and transfer of ownership
- Marking of alignment, Relocation of utilities, Clearing of vegetation, Dismantling of structures
- Identification of borrow area, quarry area and waste disposal sites

B. Construction Stage

1. Site Clearing

- Clearing and Grubbing of the Road Construction Area
- Traffic diversion & management
- Operation of camp & maintenance yard

2. Material Procurement

- Operation of borrow pits, crusher plants
- Material transport & Storage including oil & chemicals

3. Construction activities

- Embankment construction
- Subgrade construction
- Construction of bridge, culvert, drain, flyover, toll plaza, junctions, interchange etc.
- Environmental monitoring
- Operation of batching plant, GSB, WBM, other machinery
- Operation of HMP, transport and laying of hot mix, bituminous waste
- Rainwater harvesting structures

C. Post Construction Stage

- Decommissioning
- Decommissioning of camps
- Removal of C&D waste
- Site restoration & rehabilitation

Construction Period:

The period of construction has been taken as 24 months.

CHAPTER 3 : POLICY, LEGAL AND REGULATORY FRAMEWORK

This section presents the national and state level environmental legislations and regulations; and World Bank Policies relevant to the Improvement and upgradation of Bewar Pilibhit Section (Km 0.000 to Km 183.380) section of NH 730 C and NH 731 K in Uttar Pradesh. The various environmental regulations applicable and regulatory consents and clearances required for the proposed up-gradation project are also been incorporated in this section.

3.1 Legal Framework

The Government of India has laid out various policy guidelines, acts and regulations pertaining to environment. The Environment (Protection) Act, 1986 provides umbrella legislation for the protection of environment. As per this Act, the responsibility to administer, the legislation has been jointly entrusted to the Ministry of Environment, Forests and Climate Change (MoEF&CC) at National level, whereas Uttar Pradesh Pollution Control Board (UPPCB) at state level in the present context to Improvement and upgradation of Bewar Pilibhit Section (Km 0.000 to Km 183.380) Section of NH 730 C and NH 731 K in Uttar Pradesh.

3.2 Applicable National and State Regulations

The key environmental and other regulations relevant to improvement and upgradation of Bewar Pilibhit Section (Km 0.000 to Km 183.380) Section of NH 730 C and NH 731 K in Uttar Pradesh is presented in **Table 3.1.**

Table 3.1: Environmental Regulations Relevant to the Project

S. No.	Act / Rules	Purpose	Applic Able	Reason for Applicability	Regulatory Clearances Required	Authority
1	Environment (Protection) Act, 1986	To protect and improve overall environment	Yes	It is an umbrella legislation. Various notifications, rules and schedules are promulgated under this act.	--	MoEF&CC; UPPCB
2	Environmental Impact Assessment Notification, 2006 & subsequent activities	Prior environmental clearance for designated activities for category A and B projects under the EIA	Yes	Project road is not covered under the preview of EIA Notification 2006 towards obtaining an EC#. However, for opening of stone quarry, prior environmental clearance will be required from SEIAA/DEIAA	No. Prior Environmental Clearance for opening stone quarry	SEIAA/ DEIAA

S. No.	Act / Rules	Purpose	Applic Able	Reason for Applicability	Regulatory Clearances Required	Authority
		Notification 2006 & subsequent activities				
3	Notification for use of Fly ash, 3rd November, 2009 and its amendment on 25th January 2016	“No agency, person or organization shall, within a radius of 300 km of a thermal power plant undertake construction or approve design for construction of roads or flyover embankments with top soils; the guidelines or specifications issued by the Indian Road Congress (IRC) as contained in IRC specification No. SP: 58 of 2001 as amended from time to time regarding use of fly ash	Yes	There are four coal based Thermal Power Plants within a distance of 100km from the project road, namely: • NTPC Thermal Power Plant, Dadri at Dadri in Gautam Budha Nagar district • Harduaganj Thermal Power Plant owned by Uttar Pradesh Vidyut Utpadan Nagar Limited (UPVUNL) in Aligarh district • UPRVUNL Jawaharpur Thermal Power Plant in Village Malawan, district Etah • Rosa Thermal Power Plant at Rosa village in Shahjahanpur district Two power stations are located within a distance of 100km to 300km from the project road, namely: • Panki Thermal Power Station located at Panki in Kanpur district • Parichha Thermal Power Station	Essential Use of Fly ash in the Road	MORTH

S. No.	Act / Rules	Purpose	Applic Able	Reason for Applicability	Regulatory Clearances Required	Authority
				located at Parichha in Jhansi district Therefore, use of fly ash in the project is warranted in the project as per above notification. Fly ash can provide technically viable, environmentally sound & cost-effective alternative to natural borrow soil.		
4	Forest Conservation Act, 1980	To check deforestation by restricting conversion of forested areas into non-forested areas	Yes	Road side plantation along Sections of the Project road are notified protected forest. In the project road 192.777 ha protected forest diversion will be required.	Prior Forest Clearance for diversion of Forest Land for Non Forestry Use	MoEF&CC /Dept. of Forest, Govt. of Uttar Pradesh
5	Tres Cutting Permission	Permission for felling of road side trees on forest and private land	Yes	Tree cutting permission for forest land will be at the time of forest clearance. Trees on private land shall be felled after taking permission	Tree Cutting Permission	District Authority/ Forest Dept.
6	Air (Prevention and Control of Pollution) Act, 1981	To control air pollution & controlling emission of air pollutants as per the prescribed standards.	Yes	This act is applicable for construction phase to control stack/fugitive emissions and to manage ambient air quality at project site and ancillary activities like crusher plant, hot mix plant, concrete batch mix	Consent to Establish (CTE) and Consent to Establish (CTO) and Consent to Operate for hot mix plant, batching plant and	UPPCB

S. No.	Act / Rules	Purpose	Applic Able	Reason for Applicability	Regulatory Clearances Required	Authority
				plant, WMM Plants, DG Set etc, for the road. The NAAQ standards (CPCB) for Ambient Air Quality have been promulgated by the MoEF&CC for various land uses. The NAAQ standards (CPCB) for Ambient Air Quality have been promulgated by the MoEF&CC for various land uses.	WMM Plants, DG sets, etc.	
7	Water Prevention and Control of Pollution) Act1974	To control water pollution by controlling discharge of liquid pollutants as per the prescribed standards	Yes	This act is applicable for construction phase of the road to manage to liquid effluent discharges from worker camp, concrete batch mix plant, etc. .	Consent to Establish (CTE) and Consent to Operate (CTO) for plants and workers camps, etc.	UPPCB
8	Noise Pollution (Regulation and Control) Rule 2000	The standards for noise for day and night have been promulgated by the MoEF&CC for various land uses.	Yes	This act will be applicable for all construction equipment/ plant and machinery including vehicles deployed for construction of the proposed road to regulate ambient This act will be applicable to regulate noise nuisance during construction phase	None	UPPCB
9	Hazardous and Other Wastes (Manageme	Protection to the general public	Yes	The rules will be applicable to used oil generated from construction	Hazardous Waste Authorization	UPPCB

S. No.	Act / Rules	Purpose	Applic Able	Reason for Applicability	Regulatory Clearances Required	Authority
	nt, & Trans-boundary Movement) Rules, 2016 and amended thereof	against improper handling and disposal of hazardous wastes		equipment/ machinery during construction works. The rule includes storage, handling, transportation procedures and requirements for safe disposal of hazardous wastes	with CTE and CTO	
10	Construction and Demolition Waste Management Rules, 2016	Safe disposal and management of construction and demolition wastes	Yes	This rule is This rule shall be applicable to generation of wastes resulting from demolition of bridge and culvert structures and scarifying of surface of existing road and from road construction activities.	Construction and Demolition Waste Management Plan should be prepared, prior to commencement of works	Local Municipal Corporations
11	Solid Waste Management Rules 2016	Collection and disposal of municipal solid waste	Yes	This rule is applicable to all forms/types of solid waste generated at construction activities, camp site, plant sites, etc..	Solid Waste Management Plan should be prepared, prior to commencement of works	Local Municipal Corporations
12	Mines and Minerals (Development and Regulation) Amendment Act, 2015	This act has been notified for safe and sound mining activity.	Yes	The construction of project road will require aggregate through mining from riverbeds and quarries	Permit and mining lease for stone quarry	Department of mining, State Government
13	Minor Mineral and concession Rules, 2015	For opening stone quarry	Yes	Regulate use of minor minerals like stone, soil, river sand etc.	Permit and mining lease for stone quarry	District Collector
14	The Building and Other	To regulate the employme	Yes	To ensure safety and welfare measures for	None. Safety and welfare	State Labour Department

S. No.	Act / Rules	Purpose	Applic Able	Reason for Applicability	Regulatory Clearances Required	Authority
	Construction Workers (regulation of employment and conditions of service) Act, 1996	nt and conditions of construction workers and to provide for their safety, health and welfare measure and for other matter incidental thereto		workers employed at construction sites. Compliance to provisions of health and safety measures for the construction workers in conformity with BOCW rule concerning safety and health in construction. These regulations to be complied with during the construction of proposed road works.	measures for work force employed at construction sites are to be regulated in conformity with this act.	
15	Bonded Labour System (Abolition) Act, 1976 along with Rules, 1976	An Act to provide for the abolition of bonded labour system with a view to preventing the economic and physical exploitation of the weaker sections of the people and for matters connected therewith or incidental thereto	Yes	Contractors shall employ numbers of Labours during Construction Phase. Contractor will ensure that there is no Bonded Labour by him or sub contractors.	Labour License	State Labour Department
16	Contract Labour (Regulation	The Object of the Contract	Yes	Contractors shall employ numbers of work-force during	Labour License	State Labour Department

S. No.	Act / Rules	Purpose	Applic Able	Reason for Applicability	Regulatory Clearances Required	Authority
	and Abolition) Act 1970 along with rules, 1971	Labour Regulation and Abolition) Act, 1970 is to prevent exploitation of contract labour and also to introduce better conditions of work		Construction Phase. The Act applies to the Principal Employer of an Establishment and the Contractor where in 20 or more workmen are employed or were employed even for one day during preceding 12 months as Contract Labour.		
17	Employees Provident Funds and Miscellaneous Provisions Acts 1952 along with EPF Scheme Rules and Forms	It is a beneficent piece of social welfare legislation aimed at promoting and securing the well-being of the employees	Yes	Contractors shall be employing Workman more than 20 persons during Construction Phase	Compliance of regulations	State Labour Department
18	Employees State Insurance Act 1948 along with Rules and Regulations	Protect the interest of workers in contingencies such as sickness, maternity, temporary or permanent physical disablement, death due to employment injury resulting in	Yes	Contractor shall be applying large number of labours during construction which will include both Men and Women	Insurance	State Labour Department

S. No.	Act / Rules	Purpose	Applic Able	Reason for Applicability	Regulatory Clearances Required	Authority
		loss of wages or earning capacity. the Act also guarantees reasonably good medical care to workers and their immediate dependents.				
19	Equal Remuneration Act, 1976 along with allied Rules	An Act to provide for the payment of equal remuneration to men and women workers and for the prevention of discrimination, on the ground of sex, against women in the matter of employment and for matters, connected therewith or incidental thereto.	Yes	Contractor shall be applying large number of labours during construction which will include both Men and Women.	Compliance of regulations	State Labour Department

S. No.	Act / Rules	Purpose	Applic Able	Reason for Applicability	Regulatory Clearances Required	Authority
20	Inter State Migrant Workmen (Regulation of Employment and Conditions Service Act	Act of the Parliament of India enacted to regulate the condition of service of inter-state labourers in Indian labour law. The Act's purpose is to protect workers whose services are requisitioned outside their native states in India. Whenever an employer faces shortage of skills among the locally available workers, the act creates provision to employ better skilled workers available outside the state	Yes	Contractor Shall be employing large number of workers during Construction from other States also.	Compliance of regulations	State Labour Department

S. No.	Act / Rules	Purpose	Applic Able	Reason for Applicability	Regulatory Clearances Required	Authority
21	Minimum Wages Act 1948 along with Central Rules 1950	To ensure that workman gets at least minimum wages as fixed by Govt. Minimum wages sets the lowest limit below which wages cannot be allowed to sink.	Yes	Contractor Shall be employing large number of workers during Construction	Compliance of regulations	State Labour Department
22	Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participations) Act , 1995 along with Rules,1996 and National Trust for Welfare of Persons with Disabilities Act,1999 with rules 2000.	Contractor Shall be employing large number of workers during Construction creation of barrier free environment, social security, etc.	Yes	Contractor Shall be employing large number of workers during Construction.	Compliance of regulations	State Labour Department
23	Central Motor Vehicle Act 1988 and	The Act provides in detail the legislative	Yes	These rules will be applicable to road users	--	Motor Vehicle Department

S. No.	Act / Rules	Purpose	Applic Able	Reason for Applicability	Regulatory Clearances Required	Authority
	Central Motor Vehicle Rules 1989	provisions regarding licensing of drivers/ conductors, registration of motor vehicles, control of motor vehicles through permits, special provisions relating to state transport undertakings, traffic regulation, insurance, liability, offences and penalties.				

Note: *The subproject is national highway and expansion of highway is proposed in the form of upgradation/ widening. As per EIA Notification, 2009 and amendment dated 22 Aug 2013, environmental clearance is required for expansion of National Highways greater than 100 km involving additional right of way or land acquisition greater than 40 m on existing alignments and 60 m on realignments and bypasses. In the subproject additional right of way or land acquisition is less than 20 m on existing alignments. Therefore, Environmental Clearance and Environmental Impact Assessment are not required for the subproject as per EIA Notification 2009.*

3.3 World Bank Safeguard Policies Applicable to Project Road

The safeguard policies of the World Bank relevant to the Improvement and upgradation of Bewar Pilibhit Section (Km 0.000 to Km 183.380) section of NH 730 C and NH 731 K in Uttar Pradesh are given in **Table 3.2**.

Table 3.2: Relevant and Applicability of WB Safeguard Policies

S. No.	World Bank Safeguard Policy	Key Features	Policy Applicability to Sub Project	Policy Triggered Or Not
1.	OP/BP 4.01 Environmental Assessment	Overall governing policy intended to ensure Bank-financed projects are environmentally sound and sustainable	All potential impacts due to the improvement and up-gradation project road are to be assessed and necessary mitigation measures are to be incorporated accordingly.	Triggered
2.	OP/BP 4.36 Forests	Policy is intended to support sustainable and conservation-oriented forest management, harness potential of forests to reduce poverty in a sustainable manner, integrate forests into sustainable economic development, and protect vital local and global environmental services and values of forests.	The proposed improvement and upgradation of the project road is passing through forest area and prior forest clearance is required for diversion of forest land for non forest purpose.	Triggered
3.	OP/BP 4.11 Physical Cultural Resources	Policy is intended to ensure that projects identify and inventory cultural resources that are potentially affected by the project. Projects should include mitigation measures, when there are adverse impacts on physical cultural resources.	Construction of road will be on existing road corridor and will avoid cultural property resources (CPR) and therefore does NOT warrant shifting or affect CPRs. However, there may be direct or indirect impact on nearby cultural properties along the road.	Triggered
4.	OP/BP 4.11 Involuntary Resettlement	Involuntary Resettlement Policy addresses direct economic and social impacts from project activities that may cause involuntary taking of land resulting in: (i) relocation or loss of shelter, (ii) loss of	The proposed improvement and upgradation of the project road require land acquisition and Involuntary Resettlement.	Triggered

S. No.	World Bank Safeguard Policy	Key Features	Policy Applicability to Sub Project	Policy Triggered Or Not
		assets or access to assets, and/or (iii) loss of income sources or livelihoods		
5.	OP 09 Paste Management	The objective of this policy is to reduce reliance on synthetic chemical pesticides, promote Integrated pest management (IPM) and Integrated Vector Management (IVM) Minimize the environmental and health hazards of pesticide use.	In the subproject tree plantation will be done by Forest Department. In roadsides plantation, synthetic chemical pesticides are not used. Usually, organic manure is used at the time of sapling plantation.	Not Triggered.

3.4 Indian Road Congress (IRC) Code Applicable for the Project Road

The key Indian Road Congress (IRC) Codes applicable for the project road with respect to environment are given in **Table 3.3**:

Table 3.3: Indian Road Congress Code of Practices for Project Road

Sl. No.	IRC Code Theme	Year	Purpose
1.	Recommendations for Road Construction in Areas Affected by Water Logging, Flooding and/or Salts Infestation	IRC:34-2011	Construction in water logged areas
2.	Recommended Practice for Construction of Earth Embankments and Sub-Grade for Road Works (First Revision)	IRC:36-2010	Issues relating to Borrow pits
3.	Guidelines for Pedestrian Facilities	IRC: 103 -1988	Safety of pedestrians
4.	Recommended Practice for Recycling of Bituminous Pavements	IRC:120-2015	For recycling of bituminous pavements
5.	Guidelines for Use of Construction and Demolition Waste in Road Sector	IRC:121-2017	Use of Construction and Demolition Waste in Road Sector
6.	Guidelines on Landscaping and Tree Plantation	IRC:SP:21-2009	Landscaping and Tree Plantation along of the road
7.	Guidelines on Road Drainage	IRC: SP: 42-1994	Drainage

Sl. No.	IRC Code Theme	Year	Purpose
8.	Highway Safety Code	IRC: SP: 44-1994	Highways safety
9.	Guidelines for Use of Flyash in Road Embankments	IRC:SP:58-2001	Use of Flyash in Road Embankments
10.	Guidelines for Use of Geotextiles in Road Pavements and Associated Works	IRC:SP:59-2002	Use of Geotextiles in Road Pavements and Associated Works
11.	Guidelines for Soil and Granular Material Stabilization Using Cement Lime and Fly Ash	IRC:SP-89-2010	Soil and Granular Material Stabilization Using Cement Lime and Fly Ash
12.	Guidelines on Requirements for Environmental Clearance for Road Projects	IRC:SP-93-2017	Requirements for Environmental Clearance for Road Projects
13.	Guidelines for the use of Waste Plastic in Hot Bituminous Mixes (Dry Process) in Wearing Courses	IRC:SP-98-2013	Use of waste plastic in hot bituminous mixes (dry process) in wearing courses
14.	Use of Cold Mix Technology in Construction and Maintenance of Roads Using Bitumen Emulsion	IRC:SP-100-2014	Use of Cold Mix Technology in Construction and Maintenance of Roads Using Bitumen Emulsion
14.	Interim Guidelines for Warm Mix Asphalt	IRC:SP-101-2014	Warm Mix Asphalt
15.	Guidelines on Preparation and Implementation of Environment Management Plan	IRC:SP-108-2015	Preparation and Implementation of Environment Management Plan

3.5 Environmental Standards

Environmental standards applicable to the Improvement and upgradation Bewar-Pilibhit Section (Km 0.000 to Km 183.380) section of NH 730 C and NH 731 K in Uttar Pradesh are National Ambient Air Quality Standards, 2009 are given below:

- National Ambient Air Quality Standards, 2009
- Ambient Noise Standards
- Drinking Water Quality Standards-IS:10500:2012
- CPCB Standards for Surface Water Use

3.6 World Bank Guidelines for Environmental, Health, and Safety Guidelines for Toll Roads

The Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). When one or more members of the World Bank Group are involved in a project, these EHS Guidelines are applied as required by their respective policies and standards. These industry sector EHS guidelines are designed to be used together with the General EHS Guidelines document, which provides guidance to users on common EHS issues potentially applicable to all industry sectors. For complex projects, use of multiple industry-sector guidelines may be necessary. A complete list of industry-sector guidelines can be found at:
www.ifc.org/ifcext/enviro.nsf/Content/EnvironmentalGuidelines

World Bank Guidelines for Environmental, Health, and Safety Guidelines for Toll Roads are given in **Annexure 3.1** at the end of EIA report.

CHAPTER 4: BASELINE ENVIRONMENTAL CONDITIONS

4.1 General

This chapter provides the details of the baseline environment conditions along the project road. Baseline environment includes physical, biological and the socioeconomic environment. The study of baseline environment features of the project road will help in determining the sensitivity and related impacts due to proposed project activities.

Considering the existing environmental scenario, potential impacts of road improvement will be identified and accordingly management plan will be proposed in forthcoming sections. The baseline environmental conditions will help in comparing and to monitor the predicted negative and positive impacts resulting from the project during construction and operation phases.

Ambient air quality monitoring, noise levels measurement, soil characteristics and water quality samples were collected along the project road to prepare a baseline database. All necessary information required for environmental study has been collected either through primary survey or through secondary data sources and community consultations.

4.1.1 Study Area

The project impact area has been considered Right of Way (ROW), while project influence area is 10 km eighter side from the edge of RoW. Collection of primary information has been limited to project impact area only. However, environmental sensitivity assessment has been undertaken for 10 km distance from the project road.

4.1.2 Study Period

The baseline study was commenced with an initial review and reconnaissance survey of the study area. Baseline environmental monitoring and analysis for one month was carried out by M/s AGSS Analytical & Research Lab (P) Ltd., Delhi during the month of May-June 2020.

4.1.3 Data Collection

The efforts have been made to collect the latest information both at regional as well as local level especially along the project road. The team has undertaken the site visit and key stakeholders consultation along the project road. The outcome of baseline study is discussed in the following sections.

4.1.4 Secondary Data

Data collection from the secondary sources has been done from various authentic and published sources. The following are some important information available from secondary sources:

- Project objectives, technical information on existing road features from Contract Document and design report;
- Climatic condition & long-term meteorological data from Indian Meteorological Department and Government websites;
- Geology, soil, topography and water table from government websites & district groundwater brochure of CGWB;
- Land Use from Survey of India Topo-sheet, Google Earth & field observation during surveys;
- Ecological information from State Forest Dept., ENVIS, Other Govt. of India / State Govt. Websites.

4.1.5 Primary Data

The field study has been carried out to collect primary data in the study corridor, which involves:

- Physical environmental conditions including topography and physiography, geology, meteorology, water source resources, ambient air quality, noise levels, soil and ground and surface water quality, landuse, community structures, archeological monuments, industries, etc.
- Biological environmental conditions including environmentally sensitive areas, terrestrial ecology, and biodiversity.

Environmental monitoring was carried out for a period of one month (May - June 2020) for environmental parameters air, water (surface and ground), noise and soil. The environmental monitoring reports as submitted by the laboratory are enclosed in **Annexure 4.1**.

4.2 Physical Environment

The project road is located in the state of Uttar Pradesh and passes through the districts of Mainpuri, Farrukhabad, Shahjahanpur and Philibit. Package–I (NH-730C) starts at Bewar and ends at Allahganj (km 0.000 to km 52.77) passes through Mainpuri and Farrukhabad Districts, Package-II (NH-730C) starts at Allahganj and ends at Miranpur Katra falls in Shahjahanpur district, Package-III (NH-730C) starts at Miranpur Katra and ends at Radhaita falls in Shahjahanpur district and Package – IV(NH-731K) starts at Radhaita and ends at Pilibhit falls in Pilibhit district. Physical environmental conditions are described in the following sections:

4.2.1 Topography and Physiography

The project is located mostly in Gangetic plain. The terrain along the project road is mostly flat and level plain. The project road traverse mostly through drainage area of river Ganga, Yamuna, Gomti and main tributaries of these revers.

Mainpuri district generally presents the appearance of an extensive level plain broken only by the sand ridges on the western border, the rolling sand hills and undulations of the Kali and Isan rivers, and the ravines along the Yamuna to the south-west. The Kali

Nadi forms the boundary of this plain on the north and north-east and the Yamuna encloses it on the south-west. Both these rivers flow towards the south-east, and between them.

Farrukhabad Districts a part of the Southern upper Ganga Basin and is divided into four (4) sub-micro regions, viz.

i. Ganga Ramganga Khaddar-Extends parallel to Ganga river in a narrow strip, which is wider in north and taper down towards. A natural levee from Kampil to Singhi Rampur along the Ganga is a prominent topographical feature. The project road passes through this region.
ii. Farrukhabad-Kaimganj Plain-The region is situated in the northern part of the district covering parts of Kaimganj and Farrukhabad tehsils. It is a flat plain flowing towards east.
iii. Lower Kali Plain-It is situated in the central part of the district covering southern parts of Farrukhabad and northern parts of Chhibramau and Kannauj tehsils. River Kali along with its tributaries join the Ganga near Kannauj.The slope runs from west to east. The sand dunes of Bhur near Mohanpur, Ratanpur and Singhi Rampur and a patch of mounds at Induiaganj are worth mentioning physical features.
iv. Isan Plain-It is situated in the southern part of the district covering majority portions of Chhibramu and Kannauj tehsils. The Isan along with its tributaries flows from the centre of this plain. The slope is very gentle and runs from west to east.

Shahjahanpur District is bounded on the north by district Philbit, on the east by district Kheri, on the south by district Hardoi and Farrukhabad and on the west by Budaun and Farrukhabad. It has been divided into four (4) sub-micro regions, *viz.*

i. Ganga Khadar-The region covering Jalalabad tehsil is narrow belt situated along the river Ganga which flows on the boundary line.The area is subject to the frequent floods during rainy seasons. There are numerous rivulets which originate from the mother stream. The project road passes through this region.
ii. Ram Ganga Flood Plain-Ram Ganga, Bahgul, Andhoi, Aril are the main rivers flowing in the region.
iii. Shahjahanpur Plain-It is situated in the central part of the district occupying a major part of the total area of the district. The watershed zone of the Gomti in the east and Ram Ganga in the west keeps the identity of this region separately. The general slope of the area is towards south. Deoha is the main stream.
iv. Gomati Basin-Situated in the eastern part of the district covering major part of Powayan tehsil. Gomti is the main river.

The district of Philibit is the north-eastern district of the Rohilkhand Division which is situated in the Sub-Himalayan belt on the boundary of Nepal. On the North are the district Nainital and the territory of Nepal, on the South lies Shahjahanpur district, on the east the district is flanked for a short distance by district Kheri. The two (2) sub-micro regions are ,viz.

i. PilibhitTarai-The region is situated in the northern part of the district covering the northern parts of Puranpur and Philibit tehsil. The Sharda River drains on the boundary line from North-West to South-East direction. The project road ends in Pilibhit Tehsil much before Puranpur Tehsil.

ii. Pilibhit-Bisalpur Plain-Situated in the southern part of the district covering entire Bisalpur and parts of Puranpur and Pilibhit tehsils. The frequency of streams flowing in this tract is relatively reduced as compared to Tarai zone. Major part of the project road passes through this region.

The physiographical map of the state showing the project road is given in **Figure 4.1.**

Figure 4.1: Physiographic Map of Uttar Pradesh State showing Project Road

4.2.2 Geology

The project road is located in ganga alluvial plain which is sub-divided in older and newer alluvial plains.

The section of road passing through Mainpuri district forms part of the Central Ganga Alluvial Plain (Upper Gangetic Plain as per the Agro-climate zone classification) which is an extensively leveled tract intercepted by sand ridges on its western border, the rolling sand hills and undulations of the Kali and Isan rivers. The terrain has gentle slope from north-west to south-east with a gradient of 0.2 m/km.

After this the road enters Farrukhabad district which has three geomorphological features -meander flood plain, newer alluvial plain or lowland and older alluvial plain or Upland.Meander flood plain is a flat low lying, poorly drained area of little or no relief feature. Confined mainly along the river channels, spreading few meters to a kilometers in width. The sediments of this area are comprised of coarse to fine sand, silt, clay and at places gravels are also found. Newer alluvial plains are flat to gently sloping & slightly undulating terrain formed by the extensive deposition of sediments by the river Ganga. It comprises of unconsolidated alluvial sediments of varying lithology. Older Alluvial Plain or upland cover about 80% of the total area of the district and it is sub divided into the four sections by the river Bagar, Kali and Isan that traversing from west to east, which are Doab, between Ganga cliff and Bagar rivers occupying the northern most part of the district; area between Bagar and Kali rivers bounded eastward by Ganga; area between Kali and Isan rivers and; area lying south of Isan river. The sediments of the older alluvial plain are mainly comprised of coarse to fine sand, silt and clay. Abandoned channels, meander lakes, marshy and swampy lands are common and frequent in this unit.

The project road at km 52+770, where Package 2 starts enters Shahjahanpur district, which is a part of Central Ganga Plains in the upper Ganga Basin, exhibiting monotonous flat topography, with master slope towards south and southeast. Ground elevation generally ranges from 148-172 amsl. The geology of Shahjahanpur is divided into upland – the Varanasi Older Alluvium (VOA) Plain (Bhanger surface) and the low land – the flood plain (Khadar surface). The former is the oldest geomorphic unit covering major part of the area, occupying interfluve zones above the general flood level of different rivers. The plain has been subdivided into sandy 7 and silty-clayey surfaces. The Khadar surface (low land) can be further subdivided into Older Flood Plains of Ganga/ Ramganga/ Garra/ Gomati/ Khannaut/ Katni/ Bahhul/ Dojara rivers and Active Flood Plains of these rivers. In major part, there are two levels of Terrace in Older Flood Plains. The higher level terrace is an erosional surface over the Varanasi Older Alluvium, whereas the lower level Terraces is made up of Terrace Alluvium.

At last, project road enters Pilibhit District that has been divided in two distinct tracts. In the north and north-west the tract is a continuation of the Tarai belt. Though there are no hill the level surface is characterized by many troughs and depressions making the beds of river and water courses which carry at the surface drainage. The low basins, known as Khader (younger sediments) differ greatly in character from the upland sediments of Bangers (older sediments) which marks the watershed. The geological map of Uttar Pradesh showing project road is shown in **Figure 4.2.**

Figure 4.2: Project Area on Geological Map of Uttar Pradesh

4.2.3 Soil Characteristics

The project road packages pass through four districts which have diverse nature of soils. In Mainpuri District commonly found soil type is matiyar, which is stiff unyielding clay of dark colour. In favourable circumstances matiyar yields good crops of rice. The second natural soil is bhur, which is loose and sandy and incapable of retaining moisture. Loams, dumat and pira, are also found in district. Dumat comprises sand and clay in almost equal proportions and is fertile in nature, whereas Pilia, as its name suggests, is of yellowish colour.

In Farrukhabad District, three main classes of soil found are Dumat or Loam, Matiyar or Clay and Bhur or sand. In the tarai portion of district, the soil everywhere is alluvial, consisting of stratum of loam of varying thickness more or less intermixed with sand overlying a bed of white river sand.

In Shahjahanpur District, the chief varieties of soil are Bhur, matiyar and domat. Locally the rich improved soil near the village site is called gaubani, the soil growing rice and other crops, is called dhankar while khapat is very hardest and poorest clay usually found in natural drainage and flood times where water collects and remains locked for long periods during the rainy season.

The soil of the Philibit district is identical to with those found throughout the Gangetic plain and particularly those occurring in the sub-Himalayan belt consisting of the bhur, matiar and dumat. Clay differs from place to place in weight, colour, cohesiveness and liability to split into fissure under the influence of hot weather, though on the whole it is very retentive of moisture. The greasy and sticky clay is called Chiknot, that found in low situations in a drainage line and the white heavy clay which becomes pasty with rain and as hard as iron is known as khapat which is of little value producing only in the inferior kinds of rice. Another kind of Calcareous nature and yellowish colour is known as Siwai. Soil map of Uttar Pradesh showing project road is presented in **Figure 4.3.**

4.2.3.1 Soil Quality Along the Project Road

The soil was collected from 5 locations along the project road, as shown **Figure 4.4**:

The details of soil sampling locations are provided in **Table 4.1.** The analytical results for each location are provided in **Table 4.2**. Field photographs for soil sample collection are shown in **Figure 4.5.**

Table 4.1: Soil Sampling Locations

Location Code	Name of Location	Date	GPS Coordinates	Package
SQ-1	Bewar Km. 3+500	23-May-20	27°14'08.65"N 79°19'41.94"E	Package-I
SQ-2	Bahadurpur (Km. 39+750)	23-May-20	27°23'56.90"N 79°37'34.57"E	Package-I
SQ-3	Daudapur (Km. 71+200)	24-May-20	27° 38'24.06"N 79°39'42.79"E	Package-II
SQ-4	Bhunda Harbanspur (Km. 133+370)	25-May-20	28°10'34.19"N 79°43'43.30"E	Package-III
SQ-5	Mathu Dandi (Km. 179+150)	26-May-20	28°34'13.45"N 79°48'20.96"E	Package-IV

Figure 4.3: Soil Map of Uttar Pradesh Showing Project Location

Figure 4.4: Soil Sampling Locations

Table 4.2: Analytical Results of Soil Sampling of the Study Area

Test Parameter	Location Code	SQ-1	SQ-2	SQ-3	SQ-4	SQ-5	Method of Testing
	Location	Bewar	Bahadurpur	Daudapur	BhundaHarbanspur	MathuDandi	
Texture	--	Sandy Loam Clay	Sandy Loam Clay	Loamy Sand	Loamy Sand	Sandy Loam Clay	IS:2720(Part-4)
Sand	%	26.4	20.3	10	12	13	IS:2720(Part-4)
Silt	%	33.9	40.2	75	69	65	IS:2720(Part-4)
Clay	%	39.7	39.5	15	19	22	IS:2720(Part-4)
pH (1:2)	--	7.45	8.4	8.57	7.2	7.81	IS:2720 (Part-26)
Electrical Conductivity	µmhos/cm	132	210	186	159	217	IS: 14727:2002
Cation exchange capacity	meq/100g	37.9	28.4	18	27.9	25.6	IS:2720 (Part-24)
Exchangeable Potassium	mg/kg	450	356	102	298	321	IS:2720(P-24)
Exchangeable Sodium	mg/kg	1860	1450	245	850	1360	IS:2720(P-24)
Exchangeable Calcium	mg/kg	3540	2450	2180	2780	2360	IS:2720(P-24)
Exchangeable Magnesium	mg/kg	1310	1069	690	1140	850	IS:2720(P-24)
Sodium Absorption Ratio	-	6.76	6.13	1.17	3.42	6.09	AGSS/CHEM/SOP
Water Holding Capacity	%	33.6	37.4	24.5	29.8	36.4	IS:2720(Part-2)
Porosity	%	40.4	32.6	35.6	42.6	34.1	IS:2720(P-6)
Permeability	Cm/hr	2.1	1.8	2.5	2.3	1.9	IS:2720 (Part-17)
Total Nitrogen	%	0.41	0.34	0.24	0.18	0.38	AGSS/CHEM/SOP
Available Phosphorus (Olsen's)	mg/kg	321	278	288	345	296	AGSS/CHEM/SOP
Organic Matter	%	1.02	0.49	0.35	0.28	0.64	IS:2720 (Part-22)

Source: Test report of Environmental monitoring

The soil quality analysis shows that at all the locations, soil are basic in nature and the moisture retention capacity is less than 11%. The soil are loamy sand or sandy loam clay in nature. Electrical conductivity was found to be in range of 132 to 217 µmhos/cm. Water holding capacity of soil is between 24.5 to 37.4%.

	
SQ-1	SQ-2
	
SQ-3	SQ-4
	Blank
SQ-5	

Figure 4.5: Field Photographs for Soil Sampling

4.2.4 Water Environment

4.2.4.1 Hydrogeology

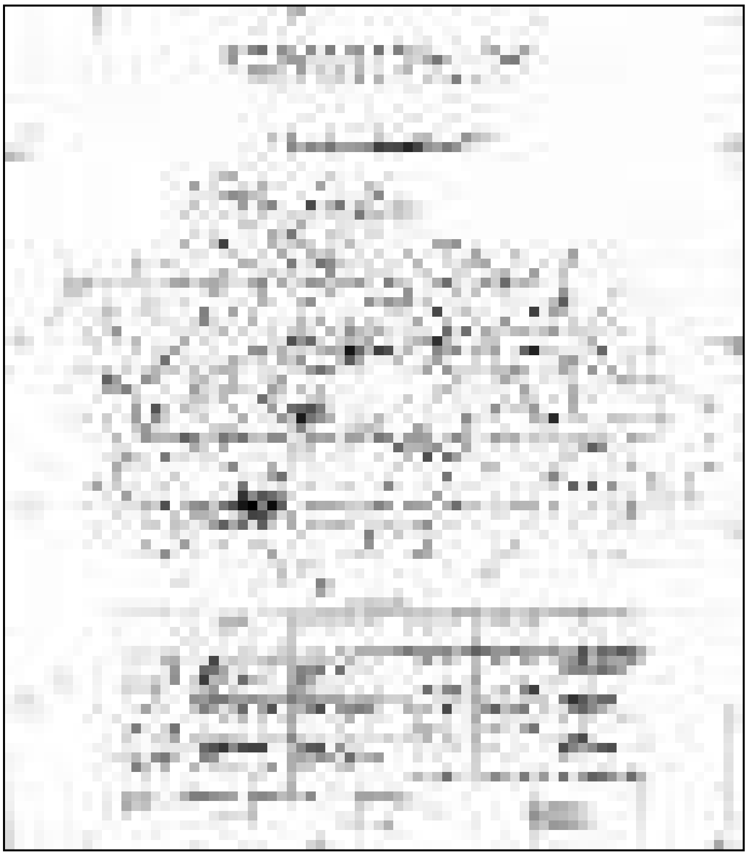
The project road section from Km 0+000 to Km 3+500 in Mainpuri district is underlain by Quaternary alluvium comprising mainly clay, Kankar, sand and gravel over the basement of Pre-Cambrai Vindhyan formation. Different grades of sand and gravel form the multi aquifer system in the area. Ground water occurs under water table condition in phreatic zones and under semi-confined condition in deeper zones.

The road after Km 3+500 enters Farrukhabad district, which occupies a small part of Indo-Gangetic alluvial plain in the Ganga-Yamuna Doab. The area is underlain by quaternary sediments comprising mainly a sequence of clay, silty clay,fine to coarse sand occasionally mixed with kankars and gravels in varying proportions.

In Shahjahanpur District which begins at km 52+770, lithological units are composed mainly of fine to medium and coarse sand, gravel, clay and kankar, with sand being the dominant component.

Towards the end is the Pilibhit District which is underlain by quaternary alluvium comprising clay, sand, silt, gravel and kankar in varying proportions. This area falls under interfluve area of Ganga and Sarda which is part of Indo-Gangetic plains. Tarai belt occurs in the northern fringe of the districts comprising mainly sand pebbles beds interbedded with clays. South of Tarai belt is underlain by the deposits of the older gangetic alluvium composed of fine to medium grained sand and clay with kankar in varying proportions. Further, south lies the belt of younger alluvium of recent age which occupies the lower grounds at thick sequence of clay, silt and sand with occasional kankar.

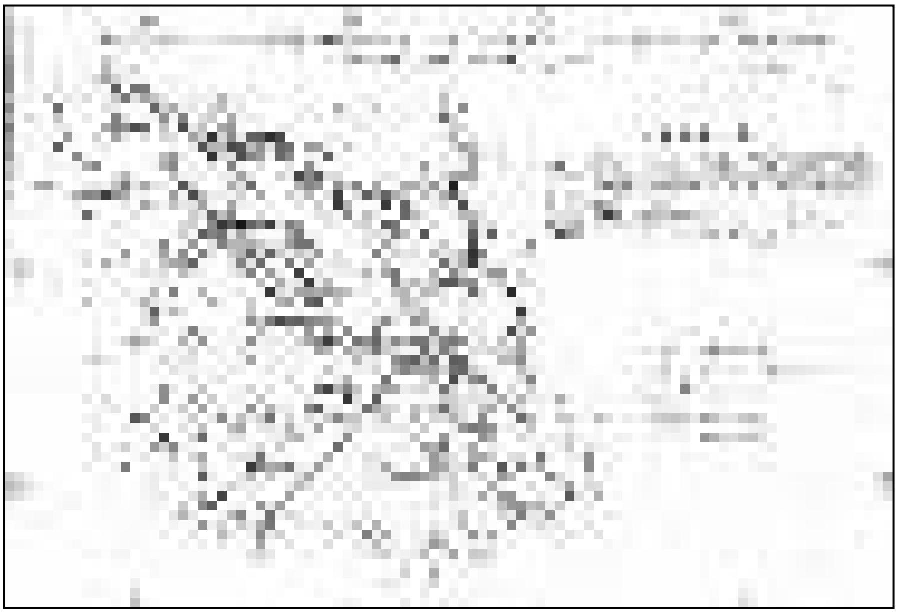
Hydrogeological maps of Mainpuri, Farrukhabad, Shahjahanpur, Pilibhit Districts are shown in **Figure 4.5** to **4.9.**



Source: District Ground Water Brochure, Mainpuri District, CGWB

Figure 4.6:Hydrogeological map of Mainpuri District

Source: District Ground Water Brochure, Farrukhabad

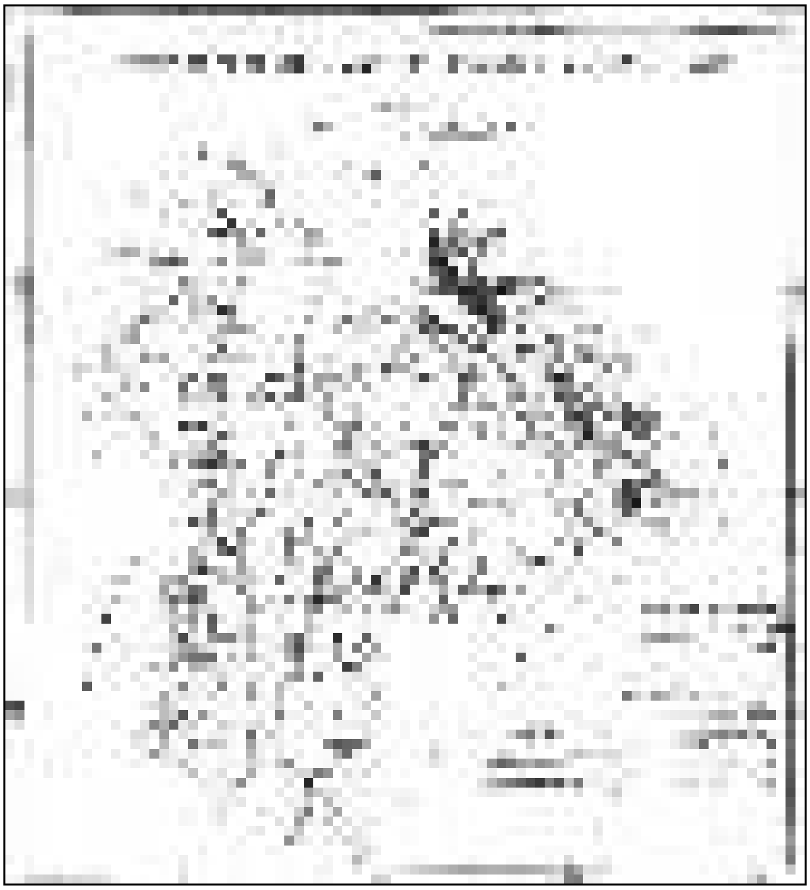


District, CGWB.

Figure 4.7: Hydrogeological Map of Farrukhabad District

Source: District Ground Water Brochure, Shahjahanpur District, CGWB.

Figure 4.8: Hydrogeological Map of Shahjahanpur District



Source: District Ground Water Brochure, Pilibhit District, CGWB.

Figure 4.9: Hydrogeological Map of Pilibhit District

4.2.4.2 Surface Water Resource

The project road crosses a number of streams and rivers. Main source of drainage in the project area passing through Mainpuri district is Yamuna and some other streams are Kali Nadi, Isan, Arind (Rind), Senger, Sirsa rivers. Mainpuri abounds in swambs and marshes particularly in the central portion. The principal rivers and streams of the Farrukhabad and Shahjahanpur districts are Ganga, Ram Ganga, Kali Nadi, Old Ganga and some other small streams. In Pilibhit District, Deoha is the main river which drains mostly the western part of the area. The Sharda river drains on the boundary line form north-west to south east direction. Other streams are Mala, Karta, Kailas and Khanaut etc. Besides, there are numerous rivulets which drain the region for a shorter distance.

The water bodies crossed by the road are given in **Table 4.3**.

Table 4.3: Water Bodies Crossing the Road

S.N.	Chainage	Type	Name
1	3+500	River	Kali Nadi
2	39+800	River	Ganga
3	53+150	River	Ramganga

S.N.	Chainage	Type	Name
4	123+800	Tributary	Shahjahanpur branch of Devha River
5	129+250	Lake / pond	Khudaganj
6	133+350	River	Deora or Garra river
7	144+250	Distributary	Tikri Distributary
8	179+150	Distributary	Takia Distributary

There are 34 ponds along the project road. The package-wise list of ponds along the project road is given in **Table 4.4** below:

Table 4.4: Details of Ponds Along The Project Road

S.N.	Chainage	Side	S.N.	Chainage	Side
Package 1			**Package 3**		
1.	10+000	LHS	1.	114+950	RHS
2.	16+850	LHS	2.	115+100	RHS
3.	36+450	RHS	3.	116+750	LHS
4.	36+600	LHS	4.	121+800	LHS
5.	37+050	LHS	5.	123+300	RHS
6.	37+850	RHS	6.	125+350	RHS
7.	38+550	RHS	7.	126+600	RHS
8.	44+650	RHS	8.	129+250	LHS
			9.	130+000	RHS
			10.	132+350	LHS
Package 2			**Package 4**		
1.	81+150	LHS	1.	140+450	LHS
2.	89+500	LHS	2.	147+100	LHS
3.	103+150	RHS	3.	146+500	LHS
4.	104+300	RHS	4.	153+400	RHS
5.	112+350	RHS	5.	153+800	RHS
6.	112+500	LHS	6.	158+950	RHS
			7.	162+000	RHS
			8.	162+450	LHS
			9.	163+750	RHS
			10.	178+050	RHS

Source: Detailed Project Report

4.2.4.3 Floods

Flood is the most commonly occurring disaster in Uttar Pradesh, affecting almost every year some part of the state or the other. Important rivers, which create floods in the State, are the Ganga, the Yamuna, the Ramganga, the Gomti, the Sharda, the Ghaghra, the Rapti and the Gandak, etc. The Ganga River basin of Uttar Pradesh experiences normal rainfall in the region from 60 cm to 190 cm of which more than 80% occur during the southwest monsoon. The rainfall increases from west to east and from south to north. Similar is the pattern of floods, the problem increases from west to east and south to north. The flood prone areas in the project area are shown in **Figure 4.10.**

Figure 4.10:Flood Hazard Vulnerability Map of Uttar Pradesh

4.2.4.4 Ground Water

Ground water is an important source for catering to the needs of water consumption in the rural and urban areas. Therefore, any kind of deterioration in the quality of ground water owing to the developmental activities will pose threat to the local population and attention needs to be paid towards maintaining the quality of water using all possible tools. Since the ground water is used without treatment by a large portion of population for drinking purpose and domestic use, the quality of ground water is important.

Depth of Ground Water as per CGWA

Mainpuri District- Pre-monsoon depth to water level during May'2012 was 1.37 - 8.59 m bgl and post-monsoon depth to water level during Nov'2012 was 1.39 - 8.05 mbgl

Farrukhabad District- Pre-monsoon depth to water level (m bgl) during 2012 was 4.81 to 18.59 and post-monsoon depth to water level (m bgl) during 2012 was 4.85 to 17.40

Shahjahanpur District- Pre-monsoon depth to water level (m bgl) during 2011 was 2.60 – 9.17 mbgl and post-monsoon depth to water level during 2011 was 0.82 – 8.95 mbgl

Pilibhit District-Pre-monsoon depth to water level (m bgl) during 2012 was 3.30 - 5.63 and post-monsoon depth to water level (m. bgl) during 2012 was 2.00 - 4.65.

4.2.4.5 Surface and Ground Water Quality

The details of locations of ground and surface water samples are provided in **Table 4.5** and **Table 4.6,** respectively. The analytical results of ground and surface water are given in **Table 4.7** and **Table 4.8,** respectively**.** Surface water samples were analysed based on CPCB classification and the ground water samples were analyzed for all essential characteristics and for most of the desirable characteristics specified in IS 10500:2012. The water sampling photographs are shown in **Figure 4.11** and **4.12.** Ground Water sampling photographs are shown in **Figure 4.13.**

Figure 4.11:Ground Water Monitoring Locations

Figure 4.12:Surface Water Monitoring Locations

Table 4.5:Details of Ground Water Sampling Locations

Location Code	Locations Name	Date of sampling	GPS Coordinates	Package
GW-1	Bewar (Km 0+050)	23-May-20	27°13'17.79"N 79°18'04.05"E	Package-I
GW-2	Bahadurpur Km. 39+475	23-May-20	27°23'47.22"N 79°37'29.30"E	Package-I
GW-3	Jalalabad (Km. 79+150)	25-May-20	27°42'38.36" 79°39'4.20"E	Package-II
GW-4	Bisalpur (Km. 147+670)	26-May-20	28°17'21.95"N 79°47'58.54"E	Package-III
GW-5	Pilibhit Km. 183+320	26-May-20	28°36'22.06"N 79°48'13.12"E	Package-IV

Table 4.6 :Details of Surface Water Sampling Locations

Sample Code	Location Name	Source	GPS Coordinates	Date of Sampling	Package
SW-1	Bewar	River at Ch. 3+500	27°14'10.15"N 79°19'45.49"E	23-May-20	Package-I
SW-2	Bahadurpur	River near Ch. 39+800	27°23'56.24"N 79°37'37.17"E	23-May-20	Package-I
SW-3	Daudapur	River near Ch. 71+300	27° 38'24.06"N 79°39'42.79"E	25-May-20	Package-II
SW-4	Bhunda Harbanspur	River near Ch. 133+300	28°10'39.18"N 79°43'46.34"E	25-May-20	Package-III
SW-5	Mathu Dandi	Canal / Drain near Ch. 179+100	28°34'13.26"N 79°48'20.74"E	26-May-20	Package-IV

Analysis results for ground and surface water analysis are given in **Table 4.7** and **Table 4.8,** respectively.

Analysis Result for Ground water Analysis

The analysis results of the ground water samples at all the locations reflect that the pH is within permissible limit. Total hardness at all locations is more than acceptable limits, but within the permissible limits, highest value being 372 at GW-1 location, in Bewar. Values of Magnesium also found to be high at two locations but were under the permissible value range. These two locations are GW-1 (Bewar) and GW-4 (Bisalpur). Total dissolved solid varied from 260.0 mg/l to 440.0 mg/l at different locations along the project road. The concentration of chlorides, iron, fluoride concentration and other metals are below the permissible limit in all the samples taken along the project road.

Table 4.7: Ground Water Quality Along The Project Road

S.N.	Test Parameter	Units	Results					IS-10500: 2012- Drinking Water Standards		Method of Testing
			GW-1	GW-2	GW-3	GW-4	GW-5	Acceptable Limits	Permissible Limits	
1	pH value at 25^{0}C	-	7.12	6.95	6.51	7.25	6.75	6.5-8.5	No Relaxation	IS : 3025(Pt-11)
2	Color	Hazen	<5	<5	<5	<5	<5	5	15	IS : 3025(Pt-4)
3	Conductivity	µmhos/ cm	676	401	410	592	480	--	--	IS3025(Part-14)
4	Turbidity	NTU	<1.0	<1.0	<1.0	<1.0	<1.0	1	5	IS: 3025(Pt-10
5	Total Suspended Solid	mg/l	<5.0	<5.0	<5.0	<5.0	<5.0	--	--	IS3025(Part-17)
6	Total Dissolved Solid	mg/l	440	260	266	344	312	500	2000	IS : 3025(Pt-16)
7	Dissolved Oxygen	mg/l	6.8	6.8	6.9	6.7	6.7	--	--	IS3025(Part-38)
8	Oil & Grease	mg/l	<1.0	<1.0	<1.0	<1.0	<1.0	--	--	IS:3025 (Part-39)
9	Total Hardness (as $CaCO_3$)	mg/l	372	223	224	334	265	200	600	IS : 3025(Pt-21)
10	Calcium (as Ca^{2+})	mg/l	85	50	55	65	65	75	200	IS : 3025(Pt-40)
11	Sodium (as Na)	mg/l	8.1	6.5	7	9.5	9.5	--	--	
12	Potassium (as K)	mg/l	4.2	2.5	2.4	3.5	3.2	--	--	
13	Magnesium (as Mg^{2+})	mg/l	48	9	21	42	25	30	100	IS:3025 pt 46
14	Total Alkalinity as $CaCO_3$	mg/l	472	248	256	414	284	200	600	IS : 3025(Pt-23)
15	Nitrate (as NO_3)	mg/l	5.6	2.8	3.2	2.6	4.5	45	No Relaxation	IS : 3025(Pt-34)
16	Ammonical Nitrogen	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	--	--	IS:3025 (Pt-34)
17	Phosphate (as PO_4)	mg/l	<0.4	<0.4	<0.4	<0.4	<0.4	--	--	

S.N.	**Test Parameter**	**Units**	**Results**					**IS-10500: 2012- Drinking Water Standards**		**Method of Testing**
			GW-1	**GW-2**	**GW-3**	**GW-4**	**GW-5**	**Acceptable Limits**	**Permissible Limits**	
18	Sulphate (as SO_4)	mg/l	3.2	6.1	7.5	3.5	4	200	400	IS : 3025(Pt-24)
19	Chlorides (as Cl)	mg/l	21.9	22	24	12.5	30	250	1000	IS : 3025(Pt-32)
20	Fluoride (as F)	mg/l	0.64	0.91	0.61	0.58	0.74	1	1.5	APHA 22nd Ed., 4500F(D)
21	Phenolic Compounds (as C6H5OH)	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.002	IS: 3025(Part-43)
22	Lead (as Pb)	mg/l	<0.005	<0.005	<0.005	<0.005	<0.005	0.01	No Relaxation	IS:3025 (Part-2)
23	Iron (as Fe)	mg/l	0.19	0.18	0.18	0.23	0.26	0.3	No Relaxation	IS:3025 (Part-2)
24	Arsenic (as As)	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.05	IS:3025 (Part-2)
25	Zinc (as Zn)	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	5	15	IS:3025 (Part-2)
26	Cadmium (as Cd)	mg/l	<0.002	<0.002	<0.002	<0.002	<0.002	0.003	No Relaxation	IS:3025 (Part-2)
27	Manganese (as Mn)	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	0.1	0.3	IS:3025 (Part-2)
28	Copper (as Cu)	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	1.5	IS:3025 (Part-2)
29	Chromium (as Cr)	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	0.05	No Relaxation	IS:3025 (Part-2)
30	E. coli	MPN per 100ml	Absent	Absent	Absent	Absent	Absent	Shall be Non-detectable		IS : 1622
31	Total coliform	MPN per 100ml	Absent	Absent	Absent	Absent	Absent	Shall be Non- detectable		IS : 1622

Source: Environmental Baseline Monitoring

	
GW-1	GW-2
	
GW-3	GW-4
	Blank
GW-5	

Figure 4.13: Field Photographs for Ground Water Sampling

Table 4.8: Surface Water Quality Along The Project Road

S.N.	Test Parameter	Unit	Results					Method of Testing
			SW-1	SW-2	SW-3	SW-4	SW-5	
1	Temperature	(°C)	33.5	32.9	32.3	33.4	31.8	IS : 3025(Part-9)
2	pH	--	6.85	6.61	6.69	6.96	6.4	IS:3025 (Part-11)
3	Color	hazen	<5.0	<5.0	<5.0	10	14	IS : 3025(Part-4)
4	Conductivity	µmhos/cm	370	140	220	250	285	IS3025(Part-14)
5	Turbidity (NTU)	NTU	11	3	5	54	58	IS:3025 (Part-10)
6	Total Suspended Solids	mg/l	30	9	11	23	31	IS3025(Part-17)
7	Total Dissolve solids	mg/l	246	194	152	166	172	IS:3025 (Part-16)
8	Dissolved Oxygen	mg/l	6.6	6.7	6.9	6.7	5.2	IS3025(Part-38)
9	Biochemical Oxygen Demand (3 days at 27^0 C)	mg/l	<2.0	<2.0	<2.0	<2.0	<2.0	IS3025(Part-44)
10	Chemical Oxygen Demand	mg/l	<4.0	<4.0	<4.0	<4.0	<4.0	IS3025(Part-58)
11	Oil & Grease	mg/l	<1.0	<1.0	<1.0	<1.0	<1.0	IS:3025 (Part-39)
12	Total Hardness as CaCO3	mg/l	168	36	92	112	119	IS:3025 (Part-21)
13	Calcium as Ca	mg/l	48	25	21	24	27	IS:3025 (Part-40)
14	Sodium (as Na)	mg/l	7.6	8	6.5	7.2	7.6	IS3025(Part-45)
15	Potassium (as K)	mg/l	2.4	3.5	2.6	2.5	2.2	IS3025(Part-45)
16	Magnesium as Mg	mg/l	9.2	4.5	9.1	12	11	IS:3025 (Part-46)
17	Total Alkalinity	mg/l	132	48	80	96	98	IS:3025 (Part-23)
18	Nitrates as NO_3	mg/l	<1.0	<1.0	<1.0	<1.0	2.5	IS:3025 (Part-34)
19	Ammonical Nitrogen	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	IS : 3025(Pt-34)

S.N.	Test Parameter	Unit	Results					Method of Testing
			SW-1	SW-2	SW-3	SW-4	SW-5	
20	Phosphate (as PO_4)	Mg/l	<0.1	<0.1	<0.1	<0.1	<0.1	IS3025(Part-31)
21	Sulphate as SO_4	mg/l	2.5	<2.0	<2.0	<2.0	<2.0	IS:3025 (Part-24)
22	Chloride as Cl	mg/l	12	9.9	10	6	9	IS:3025 (Part-32)
23	Fluorides as F-	mg/l	0.58	0.61	0.59	0.63	0.7	IS:3025 (Part-60)
24	Lead as Pb	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	IS:3025 (Part-2)
25	Phenolic Compounds (as C_6H_5OH)	mg/l	<0.001	<0.005	<0.005	<0.005	<0.005	IS: 3025(Part-43)
26	Iron as Fe	mg/l	<0.005	0.19	0.19	0.19	0.28	IS:3025 (Part-2)
27	Arsenic as As	mg/l	0.19	<0.01	<0.01	<0.01	<0.01	IS:3025 (Part-2)
28	Zinc as Zn	mg/l	<0.01	<0.05	<0.05	<0.05	<0.05	IS:3025 (Part-2)
29	Cadmium as Cd	mg/l	<0.05	<0.002	<0.002	<0.002	<0.002	IS:3025 (Part-2)
30	Manganese as Mn	mg/l	<0.002	<0.01	<0.01	<0.01	<0.01	IS:3025 (Part-2)
31	Copper as Cu	mg/l	<0.01	<0.05	<0.05	<0.05	<0.05	IS:3025 (Part-2)
32	Chromium as Cr	mg/l	<0.05	<0.01	<0.01	<0.01	<0.01	IS:3025 (Part-2)
33	Total Coliform	Total Coliform	140	290	195	180	470	IS : 1622
34	Fecal Coliform	Fecal Coliform	50	110	90	70	180	IS : 1622

Source: Environmental Baseline Monitoring

Analysis Result for Surface water Analysis

The analysis result reflects that surface water samples taken from rivers located at Bewar (SW1), Bahadurpur (SW2), Daudapur (SW3) and Bhunda Harbanspur (SW4) have good water quality and fall into Category B (Designated best use : Outdoor bathing) as per criteria provided by Central Pollution Control Board. The criteria for outdoor bathing designated best use is Total Coliforms Organism MPN/100ml shall be 500 or less, pH between 6.5 and 8.5, Dissolved Oxygen 5mg/l or more and Biochemical Oxygen Demand 5 days 20 °C, 3mg/l or less.

For the sample taken from canal / drain crossing the project road at Km 179+100 comes under the Category C with designated best use “Drinking water source after conventional treatment and disinfection” as per CPCB criterion. The CPCB criterion for Category C is Total Coliforms Organism MPN/100ml shall be 5000 or less, pH between 6 and 9, Dissolved Oxygen 4mg/l or more and Biochemical Oxygen Demand 5 days 20 °C, 3 mg/l or less.

Field Photographs for Surface Water Sampling are shown in **Figure 4.14.**

	
SW-1	SW-2
	
SW-3	SW-4

	Blank
SW-5	

Figure 4.14: Field Photographs for Surface Water Sampling

4.2.5 Climate

The primary temperature, rainfall and wind features of the three distinct seasons of the state are:

- Summer (March–June): Hot & dry (temperatures rise to 45 °C, sometimes 47–48 °C); low relative humidity (20%); dust laden winds.
- Monsoon (June–September): 85% of average annual rainfall of 990 mm. Fall in temperature 40–45° on rainy days.
- Winter (October–February): Cold (temperatures drop to 3–4 °C, sometimes below −1 °C); clear skies; foggy conditions in some tracts.

Mainpuri District: The climate of the district is characterized by hot summer and very cold winter. The summer season is very hot and temperatures may rise upto 40-45°C.During winters the district is affected by cold waves and minimum temperatures may drop down to one-two degrees below freezing point.

Farrukhabad District: The climate is characterized by hot dry summer and a pleasant cold winter. May is generally the hottest month with mean maximum temperatures of 41°C.The maximum temperatures of the district touches 46.8°C while minimum is around 3.3°C.

Shahjahanpur District: The climate is characterized by dampness in the monsoon period, a hot dry summer and a bracing cold. The cold season begins from mid of November to February followed by summer from March to about middle of June. The period from mid of June to about the end of September is the monsoon season.

Pililbhit District: The climate of the district is influenced by its proximity to the hills and the tarai swamps and is characterized by general dryness in the summer and bracing cold season.

Summary of the long-term meteorological scenario of all the four project districts is as follows:

Rainfall

The rainfall data for the period 2014-2018 was collected for Mainpuri, Farrukhabad, Shahjahanpur and Pilibhit District are presented in **Table 4.9**.

Table 4.9: Average Annual Rainfall data (2014-2018) of Project Districts

Month	**Mainpuri**				
	2014	**2015**	**2016**	**2017**	**2018**
January	44.6	16.6	1.6	9.1	0.0
February	12.3	0.0	1.2	0.0	1.6
March	14.6	46.7	3.1	8.9	0.0
April	2.7	15.4	0.0	0.0	2.0
May	0.0	10.0	12.4	9.0	6.0
June	15.2	18.4	22.2	38.9	2.6
July	101.8	127.6	112.0	269.0	284.3
August	34.7	82.8	151.2	130.4	295.6
September	39.3	9.1	5.0	131.1	152.5
October	0.5	0.0	7.1	0.0	0.0
November	0.0	0.0	0.0	0.0	0.0
December	9.4	9.7	0.0	0.0	0.0
Month	Farrukhabad				
	2014	**2015**	**2016**	**2017**	**2018**
January	44.6	16.6	1.6	9.1	0.0
February	12.3	0.0	1.2	0.0	1.6
March	14.6	46.7	3.1	8.9	0.0
April	2.7	15.4	0.0	0.0	2.0
May	0.0	10.1	12.4	9.0	6.0
June	15.2	18.4	22.2	38.9	2.6
July	101.8	127.6	112.0	269.0	284.3
August	34.7	82.8	151.2	130.4	295.6
September	39.3	9.1	5.0	131.1	152.5
October	0.5	0.0	7.1	0.0	0.0
November	0.0	0.0	0.0	0.0	0.0
December	9.4	9.7	0.0	0.0	0.0
Month	Shahjahanpur				
	2014	**2015**	**2016**	**2017**	**2018**
January	37.8	26.5	0.8	21.4	0.0
February	21.4	0.0	4.7	0.5	18.7
March	16.6	67.9	2.4	8.9	0.3
April	3.5	25.8	0.0	0.0	7.3
May	3.6	8.3	43.8	33.5	6.4
June	22.9	43.8	34.8	46.6	63.9
July	259.3	267.5	384.0	150.0	482.2
August	71.6	191.2	146.4	165.8	345.6

September	70.0	6.7	69.7	145.7	105.7
October	25.6	7.7	7.6	0.0	1.6
November	0.0	0.0	0.0	0.0	2.4
December	8.3	0.0	0.0	0.0	0.0
Month	Pilibhit				
	2014	**2015**	**2016**	**2017**	**2018**
January	19.4	40.3	0.7	14.4	2.0
February	11.3	8.3	3.7	1.0	2.1
March	18.8	81.3	0.0	1.0	3.1
April	5.0	9.9	0.7	0.0	17.4
May	1.7	4.3	31.6	1.4	8.0
June	54.8	102.8	67.3	13.6	38.9
July	185.8	158.6	316.7	143.9	214.5
August	108.8	98.8	94.1	177.4	381.4
September	47.1	4.7	50.5	111.8	98.3
October	20.5	7.8	3.0	0.0	6.6
November	0.0	2.4	0.0	0.0	0.7
December	11.0	0.7	0.0	0.7	0.0

Source: Indian Meteorological Department, Govt. of India

Meteorological data of last 30 years

A. Temperature

The climatological data of 30 years (1981-2010) of the IMD stations along the project road, *i.e.* Mainpuri and Shahjahanpur have been considered for analyzing the climatology of the project influence area as given in **Table 4.10** which may be representative of the climatic conditions for the study area in general.

The dust storms and severe heat waves are common in the districts between April and May months. The temperature within the districts begins to rise by the end of February till May which is the hottest month of the year and the coldest months are December and January.

Table 4.10: Maximum and Minimum Temperatures of Mainpuri and Shahjahanpur District (IMD Mainpuri and Shahjahanpur 1981-2010)

Month	**Temperature (°C)**		**Temperature (°C)**	
	Avg. Max	**Avg. Min**	**Avg. Max**	**Avg. Min**
	Mainpuri District		**Shahjahanpur District**	
January	26.7	3.3	25.4	3.2
February	30.8	5.4	28.5	5.1
March	37.9	9.3	35.3	8.9
April	43.2	15.2	40.0	13.4
May	44.9	21.0	42.5	18.5
June	45.4	23.1	43.0	20.3
July	40.5	23.0	37.8	22.4

Month	**Temperature (°C)**		**Temperature (°C)**	
	Avg. Max	**Avg. Min**	**Avg. Max**	**Avg. Min**
August	37.4	22.9	36.7	22.5
September	37.2	20.7	35.7	19.5
October	36.8	15.1	34.6	12.5
November	33.2	9.6	34.6	7.7
December	28.0	4.7	26.9	4.4

The graphical representation of maximum and minimum temperature of Mainpuri and Shahjahanpur District is given in **Figure 4.15** and **Figure 4.16.**

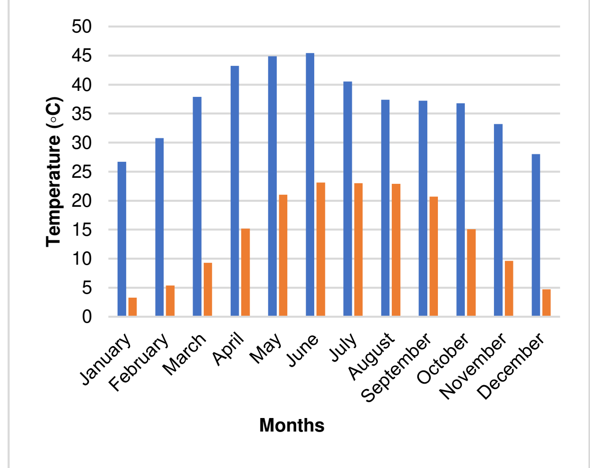


Figure 4.15: Graphical Representation of Temperature in Mainpuri District

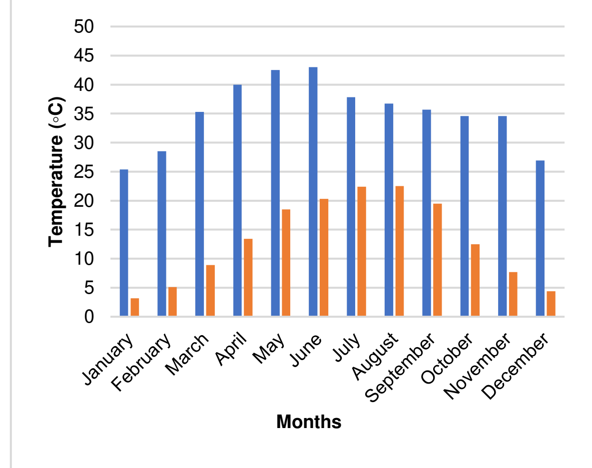


Figure 4.16: Graphical Representation of Temperature in Shahjahanpur District

B. Humidity

The average humidity in the project districts ranges from 45% to 81% in the morning and from 28% to 70% in the evening within the Mainpuri district and from 50% to 84% in the morning and from 31% to 74% in the evening within the Shahjahanpur district as shown in **Table 4.11.**

Table 4.11: Average Morning and Evening Humidity (%)

Month	**Humidity (%)**		**Humidity (%)**	
	Avg. Morning	**Avg. Evening**	**Avg. Morning**	**Avg. Evening**
	Mainpuri District		**Shahjahanpur District**	
January	81	60	84	65
February	75	51	77	54
March	61	40	67	44
April	47	28	50	31
May	45	28	53	35
June	58	43	64	48

Month	Humidity (%)		Humidity (%)	
	Avg. Morning	Avg. Evening	Avg. Morning	Avg. Evening
	Mainpuri District		Shahjahanpur District	
July	79	68	84	74
August	84	77	83	75
September	80	70	82	72
October	71	59	75	62
November	71	59	75	60
December	79	63	81	66

Source: Climatological Normals (1981-2010)

The graphical Representation of Morning and Evening Humidity in Mainpuri and Shahjahanpur District is given in **Figure 4.17** and **Figure 4.18.**

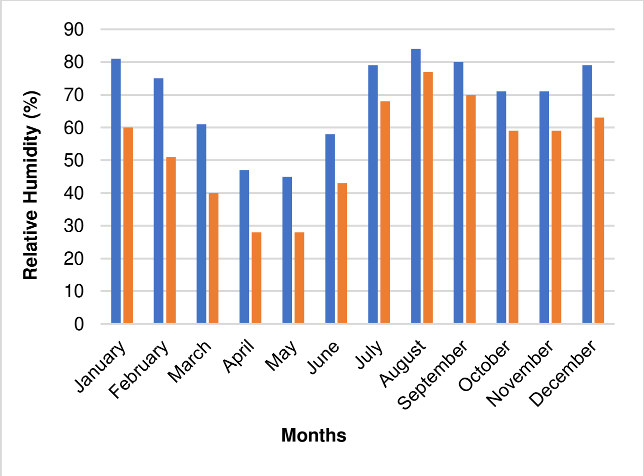


Figure 4.17: Graphical Representation of Relative Humidity in Mainpuri District

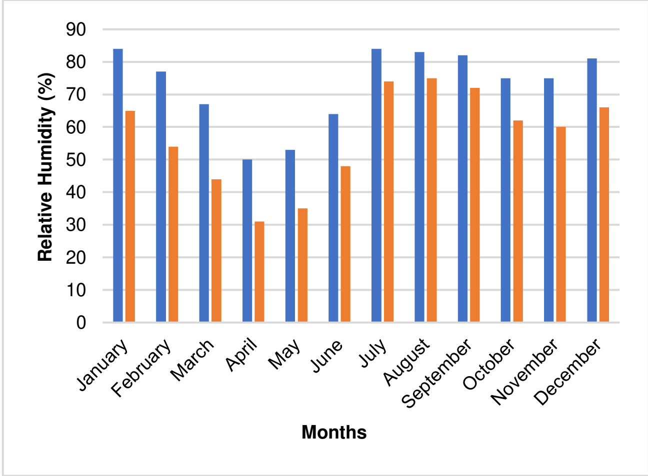


Figure 4.18: Graphical Representation of Relative Humidity in Shahjahanpur District

C. Wind Speed

Wind speed and wind direction have a significant role on the dispersion of atmospheric pollutants and therefore, the air quality of the area. Ground level concentrations for the pollutants are inversely proportional to the wind speed in the down wind direction, while in upwind direction no effect will be observed and in cross wind direction partial effect due to the emission sources is observed.

The graphical representation of wind speed within Mainpuri district is given as **Figure 4.19**.

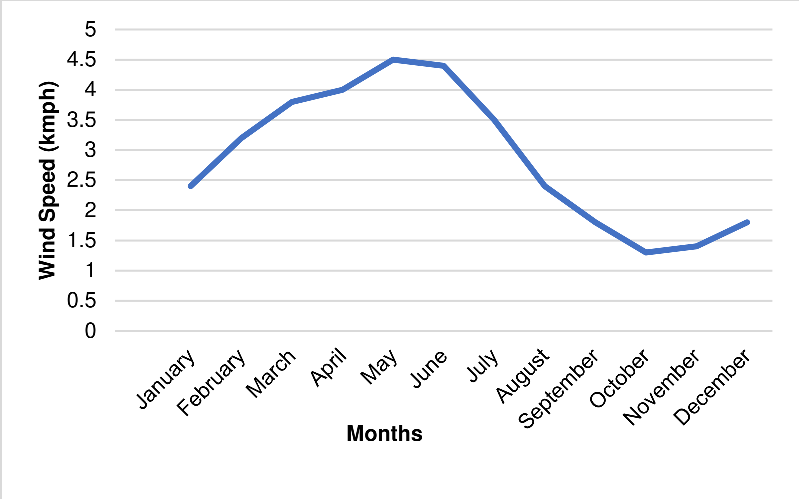


Figure 4.19: Graphical Representation of Wind Speed (IMD Mainpuri, 1981-2010)

4.2.6 Ambient Air Quality

M/s AGSS Analytical & Research Lab (P) Ltd. (A NABL Accredited laboratory) was engaged for ambient air quality monitoring along the project road. Five sampling stations were set up for monitoring of ambient air quality within the study area. Monitoring locations were selected following the CPCB guidelines for ambient air quality monitoring so as to accord an overall idea of the ambient air quality scenario in the study area along the project road. Logistic considerations such as accessibility, security and availability of reliable power supply were also considered while finalizing the monitoring locations. ambient air quality monitoring locations are given in **Table 4.12** and the air quality monitoring locations marked on google map are shown in **Figure 4.20.**

Figure 4.20: Air Quality Monitoring Locations

Table 4.12: Details of Air Quality Monitoring Locations

Location Code	Name of Location	Approx. Chainage	GPS Coordinates	Package
AQ-1	Bewar	Km 0+150	27°13'19.64"N, 79°18'09.24"E	Package-I
AQ-2	JeraRahimpur	Km 54+900	27°30'46.07"N, 79°42'10.38"E	Package-II
AQ-3	Khudaganj	Km 118+360	28°3'44.30"N, 79°39'49.37"E	Package-III
AQ-4	Bisalpur	Km 147+790	28°17'22.49"N, 79°47'57.82"E	Package-IV
AQ-5	Pilibhit	Km 183+290	28°36'22.34"N, 79°48'12.16"E	Package-IV

Ambient air quality monitoring was conducted for the following parameters:

- Particulate matter of size less than 2.5 micron or $PM_{2.5}$
- Particulate matter of size less than 10 micron or PM_{10}
- Sulphur Dioxide (SO_2)
- Nitrogen Dioxide (NO_2)
- Carbon monoxide (CO)

Ambient air quality monitoring was conducted for one month in pre-monsoon season (May - June 2020) at a frequency of twice a week at each station adopting a 24-hours schedule. CO has been measured 1- hourly.

The ambient air quality monitoring resultant are presented in **Table 4.13** and graphical presentation of monitoring data against NAAQ Standards is shown in **Figure 4.21**. Field photographs taken during air sample collection are provided in **Figure 4.22**.

Table 4.13: Ambient Air Quality along the Project Road

Locations	PM10 (µg/ m3)				PM2.5 (µg/ m3)			
	Max.	Min.	Avg.	Limit	Max.	Min.	Avg.	Limit
AQ-1	98.7	89.3	93.85	100	57.6	48.2	53.29	60
AQ-2	96.4	82.3	90.91	100	56.8	47.8	51.04	60
AQ-3	99.1	87.5	92.19	100	58.2	49.2	53.06	60
AQ-4	99.2	88.5	49.5	100	58.5	49.5	53.36	60
AQ-5	99.8	89.2	94.66	100	59.7	50.8	54.15	60

Locations	SO_2 (µg/ m3)				NO_2 (µg/ m3)				CO (mg/ m3)			
	Max.	Min.	Avg.	Limit	Max.	Min.	Avg.	Limit	Max.	Min.	Avg.	Limit
AQ-1	13.2	9.8	11.56	80	18.3	14.9	16.24	80	910	660	812.5	4000
AQ-2	12.1	8.2	10.4	80	16.6	13.8	15.51	80	890	620	725	4000
AQ-3	12.9	9.6	11.19	80	17.9	14.2	15.49	80	910	630	726.2	4000
AQ-4	13.1	9.8	11.39	80	18.2	14.5	15.79	80	930	650	746.2	4000

Locations	SO_2 (µg/ m3)				NO_2 (µg/ m3)				CO (mg/ m3)			
	Max.	Min.	Avg.	Limit	Max.	Min.	Avg.	Limit	Max.	Min.	Avg.	Limit
AQ-5	13.6	10.2	11.89	80	18.8	15.4	16.74	80	990	710	870	4000

The graphical representation of the ambient air monitoring data is as follows:

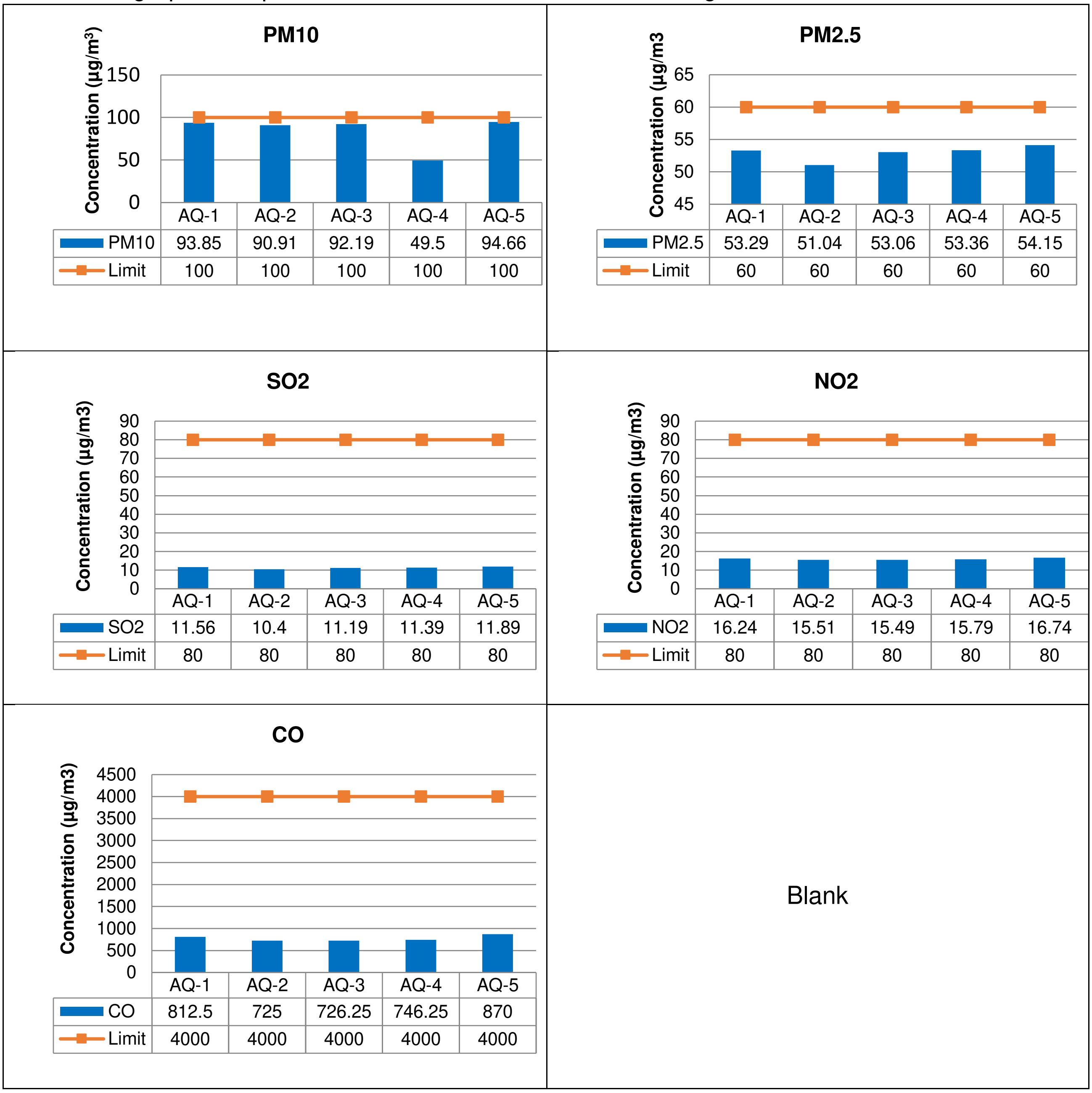


Figure 4.21: Graphical Representation of the Air Quality Data

Result Analysis:

The ambient air quality monitoring results indicate that 24 hourly mean concentration of PM_{10} in ambient air varied between 82.3 µg/m^3 and 99.8 µg/m^3 along the project road alignment, which is within the permissible limit of 100µg/m^3 as per the National Ambient Air Quality Standards. The concentration of $PM_{2.5}$ concentrations varied between 47.8 µg/m^3 to 59.7 µg/m^3 with no value exceeding the NAAQS of 60 µg/m^3. Monitored values of SO_2, NO_2 and CO were also found to be within the National Ambient Air Quality Standards.

	
AQ-1	AQ-2
	
AQ-3	AQ-4
	Blank
AQ-5	

Figure 4.22: Field Photographs for Ambient Air Sampling

4.2.7 Noise Environment

Road construction activity is a major source of noise generation due to movement and operation of machineries, heavy vehicles, loading and unloading of construction materials, apart from high noise levels at the asphalt plants (90 - 100 dB (A)). During the operation phase, noise is generated from vehicle movement in three ways, namely from the vehicle body parts, from the tyre-roadway system (also known as the rolling noise) and from the driver behaviour, such as use of horns.

The noise level depends upon the type and condition of tyres and pavement. At higher speed, these types of noise increase at same rate. At lower speeds in urban areas, where lower gears are used, noise from the vehicle body parts tends to be independent of vehicle speed whereas noise from the tyre-roadway system becomes less important. Driver behaviour contributes to road noise by using vehicle's horns, sudden breaking on vehicle speed, depending on the road surface and whether the surface is wet or dry.

Traffic operation and industrial activities alongside the road are also the major source of noise pollution in the area. However, people were found disconcerted for noise related issues. Hence, Noise level in the study area is not the major issue of concern. In the present study, sound pressure levels (SPL) have been measured by a sound level meter. Since loudness of sound is important for its effects on people, the dependence of loudness upon frequency must be taken into account in noise impact assessment. This has been achieved by the use of A-weighting filters in the noise-measuring instrument which gives a direct reading of approximate loudness. A-weighted equivalent continuous sound pressure level (Leq) values have been computed from the values of A-weighted sound pressure level measured with the help of noise meter.

Five different locations were chosen for assessment of ambient noise quality in study area, as shown on google map below in **Figure 4.23.**

Figure 4.23: Noise Quality Monitoring Locations

Monitoring has been carried out once in a season at each location. Details of noise sampling location are presented in **Table 4.14**.

Table 4.14: Details of Noise Sampling Locations

Location Code	Name of Location	Approx. Chainage	GPS Coordinates	Package
NQ-1	Bewar (Residential)	Km 0+150	27°13'19.64"N, 79°18'09.24"E	Package-I
NQ-2	JeraRahimpur(Residential)	Km 54+900	27°30'46.07"N, 79°42'10.38"E	Package-II
NQ-3	Khudaganj (Residential)	Km 118+360	28°3'44.30"N, 79°39'49.37"E	Package-III
NQ-4	Bisalpur (Commercial)	Km 147+790	28°17'22.49"N, 79°47'57.82"E	Package-IV
NQ-5	Pilibhit (Commercial)	Km 183+290	28°36'22.34"N, 79°48'12.16"E	Package-IV

To establish the baseline environment scenario, noise measurements along the project road were carried out. The ambient noise quality as collected is presented in **Table 4.15** and graphical presentation of the concentration against NAAQ standards is shown in **Figure 4.24**. Field photographs taken during noise sample collection are provided in **Figure 4.25.**

Table 4.15: Ambient Noise Quality along the Project Corridor

S.N.	Para-meter	Results									
		NQ-1		NQ-2		NQ-3		NQ-4		NQ-5	
		Result (dBA)	Noise Std. (Res.)	Result (dBA)	Noise Std. (Res.)	Result (dBA)	Noise Std. (Res.)	Result (dBA)	Noise Std. (Com.)	Result (dBA)	Noise Std. (Com.)
1	Day Time	52.8	55	53.2	55	54.1	55	59.8	65	64.3	65
2	Night Time	39.1	45	40.1	45	39.5	45	47.9	55	48.2	55

Day Time Noise Level - 6:00 AM to 10:00 PM
Night Time Noise Level - 10PM to 6AM

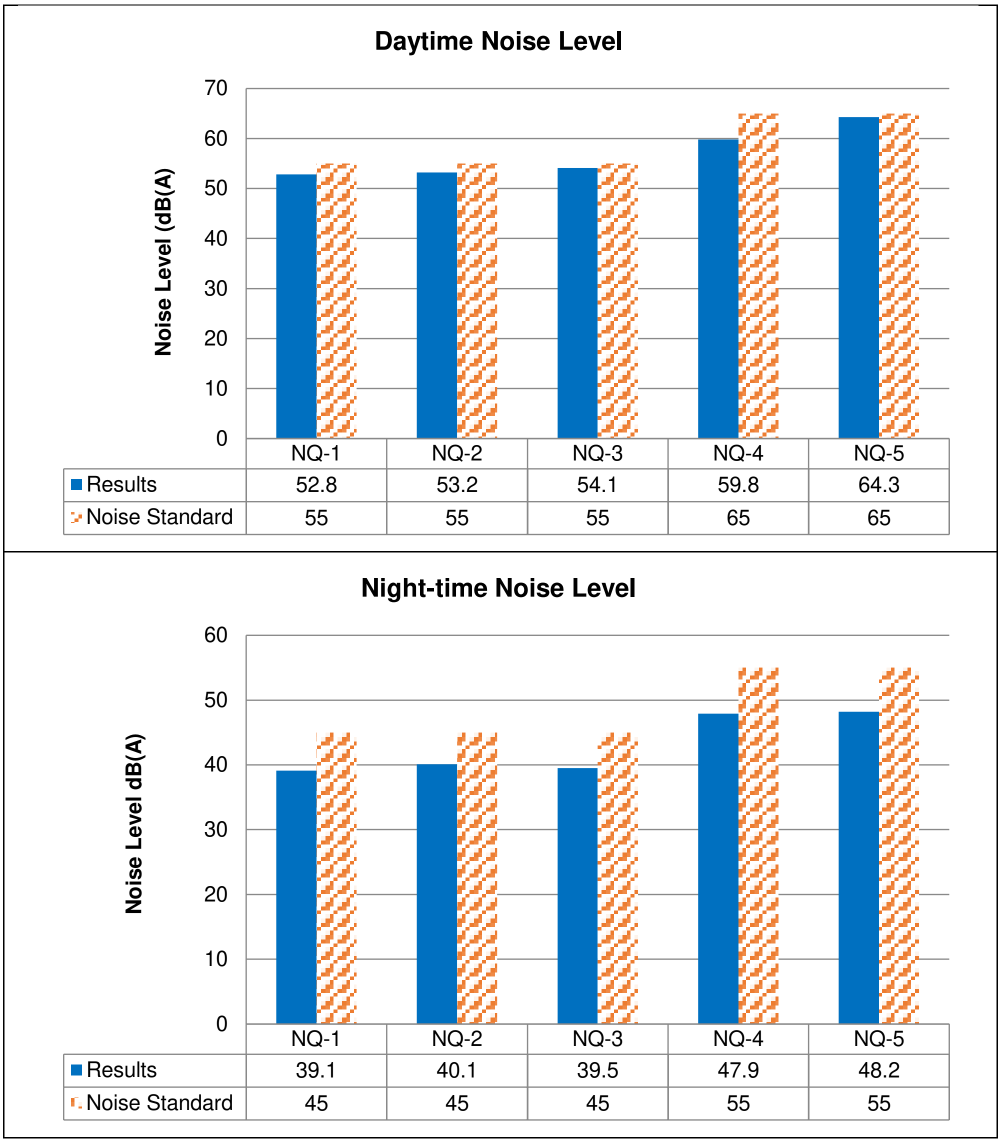


Figure 4.24: Graphical Representation of Noise Quality Data

The ambient noise levels at 5 monitoring locations were within the permissible level of residential and commercial zones as stipulated by Central Pollution Control Board. The average daytime equivalent noise levels were recorded in the range of 52.8Leq dB(A) to 54.1Leq dB(A) in residential areas of Bawar, Jera Rahimpur and Khudaganj, whereas in commercial areas of Bisalpur and Vasundhara, Pilibhit, average noise levels were 59.8 dB(A) and 64.3 dB(A).

	
NQ-1	NQ-2
	
NQ-3	NQ-4
	Blank
NQ-5	

Figure 4.25: Field Photographs for Noise Sampling

4.2.8 Land Use Pattern

The land environment describes the baseline aspects of the nature and geomorphic features, soil conditions and quality, borrow and material resources and land use characteristics. Land Use Map for the Project road is attached as **Annexure 4.2.**

The land use along the project corridor is predominantly agricultural, followed by built-up area, plantation and water bodies respectively. Package-wise land use pattern is shown through pie charts in **Figures 4.26, 4.27, 4.28** and **4.29**, whereas overall land use pattern for the entire road is shown in **Figure 4.30**.

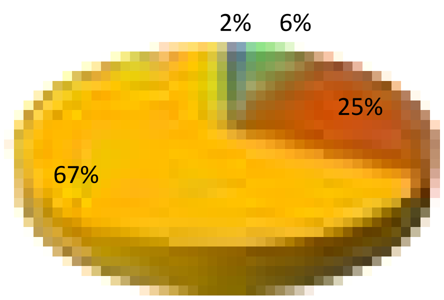


Figure 4.26: Landuse Map – Package 1

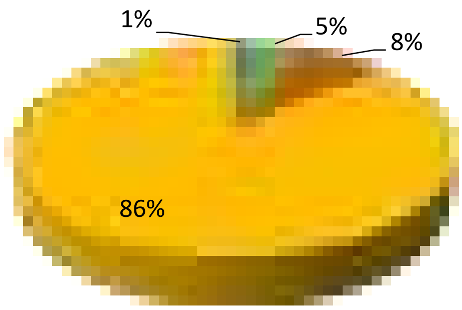


Figure 4.27: Landuse Map – Package 2

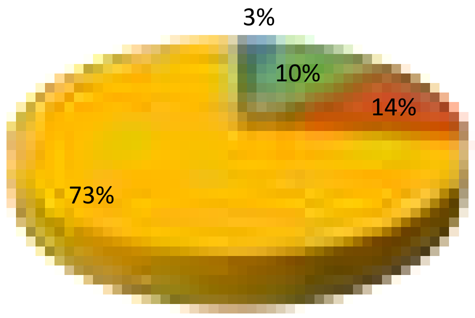


Figure 4.28: Landuse Map – Package 3

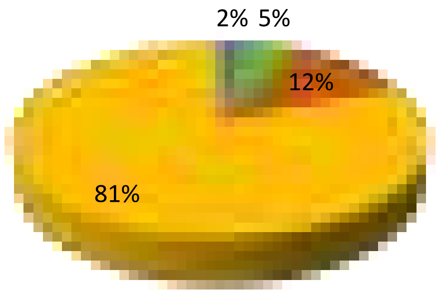


Figure 4.29: Landuse Map – Package 4

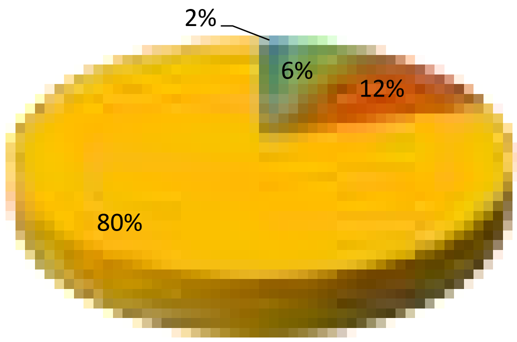
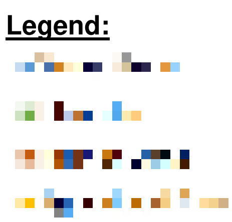


Figure 4.30: Landuse Map – Total Project Road



4.2.9 Seismicity

According to 2014 seismic zoning map of India, the state of Uttar Pradesh falls in Zone III & IV, which are moderate active and highrisk zone of seismic hazard. The project districts of Pilibhit and Shahjahanpur fall under Zone IV and the project districts of Mainpuri and Farrukhabad fall under Zone III as shown in the **Figures 4.31** and **Figure 4.32**:

Figure 4.31: Seismic Zonation Map of India

Figure 4.32: Seismic Zonation Map of Uttar Pradesh

4.3 Ecological and Biological Environment

4.3.1 Forests

The project road starting at Mainpuri district and passing through Farrukabad, Shahjahanpur districts and ending at Pilibhit district does not cross any natural forest area other than Protected Forest which is road side plantations declared as Protected Forest (PF) by the State of Uttar Pradesh.

The road alignment marked on the map of state of Uttar Pradesh is shown below in **Figure 4.33**.

The road side plantation along the carriageway within the Right of Way (ROW) of National and State Highways in Uttar Pradesh have been declared as Protected Forest by the State's Department of Forest (Van Vibhag) and accordingly the land within the ROW was transferred to the Forest Department vide notification No. 1115/XIV-331-50 dated February 10,1960**.** Hence, the project will attract diversion of forest land under the provisions of Forest (Conservation) Act, 1980.

Roadside plantation from Km 0+000 to Km 114+000, Km 147+600 to Km 183+380 is notified as protected forest and will need diversion of Protected Forest for none forestry use. Forest clearance application for same has been submitted to the Forest Department, as per details given below in **Table 4.16.**

Figure 4.33: Forest Cover Map of Uttar Pradesh State Showing Project Road

Table 4.16: Forest Clearance Status

Package	Proposal number	Project length	Forest Division	Forest area applied for	Date of submission	Current status
NH-730C Package-1	FP/UP/ROAD/49579/2020	52.770	Social Forestry Division Mainpuri	5.55 Ha.	September 11, 2020	At DFO level. Hard copy of FDP submitted to DFO and Tree enumeration is under progress
			Social Forestry Division Farrukhabad	68.588 Ha.		
			Total Area	74.138 Ha.		
NH-730C Package-2	FP/UP/ROAD/49621/2020	61.230	Social Forestry Division Shahjahanpur	74.263 Ha.	September 12, 2020	At DFO level. Hard copy of FDP submitted to DFO and

Package	Proposal number	Project length	Forest Division	Forest area applied for	Date of submission	Current status
						Tree enumeration is under progress
NH-730C Package-3	Forest area diversion not required for the package as land acquisition does not involve any notified forest					
NH-731K Package-4	FP/UP/ROAD/49626/2020	46.13	Social Forestry Division Pilibhit	44.376	September 12, 2020	At DFO level. Hard copy of FDP submitted to DFO and Tree enumeration is under progress

4.3.2 Roadside Trees

Plantation of trees along the project road has been recorded within the RoW. The predominant tree species along roads are Papdi (*Terminalia catappa*), Eucalyptus (*Eucalyptus globulus*), Siris (*Albizia lebbeck)*, Shisham (*Dalbergiasissoo*), Paakad (*Ficus virens*), Neem (*Azadirachta indica*) and Sagaun (*Tectonagrandis*). Apart from these Amaltas (*Cassia fistula*), Babul (*Vachellia nilotica*), Bakain (*Melia azedarach*), Gular (*Ficusra cemosa*), Mango (*Mangifera indica*), Peepal (*Ficusreligiosa*), etc. Most of the trees are confined within 10 m distance from existing central line of the road.

4.3.3 Flora in Study Area

The study area around the project road is majorly agricultural land. At certain location in Mainpuri District babul (*Acacia arabica*) grows in large clumps on the usar plains and is indeed, the only tree which flourishes on them. Its timber is in great demand both for fuel and carpentry. Its bark is used in tanning, its gumth in dyeing and in medicine. Beside babul and dhak other species of tree found in the district are Shishum (*Dalbergia sissoo*), Neem (*Azadirachta indica*), Pipal (*Ficus religiosa*), Eucalyptus (*Eucalyptus Spp*.), Ashoka (*Polyathia longifolia*), Gulmohar (*Delonix regia*), Mango(*Mangifera indica*), Bargad (*Ficus bengalensis*), Jamun(*Syzygium cumini*) etc.

The Farrukhabad district contains practically no natural forests, but cultivable waste lands were resumed by government and transferred to forest department. At places there are small patches of Dhak forest and some other trees planted by the forest department are Sissoo, Babul, Jamun, Kanji and Arjun.

Dhak is the common tree found throughout the Shahjahanpur district District. Other treesfound in are Mango (*Mangiferaindica*), Babul (*Acacia arabica*), Sissoo (*Dalbergiasissoo*), Semal (*Salmalia mala barica*), Siris (*Albizzia species*), Tamarind (*Tamarindusindica*), Jamun (*Syzygiumcamini*), Bel (*Aeglamarnelos*), Neem (*Azadirachtaindica*), Pipal (*ficusreligiosa*), Bargad (*Ficusbengalenis*), Pakar

(*Ficusindica*) and Gular (*Ficusglomerata*), Sal, Asna (*Terminaliatomentosa*) and Mahua(*Madhucalatifolia*). In addition to these bamboos are to be seen almost everywhere and are of much economic value.

There are Deoria Reserved Forest and Mala Reserved Forest around 14 km from Km 155+750 and 11 km from Km 183+350 respectively from the project road.. The main varieties of trees found in the forests of the Pilibhit district are Sal, Shisham (*Dalbergia sissoo*), Haldu (*Adina cordifolia*), Asna (*Terminalia tomentosa*) Phaldu (*Mitragynanaryfolia*), Teak or Sagaun (*Tectona grandis*), Semal (*Salmalia malabarica*), khair (*Acacia indica*) Jamun (*Syzygium cumini*), Neem(Azadirachta indica), Bargador Banyan (*Ficus bengalensis*), guava (*Psidium guajava*), mahua (*Madhuca indica*), Aonla (*Emblica officinal's*) and Kathal (*Atrocarpusheterophyllus*), Grasses like Dub (C*ynedon dactylo*n) saib (*Eulaliopisbineta*) and Kano (*Saccharum spontneun*) and spear grass are also found in the district.

4.3.4 Wildlife Sanctuary/ National Park/ Tiger Reserve or Eco-sensitive Zones

Uttar Pradesh has one National Park and 23 Wildlife Sanctuaries. The project stretch does not pass through any wildlife sanctuary, national park or notified ecologically sensitive areas or any other significant area of ecological interest, neither any such environmental sensitive locations are located within 10 Km radius on either side of the project road. National parks and wildlife sanctuaries in Uttar Pradesh are shown in **Figure 4.34.**

The Saman Bird Sanctuary which lies is Mainpuri district, is at an aerial distance of approx.25 km from the start point (Km.0+000) of the project road in South-West (SW)direction.

Pilibhit Tiger Reserve in Pilibhit district is at an aerial distance of approx. 28km from the end point (Km183+380) of the project road in North East (NE) direction.

Figure 4.34: National Park and Wildlife Sanctuary in Uttar Pradesh

4.3.5 Threatened or Endangered Species

No rare, threatened or endangered flora or fauna is found along the project corridor.

4.3.6 Wetlands of Ecological Importance

There is no wetland along the project road as per Wetland (Conservation and Management) Rules 2017 and list of Wetlands of International Importance (Ramsar Sites).

4.3.7 Fauna

The project districts of Mainpuri, Farrukhabad, Shahjahanpur and Pilibhit do not abound in wild animals. Among carnivorous animals the wolf wild dog (*Cuon dukhunensis*), jackal (*Coni aureus*) and Fox (*Vulpes bengalensis*) are fairly common. Other animals found are the monkey (Innus rhesus), hare (*Lepus ruficandatus*) and Lomri (Vulpes vulpes). Avean fauna found are Partridge, quail, pigeon and peacock. Many varieties of snakes are also found.

4.3.8 Aquatic Ecosystem

The major rivers crossed by the project are Kali Nadi, Ganga, Ram Ganga and Garrariver at chainages Km 3+500, Km 39+800, Km 53+150 and Km 133+350 respectively. The river Kali Nadi crossing the project at border of Mainpri and Farrukhabad Districts is quite polluted due to discharge of domestic and industrial wastes into the river at various locations, especially from sugar mills located in Uttar Pradesh. No endangered / important faunal aquatic species is present in Kali Nadi.

Ganga River

The project road is crossing Ganga River. The Ganga river originates from the Gangotri Glacier of western Himalayas in the Indian state of Uttarakhand and flows south and east through the Gangetic Plain, eventually emptying into the Bay of Bengal. The middle stretch and most of the lower stretch of the Ganga River wind through the Gangetic Plain, which is one of the largest biogeographic zones in India, extending from the Yamuna River eastward across Uttar Pradesh, Bihar, Jharkhand and West Bengal. It is considered one of the most fertile areas in the world, and most of the original vegetation has been converted into cropland.

In general, the biodiversity in the Ganga river may be grouped under seven heads, *viz.*:

- Phytoplanktons (tiny free-floating living organisms that drift with the water and constitute the main autotrophic base of the food chain in the Ganga ecosystem);
- Periphytons (phytoplanktons, attached and free-floating algal forms);
- Zooplanktons (macroscopic or assemblage of microscopic free-floating animals);

- Zoobenthos (comprising insects including higher forms that group under rocks and boulders spending part of their life as larvae and those which live and grow on soft substrate);
- Fishes;
- Higher aquatic vertebrates (comprising Reptiles, Amphibians and Mammals that include hard and soft turtles, besides the Gangetic dolphin, gharial, crocodile and porpoise);
- Macrophytes (which are higher forms of plants that grow free floating or submerged in water bodies).

The ecologically important species found in the Ganga river in Gangetic plains are given below:

Class of species in Gangetic plains	Representative species	IUCN status	CITES	IWPA Status
Mammal	Gangetic river Dolphin Smooth-coated otter	Endangered Vulnerable	Appendix I Appendix II	Schedule I Schedule II
Reptile	Gharial	Critically Endangered	Appendix I	Schedule I
Bird	Sarus crane	Vulnerable	Appendix II	Schedule IV
Fish	Bata fish	Least Concern	Not listed	Not listed

The Gangeticriver Dolphin, Otters and Gharial are not reported along the river stretch in project study area. In the Farrukhabad district, Indian sarus crane (Antigone antigone), River tern (Sterna aurantia), River lapwing (Vanellusduvaucelii), turtles (G. hamiltonii, H. thurjii and B. dhongoka) are found.

Ramganga River

Ramganga is also crossed by the project road. The Ramganga originates from the hills of Nandakot of Namik glacier in Pithoragarh district of Uttarakhand and flows towards east. The river is fed by numerous streams and finally joins river Sarju at Rameshwar ghat near Pithoragarh. Thereafter, this river is called Saryu, it finally confluences with river Kali, which originates from Milan glacier in Kumaon region. The Kali finally merges with Ganga at Farrukhabad. The condition of water in river Ramganga is reported to be good till Kalagarh dam. The fresh water of the river provides platform for the survival a number of fish species, some higher vertebrates and other microorganism. Bulk of the water downstream of Kalagarh is drawn for irrigation and the flows are meagre at Moradabad and Downstream. Domestic waste and industrial effluents find their way at number of places in Uttarakhand and Uttar Pradesh making it a polluted stretch.

Type of aquatic flora & fauna in Ramganga river are:

- Phytoplankton - The important genera are Anabaena and Oscillatoria of Myxophyceae, Achnanthidium, Cymbella, Navicula among diatoms, Spirogyra, Ulothrix and Rhizoclonium of Chlorophyceae.

- Zooplankton - The important genera of the river Ramganga are Protozoa (Arcella, Centropyxis, Diffugia, Volvox and Vorticella), Rotifera (Asplanchna, Brachionus, Philodina, Pompholix, Polyarthra and Trichocera), Crustacea (Bosmina, Ceriodaphnia, Cyclops, Daphnia, Helobdella and Nauplius)

The benthic fauna of the river comprised of larvae of Ephemeroptera, Odonata, Plecoptera, Hemiptera and Diptera.

Fish found in the river are Homalopterarupicola, Nemacheliusbevani, N. botia, N. gharwali, N. montanus, N. rubdipinnis, N. rupecola, N. submontanus, Xenentodoncancila, Channagachua, C. punctatus, Botiaalmorhae, B. lohachata, B. rostrata, Lepidocephalusguntea, Bariliusbarila, B. bama, B. bendelisis, B. shacra, B. vagra, Catlacatla, Chaguniuschangunio, Crossocheiluslatiuslatius, Garragotylagotyla, G. lamta, Labeocalbasu, L. dero, L. dyocheilus, L. rohita, Oxygasterbacaila, Puntiuschilinoides, P. conchonius, P. sophore, P. ticto, P. tor, P. vittatus, Raiamas bola, Schizothoraxplagiostomus, S. progatus, S. richardsonii, Tor mosal, T. putitora, T. tor, Mastacembelusarmatus, Bagariusbagarius, Glyptothoraxpectinoptrus, G. yelchitta, Luguviasp

4.4 Socio-Economic Conditions

4.4.1 Demographic Profile

Demographic profile has an important bearing on the development process. The basic demographic details of the project districts are presented in **Table 4.17** below.

Table 4.1: Demographic Profile of Project District

Parameter	District			
	Mainpuri	Farrukhabad	Shahjahanpur	Pilibhit
Total Population	1868529	1885204	3006538	2031007
Male population	993377	1006240	1606403	1072002
Female Population	875152	878964	1400135	959005
Sex Ratio (Per 1000)	881	874	872	895
Literacy rate (%)	75.99	69.04	59.54	61.47
Male Literacy Rate (%)	84.53	77.4	68.18	71.7
Female Literacy Rate (%)	66.3	59.44	49.57	50
Population Density	677	864	685	551
Population Growth Rate (%)	17.02	20.05	36.17	17.53
Scheduled Castes Population	368206	312712	532673	333558
SC Male	196507	168009	285280	176436
SC Female	171699	144703	247393	157122
Scheduled Tribes Population	478	230	508	1714
Male ST	258	124	259	892
Female ST	220	106	249	822

Parameter	**District**			
	Mainpuri	**Farrukhabad**	**Shahjahanpur**	**Pilibhit**
Occupational Pattern				
Total Workers	560840	592267	892214	618605
Main Workers	424782	474686	699503	463415
Marginal Workers	136058	117581	192711	155190
Agriculture labourers	137174	135679	275192	224192
Other Workers	127994	167971	240908	155155

Source: District Census Handbook, Census of India, 2011

4.4.2 Socio-economic Survey

Socio-economic survey was carried out during the study and same have been presented in SIA.

4.4.3 Government and Other Structures along the Project Road

Government structures along the project road are shown in **Figure 4.35.** Other structures along the project road are shown in **Figure 4.36.** Details of the same are presented in SIA.

Figure 4.35: Government Structures Along the Project Road

Table 4.36: Other Structures Affected Along the Project Road

	
Katra	Katra
	

Pilibhit	Pilibhit

4.4.4 Industry

The development of economy is possible only through industrial development. Industries located in the project districts are described below:

Mainpuri District: The district Mainpuri has sound agriculture base but the industrial potential is low. Lack of infrastructure, enterprise and insight among the people has been the major constraint in the industrial growth of the district. There are two medium scale industries. The main units are of Rice mill, Flour mill, Cardboard factory etc.

Farrukhabad District: To strengthen the economy of the place, state or country, industry play a vital role. The district is backward from industrial point of view. Except Bidi industry in Kamalganj area, no industry has been in operation. The district has name in printing but remained confined to itself only. Under the village and cottage industry, the many units were operational in the district.

Shahjahanpur District: The district being famous as sugar-cane producing area in the state, sugar refining is most important industry here. There are three sugar mills in the district namely Kisan Co-operative Sugar Mill, Powyan, The Kisan Chini Mill Ltd Tilhar and Rosa Sugar Works, Rosa. Crushing capacity of the sugar mills is 1,000 tons. The Keru and Company Rosa is one of the largest alcohol factory producing 500 gallons of alcohol per day. Oswal Chemical Factory is also working in private sector of the district.Other notable textile industry in the district is ordinance clothing factory.The cotton cloth made by the indigenous weavers in towns and villages was the ordinary coarse wind locally known as garha and gazi. In a few places cotton printing trade was also carried on woolen manufactures were confined only to coarse blankets and woolen bags used in the preparation of khandsari. The city was also noted for matting made of baib grass imported from the tarai of the Sharda river in the foot-hills of the Himalayas. The pottery made in the district was of the ordinary description and the only point to notice was the occasional use of vitreous glaze and the mixture of the river sand with the clay so as the enable to stand the heat of the kiln without cracking. The pottery was decorated by painting in various designs in the Tilhar and to a small extent at Shahjahanpur and other places. The manufacture of crude glass was carried on to a very small extent but a fair amount of the ordinary glass bangles were produced. Other factories working in the district are as follows:

1. Janki Solvent Extension Pvt. Ltd, Niwaspur
2. Shahjahanpur Paper and Board Pvt Ltd., Jamaur
3. Janki Floor Mill, Jamuhi
4. Vidya Ply Board Pvt. Ltd.,Sahjahanpur.
5. Janki Cattle Field Industrial Unit, Rosa
6. Janki Extension and Refinery, Solvent
7. Janki Extension and Refinery, Purification of oil
8. Filotac Fittings Pvt. Ltd, Niwaspur-fuel pipes
9. J.S.P. Vanaspati Ltd., Karaunda
10. J.S.P. Oil and Fats Pvt. Ltd, Karaunda–Solvent

11. J.S.P. Oil and Fats Pvt. Ltd., Karaunda

Pilibhit District: The district has a sound agriculture base, but its industrial potential is low. The unrefined sugar is one of the old time industries of the district. The system of manufacture is similar to that in vogue throughout Rohilkhand and unrefined sugar was sent out in the form of gur or rab. Another important industry is the manufacture of cloth, locally known as garha. In the past Pilibhit was a great centre of wood carving but this craft has disappeared now. Country carts and notably, the light two wheeled vehicles known as rahlus were also manufactured in Pilibhit and were marketed in the fair at Gola Gokarannath (in the kheri district). Some quantity of household furniture, bed-steads and the like were also manufactured and some cases these were painted and lacquered. Tarkashi work (inlaying with wire) was also done. Work in metal is also done at Pilibhit and brass vessels were exported to Nepal in large number. The pottery of the district is ordinary and the manufacture is confined to common household wares and utensils. There are four sugar mills located at Pilibhit, Majhola, Bisalpur and Puranpur, two solvent plants and one alcohol distillery working in the district. The manufacturing units of agricultural implements, engineering goods, rice, wooden furniture, sulphur sugar, gur, khandsari, flutes, brick-klins, wax candles, biscuits, washing soaps, oil, pulses, cement jali, ice and ice candy, vegetable and fruit preservation, leather articles and ayurvedic and unani medicines are the main small scale industries of the district.

4.4.5 Trade and Commerce

Mainpuri District: Most of the trade and traffic of the district in the past flowed along the Grand Trunk, which ran through the district. With the development of roads, the trade has increased in volume and a large number of trucks operate in the district, carrying goods to and from Kanpur, Agra, Delhi, Farrukhabad, Etawah, Etahand other towns. The agriculture commodities dominate the expert trade. Wheat, pulses, potatoes, oil seeds, ghee, rice and oil are the main commodities, which are exported. Fish is exported to Kolkata. Glassware, electric bulbs and leather goods are also exported. Cloth, general merchandise, chemicals, utensils, fertilizers, electric goods, paper, petrol, kerosene oil are imported. Shikohabad, Bewar, Kusmara, Sirsaganj and Ghiror are the main trade centers of the district.

Farrukhabad District: The trade of district mainly consisted of food grains, cotton, sugar, gur (Jaggery), ghee, oil, tobacco, potatoes and spices. But a certain amount of trade is also done in manufactured articles such as utensils of copper, readymade garments, footwear and saltpetre. The pattern of trade has undergone some changes but the broad features still show the domination of agricultural commodities, potato and textile prints in export trade and the import comprise mainly manufactured articles. There are organized whole sale markets (Mandis) at Farrukhabad, Kamalganj, Muhammadabad, Kaimganj, Fatehgarh and Shamsabad. Drug, medicine, cloth, agricultural implements, fertilizers, machinery, furniture, fruits, vegetable and general merchandise are sold in the urban centre of the district. The market at Farrukhabad and Fatchgarh also reflect the industrial growth of the district. Ghee, milk products, handloom cloth, foundry castings (weight and measures etc) and edible oils, which are produced in the district, are sold in the local markets. The common requirements of the villagers and those residing in the urban areas of the district are generally met by traders and pedlars operating in the local bazaars which in rural areas are known as 'hats'.

Shahjahanpur District: There are many commercial banks in the district. There are number of branches of nationalized banks, other banks ,Co-operative Bank ,village development banks. There are many establishments Punchyat distribution system. There are various private agencies which provide advances to different schemes There are marketing societies to check the malpractices in markets. Food grains, chemical fertilizer and other consumer goods are sold by this market to societies and cultivators. Here are milk collecting centres selling milk through sale depots located in the urban areas of the district. Gur and Khandsari trade is also done here. The railways mostly cater to the needs of the trade. Though a considerable volume of trade is done through roads. The agricultural commodities still form a sizeable bulk of export trade of the district and the chief imports comprise mainly manufactured articles and other consumer goods. There is a distillery at Roza. The common requirements of the villagers and the residents of the towns of the district are generally met by local bazars.

Pilibhit District: The district has many trade centres for distributing goods (whether imported or locally produced) spread over each tahsil where markets are held once or twice a week. Pilibhit is a secondary regulated and consuming market. This market is also of the combination type being an occasional as well as a regular mandi and is well connected with big mandis of some other states as well. This mandi deals mainly in the trade of rice wheat, flutes and gur. Puranpur is another regulated market which is of combination type also being an occasional as well as regular mandi. This mandi deals mainly in food grains, gur and rab. Bisalpur is another important regulated market and deals in gur, rice and other food-grains. The common requirements of the villagers and those residing in the urban areas of the district are generally met by traders and peddlers operating in the local bazaars which in the rural areas are known as hats.

4.4.6 Transport

Mainpuri District: The roads of the district can be classified as national highways, state highways, district roads, roads in the jurisdiction of the local bodies and other departments. The state public work department looks after the national highway, the state highways and the major district. District is situated in the branch railway line between Farrukhabad and Shikohabad. The total length of railway line in the district is 53 km. with 7 railway stations. Lack of communication through railways is detrimental in the economic progress of the district.

Farrukhabad District: Transport facility can broadly be classified into two categories- rail transport and road transport. Broad gauge railway line and meter gauge railway line is connects district with other parts. There are many railway stations including halts in the district. By road transport the services of buses of state road transport corporation and private operators trucks and taxis are main mode conveyance.

Shahjahanpur District: The district is connected by rail and road transport. By road transport the services of buses of state road transport corporation and private operator trucks and taxis are men mode conveyance. There are many regular bus stoppages in the district transport facilities access to anywhere in the district is available at the private bus stand. Total number of inhabited villages are 2088 of which 1238 villages are well connected by pucca roads which are 59.29per cent of the total villages. In order to transport goods within and outside the district there are many transport agencies as per the available sources. For the transportation of goods of remote places the agencies are involved. There are many bus stations/ bus stop.

Pilibhit District: Total number of inhabited villages are 1295 of which 638 villages are well connected by pucca roads which are 49.27 per cent of the total villages. In order to transport goods within and outside the district there are many transport agencies as per the available sources. For the transportation of goods of remote places the agencies are involved. There are many bus stations/ bus stop.

4.4.7 Mineral and Mining

Details of minerals and mining in the project districts are given below:

Mainpuri District: The district has no mineral of economic importance. The alluvium in the district consists of clay, sand, kankar and reh. Clay is found all over the district and is utilized in preparing bricks, toys, pottery, etc.

Farrukhabad District: Like other districts, it is not rich in minerals. Limestone conglomerate known as kankar is found all over Brick earth is found in many places and resources are sufficient to meet the local demand. Sand is found along the banks of the Ganga and Ram Ganga rivers.

Shahjahanpur District: The mineral products are few and unimportant most valuable is the nodular limestone conglomerate known as kankar, which is used mainly as road material and is also extensively employed for concrete and lime burning. Quarries are also found in the near vicinity of all the metalled roads and there are three recognized varieties, the bichna, the Chatari and the dark type called talia used only for lime burning. Clay suitable for brick making is found all over the district.

Pilibhit District: Like the other districts, it does not have minerals of much economic importance. Sand occurs in substantial quantities. Brick clay occurs commonly and is utilized locally for the manufacture of bricks.

4.4.8 Agriculture and Cropping Pattern

Mainpuri District: Most people are related to agriculture which suggests that economy of the district is agriculture based. Since the canals were opened for irrigation, a marked change in the technique and pattern of cultivations has been noticeable in the district. Agriculture department is educating the farmers in the use of new implements, better seeds and improved cultural practices. The agriculture year is divided into three generally recognized seasons of harvests which here also go by the usual names of Kharif, Rabi and Zaid. The last named is of very little importance and consists of melons, Kakri, Khira, vegetables, Spices, Tobacco and a number of low grade cereals. The main Kharif cereals in the district in order of the area they cover crops like paddy, maize and bajra. Among the Kharif pulses, urad, moong and moth are the main crops though they occupy very small areas. In Rabi season, the lead is taken by wheat which is the most valuable of all the food grains. It is sown alone as well as mixed with barley, gram, pea or mustard. The area under pure wheat cultivation has no doubt increased in recent years, but the old practice of sowing it mixed with other crops has not altogether disappeared.

Farrukhabad District: As is usual in the doab, the agriculture year yields three harvests: the Kharif, Rabi and Zaid. The last is of little significance in point of area and mainly consists of cucurbits, vegetables, spices, tobacco legumes and low-grade cereals. Melons, Kakri and Cucumbers are mostly grown in the Khadar and along the sandy banks of the rivers. The principal crops of Kharif are Maize, Rice,Bajra, Jawar, Urd, Moong and Moth, whereas the crops covered in Rabi are Wheat, Gram, Barley, Pea, Arhar and Masur. For improvement of quality and quantity of agricultural produce the district had the services of many seed store/fertilizer depots, rural godowns, insecticide depots, seed farms, cold storages and agriculture service centres. For storage of crops cultivators could avail the facility of warehouse of F.C.I., some owned by state government and some owned by Co-operative departments. In the rural areas of the district, the vegetables are better cultivated. State agriculture department is extending their services to improve agriculture in the district. Besides making arrangements for the supply of improved seeds, scientific implements, fertilizers, manures and extending improved agricultural practices, the agriculture department also gives technical advice and guidance to the cultivators on agricultural problems.

Shahjahanpur District: The Kharif crops are sown in June-July and reaped in September-October after the cessation of the rains, usually well before the preparations of the fields for Rabi sowing which begins in October-November and are harvested in March-May. The main crops of Rabi are wheat, gram barley, peamasoor. The main crops of Kharif are maize bajra, rice and jowar Sugar cane, oil seeds (like ground nut and mustard), vegetables and fruits are the notable non-food crops in the district Cotton and tobacco were the flourishing cash crops in the district in early year.

Pilibhit District: The kharif or rainfed crops are sown in June and July and harvested in September and October, while rabi or irrigated crops are sown in October – November and harvested in February March. The main kharif crops of the district are rice, maize, bajra and those of rabi wheat, barley, gram, arhar, pea and masoor. The zaid crops consist of moong, sun hemp and vegetables. The main non-food crops of the district are sugarcane, jute sunhemp and oil seeds of different types. Sugarcane is an important crop of the district.

4.4.9 Animal Husbandry

Details of animal husbandry in the project districts are given below:

Mainpuri District: The animals in the district are of ordinary type, yet there is ample scope of the development of animal husbandry in the district. Sheep and goats are generally reared by the Gadariyas for their flesh and skin, wool obtained from the sheep is used for making coarse blankets locally Considerable progress has been made in improving the breed of the cattle. Artificial insemination service for breeding cows and buffaloes is going on in the district. For promotion of milk production the district has Milk production federation under which there were sufficient milk cooperative societies.

Farrukhabad District: In order to increase livestock ,district administration has implemented programmes, of healthcare and improvement in breeds etc. To improve the health and progeny of animals, the district had the services of many Veterinary dispensaries, many animal development centres, and artificial insemination centre. There are running for prevention and treatment of various animal diseases and development of livestock .Besides these some pig development center pigri units are also working in the district. After the establishment of milk Co-operatives emphasis is being given on increasing of milk production in the district. There are many milk Co-operative societies in the district

Shahjahanpur District: Animal husbandry is an integral part of rural economy providing drought power and manures to small and marginal farmers as well as milk products, meat, eggs etc. to protein starved people of the district. There are sheep, Indian and crossbreed, there are cows,goats, buffaloes,horses and ponies, desi, crossbreed and other animals. There are many poultry farms in the district. For providing medical facilities to the animals, there are many veterinary hospitals, animal development centres, artificial insemination centre, sheep development centre and piggery development centres are functioning in the district. These are running for prevention and treatment of various animal diseases and development of livestock.

Pilibhit District: There are sheep, Indian and crossbreed, there are cows, goats, buffaloes, horses and ponies, desi, crossbreed and other animals. There are many poultry farms in the district. For providing medical facilities to the animals, there are many veterinary hospitals, animal development centres, artificial insemination centre, sheep development centre and piggery development centres are functioning in the district. These are running for prevention and treatment of various animal diseases and development of livestock.

4.4.10 Fishery

The rivers, canals and ponds of the project districts contain a plentiful of fish. There are more than 45 species of fish known in the districts, the chief being ‘Rohu’ (*Labeo rohita*), Bhakur (*Catla*), Rita (*Rita*), Bata (*Labeo bata*), Mahsher (*Barbustor*) and Karouch (*Labeo calbasu*). To make progress in fishery centre of Fishery Development Authority has been established in the districts. The authority provides loans and grants to piscicultures. Fish finds a ready sale in the local markets and are used as food by good number people. These are available in lakes and tanks of the districts. For the upliftment of poor people specially fishermen, many tanks have been given for fisheries on lease. There are many people engaged in fishery in these districts.

4.4.11 Archaeological Monuments

No archaeological / historical monuments are present along the project road.

CHAPTER 5 ANTICIPATED ENVIRONMENTAL IMPACTS

5.1. Environmental Impacts & Issues

This section presents identification and evaluate of anticipated impacts on the various relevant physical, biological and cultural environmental components along the project corridor during pre-construction, construction and operation phases of the two lane upgradation with paved shoulders of Bewar - Pilibhit Section (Km 0.000 to Km 183.380) of NH 730 C (Package I, II, III) and 731 K (Package IV). The planning of the proposed project intervention points towards the impacts in the pre-construction, the construction stages and the operation stages. The subsequent sections deal with the prediction of impacts due to the project on the physical, biological and socio & cultural environment **Tables 5.1** and **5.2** below presents the general environmental impacts expected due to the proposed up-gradation of the project road. Environmental impacts have been assessed based on the information collected from the project activities as per DPR, screening & scoping of environmental attributes, and baseline data collected during the EIA study. The quantum of anticipated impacts on physical, biological and socio-economic environment has been discussed in details in subsequent paragraphs.

5.2 Impacts on Topography, Physiography and Geology

Construction Phase

The two lane upgradation with paved shoulders of Bewar - Pilibhit Section (Km 0.000 to Km 183.380) of NH 730 C (Package I, II, III) and 731 K (Package IV) is traversing mostly through plain territory. Therefore, cutting and filling activity will be involved in existing alignment of the project road.

The proposed up-gradation of the project road will be confined along the existing alignment. The design has not suggested any substantial change in the height of the embankments of the existing alignment. The overall topography of the area is not going to alter due to minor changes in geometry & profile and two realignments construction.

Table 5.1 : Anticipated Impacts on Physical & Biological Environment

Project Activity	Planning and Design Phase	Pre-construction Phase		Construction Phase					Road Operation
Environmental component Affected		**Removal of Old Structures**	**Removal of trees and vegetation**	**Earth works including and borrow area**	**Laying of pavement**	**Vehicle & Equipment operation & maintenance**	**Asphalt & crusher plants**	**Sanitation & Waste (labour campus)**	**Vehicle operation**
Air		Dust generation during dismantling	Reduced buffering of air pollution, Hotter, drier microclimate along the road	Dust generation	Asphalt odour and emissions	Dust, Pollution	Soot, Odour, gaseous Dust, Pollution	Odour / Smoke from Cooking of food	dust, véhiculer emissions
Land	Impact on productive land if land acquisition required	Generation of debris	Erosion and loss of top soil	Erosion and loss of top soil	Land contamination due to improper disposal of bitumen waste/ solid wastes	Contamination by fuel and lubricants and compaction	Contamination and compaction of soil at camp& Plants	Contamination from Wastes and sewage	--
Water	Impact on Water Sources	Siltation due to loose earth	Siltation due to loose earth	Alteration of drainage, Break in continuity of ditches Siltation, Stagnant water pools in quarries and borrow area.	Reduction of ground water recharge area	Contamination by fuel and lubricants	Contamination by asphalt leakage or fuel	Contamination from wastes and untreated sewage disposal	Spill Contamination by fuel, lubricants and washing of vehicles

Project Activity	**Planning and De-sign Phase**	**Pre-construction Phase**		**Construction Phase**					**Road Operation**
Noise		Noise Pol-lution	High Noise due to machinery	Noise Pollution	Noise pollution	Noise pollution	Noise Pollu-tion	--	Noise from traffic movement
Flora	Tree cutting		Loss of Biomass and vegetation cover due to Removal of vegetation	Lowered pro-ductivity loss of ground for vegetation	--		Lower pro-ductivity Use as fuel wood	Felling trees for fuel	Compensatory plantation and road side plantation

Table 5.2: Anticipated Impact on Social and Cultural Environment

Project Activity	Planning and Design Phase	Pre Construction Phase			Construction Phase					Operation	
										Direct	Indirect Induced development
Env. Component Affected	**Design decisions & Implementation policies**	**Land acquisition**	**Removal of Structures**	**Removal of trees & vegetation**	**Earth works including quarrying**	**Laying of Pavement**	**Vehicle & machine operation & maintenance**	**Asphalt and crusher plants**	**Labour Camps**	**Vehicle operation**	**-**
Agricultural land	-	Change in land prices	Change in land economic value	Loss of standing crops	Loss of productive land	-	-	Dust on agricultural land reduce n productivity	-	-	Conversion of Agricultural Land
Buildings and built structures in ROW	-	-	Loss of structures, Debris generation, Noise and Air pollution	-	Dust Deposition on structures	-	Noise, vibration may cause damage to structures near to road	Dust accumulation on building and structure	-	Vibration and noise	Change in building use and characteristics
People and Community	mpact on nea by community structure,	-	Impact on people and loss of livelihood	Loss of shade & community tree.	Health hazard to people	Odour and dust	Noise and Air pollution and discomfort	Air and noise pollution and discomfort	Community clashes with migrant labour	Risk of accident due to increase in speed on smooth carriageway	Induced pollution and increase in accident rate
Cultural Assets	-	Impact on access to cultural structure	Displacement loss of structure from RoW	--.	--	-	--	Dust accumulation	-	Damage from vibration & air pollution	-

Project Activity	**Planning and Design Phase**	**Pre Construction Phase**			**Construction Phase**					**Operation**	
										Direct	**Indirect Induced development**
Utilities and Amenities	-	-	Interruption in supply	-	-	-	Damage to utility and amenities	Dust accu-mulation on water bodies	Pressure on exist-ing amenitie s		-
Labour's Health & Safety	-	-	-	-	Stagnation of water and disease	Asphalt odour and dust	Accident and injuries to labour/public	Impact on health due to inhale of dust	Health hazard from raw sewage disposal /wastes	Road safety issues	-

During construction of the project, following environmental impacts are anticipated on topography and physiography:

- minor changes are anticipated in existing profile of the land due to borrow pits and construction of re-alignments and improvement of sharp curb.
- disturbance on geological setting due to quarrying.
- uncontrolled digging of borrow pits resulting in water accumulation & breeding of vector disease.
- construction of embankments for realignments,
- debris disposal,
- construction of diversions roads for construction of bridge and culverts.

Physiographic impacts could be due to the construction of the embankments and improvement of sharp curbs. The height and width of the embankment will be altered, when the road is widened and rehabilitated as per the new design for the project road.

In most of the stretch along the project road, project will stick to the existing ROW without any noticeable changes.

Borrow earth will be required in the project road for filling and will be obtained from several borrow areas to be opened in the nearby areas or from the existing approved borrowing areas. Except the construction of embankments, there would not be any other impacts to geomorphology of the area during construction stage.

Most of the excavated materials from existing road will be left reused as construction materials. If not used, contractor may dispose of this in the nearby areas causing untidiness near disposal areas. Therefore, this is seen as a potential impact. It may increase soil erosion and could generate considerable impacts on natural drainage courses, and siltation to runoff during rains.

Likely impact on the geological resources will occur from the extraction of construction materials like borrow of earth, granular sub-base and aggregates for base courses, culverts and bridges.

Operational Phase

Upgradation and widening of the project road will not cause any topographic, physiographic and geological changes during operational stage.

5.3 Impact on Seismological Characteristics

The project road is located in seismic zone III and zone IV as per BIS classification with low seismic risk. All cross-drainage structures and bridges on the project roads need to consider the seismic coefficients with regards to the seismic energy propagation along the fragile geological/lithological strata.

The construction and operation phase of the project road are not expected to add the seismicity issues due to the project road.

5.4 Impact on Soil

Construction Phase

Soil Erosion: Erosion of top-soil can be considered a moderate, direct and long-term negative impact resulting from the construction of existing road. The potential for soil erosion is pervasive during the construction stage, especially in realignment and earth work on the existing alignment. Starting with clearing and grubbing, vegetation will be stripped away, exposing raw soil. Earth works and embankment will also prone to erosion during rains.

Road Slopes and Spoils: Erosion problems may occur on newly constructed slopes and earth fills in realignments depending on soil type, angle of slope, height of slope and climatic factors like wind (direction, speed and frequency) and rain (intensity and duration). Soil erosion will add siltation to the runoff during the monsoon season.

Construction of New Bridges and Culverts: Along the project road reconstruction/widening of bridges and culverts is planned. Major bridge, minor bridge and culverts are proposed to be constructed in the project road. Construction of bridges involves excavation of natural water channels bed and banks for the construction of the foundation and piers. If the residual spoil is not properly disposed of, increased sedimentation in downstream of the bridge may take place during the monsoon. Also, the bridge-end fills require armouring to ensure minimum gullying and slumping.

During the construction period, some amount of drainage alteration and downstream erosion/siltation is anticipated. Some of these alterations may be because of construction of temporary traffic detours/diversion. Except for these temporary works, in almost all cases there should be an improvement in the drainage characteristics of the surrounding area due to improved design and added culvert/ditch capacity. Changes in the drainage pattern due to the raising of the road profile has not been discussed in specific cases, as the likely impact will not adverse and does not warrant mitigation as the road design itself takes care of cross drainage.

Quarries and Borrow Areas:

Package wise details of quantities of borrow earth filling for the project road are given below **Table 5.3:**

Table 5.3: Package Wise Details of Quantities of Borrow Earth Filling

S.No	Package	Unit	Quantities of filling earth for the project road
1	Package 1	Cubic Metre	316885
2	Package 2	Cubic Metre	421561
3	Package 3	Cubic Metre	470861
4	Package-4	Cubic Metre	313389
	Total		**1522696**

The excavation of quarries and borrow pits used for obtaining aggregate materials and soil for road construction can cause direct, and indirect long-term major adverse impacts on the environment. While loss of productive soil is the most direct negative impact from borrow areas, other significant indirect negative impacts can also occur. Since most of the construction materials would be available from existing quarries nearby, relatively few new borrow areas may be required. One of the long-term residual adverse impacts of borrow pits not reclaimed, is the spread of mosquitos. Mosquitoes breeding and multiplying in stagnant water that collects in these pits can affect human health in villages in close vicinity.

Borrow areas will be identified by the contractor and finalized for procurement of borrow earth in consultation with Authority Engineer. The contractor will take borrow areas on lease from owners and rehabilitated after borrowing of required quantity of earth.

Generation of Debris: The major source of debris generation is dismantling of existing cross drainage structures, scarifying of bitumen from carriageway and removal of existing road for upgradation.

Chainage wise Details of Scarifying BT Layer

Scarifying of bitumen shall be generated only in three packages as per detail below:

- From Ch. 0 to 52+770= 52.770 - 2.840 (Realigned Length) = 49.93 Km.
- From Ch. 52+770 to 114+000= 61.23 - 0.550 (Realigned Length) = 60.68 Km.
- From 137+250 to 183+380=46.13 - 0.270 (Realigned Length) = 45.86 Km.

Scarifying of bitumen may contaminate soil, if not disposed in environmentally sound manner.

Contamination of Soil: In this project, contamination of the soil may take place, from the following activities at the construction zones, construction labor camps, construction plant sites and other auxiliary facilities required for the construction. Details of the activities from which the contamination can occur are presented below:

- Scarified bitumen wastes,
- Debris generation due to dismantling of structures,
- Runoff from muck disposal area,
- Maintenance of the machinery and operation of the diesel generator sets on site,
- Oil spill from the operation of the construction machineries, maintenance and diesel storage and diesel generator sets,
- Spillage bitumen from operation of hot mix plant,
- Wastes from the residential facilities for the labour and officers at camp site, and
- Storage and stock yards of bitumen

Operation Phase

No significant impact is anticipated on soil along the road during operational phase.

5.5. Water Environment

5.5.1 Water Resource - Impacts

A. Surface Water -Impacts

The project road is crossing many natural streams, which remain dry in non-rainy days. There are perennial rivers crossed by the project road. No potential impact is anticipated on surface water bodies during the pre-construction phase.

Construction Phase

The water demands for the construction work may pose stress on the public water supply if the water for construction and allied activities are taken from the public source as the project area. 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 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 indicates 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 50787 kl 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 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 will obtain all necessary statutory permits for usage of water before start of abstraction of water. Depending on the source of water there could be minor depletion of water sources due to the construction water requirements.

Operation Phase

During operation phase, no impact is anticipated on surface water resources.

B. Ground Water - Impacts

Construction Phase

Along the project road, ground water resources are available and ground water will be exploited through mostly from tube wells, where surface water sources are not available. Therefore, the eventual impact of the proposed upgradation of the project road will be negated to a considerable extent.

Operation Phase

During the operation phase, ground water resource will not be affected significantly. Therefore, no significant impact is anticipated during operation phase. However, rainwater harvesting will be provided along the project road in unpopulated areas.

5.5.2 Water Quality - Impacts

A. Impact on Surface Water Quality

Degradation of surface water quality due to sediment transport with runoff through erosion of soil and earth may occur from activities like removal of trees, clearing and grubbing, removal of grass cover, excavation, stock piling of materials as part of the pre-construction and construction activities. The soil type present along the project corridor consists of the loamy/silty soil, which are prone to erosion. The impacts due to increased sediment laden run-off will make the water more turbid. This is a significant negative impact on the water bodies/flowing streams. Heavier sediment may smother the algae growing in the lower strata and could completely alter the nature of the watercourse. Excessive sediment loads may also mean disruption to areas of fish breeding/aquatic life.

Contamination of Surface Water - The degradation of the surface to a much less extent ground water quality can occur from pavement construction works, bridges construction works, construction plants, machinery and accommodations of workers. The sources of water pollution from the construction activities are as follows:

- Water flow from scarified bitumen materials,
- Rain-water flow from muck disposal area,
- From the foundation works of the bridges and culverts such as piling and excavation for open/well foundations,
- Oil spills from the maintenance of the machinery and operation of the diesel generator sets on site,
- Oil spill from diesel storage and parking places,
- Operation of the emulsion sprayer and laying of hot mix,
- Discharge of sewage and waste from labour and plants,
- Storage and stock yards of bitumen and emulsion.

Degradation of water quality is also possible due to accidental discharges into water-courses from drainage of workers camps and from spillages from vehicle parking and/or fuel and lubricant storage areas.

Operation Phase

During normal operation phase, no impact is anticipated on the surface water quality.

B. Impact on Groundwater Quality

No impact is anticipated on ground water during pre-construction phase.

Construction Phase

- During construction phase, ground water quality can be affected due to following reason:
- Spillage of diesel, lube oil and used oil could lead to ground water pollution in long term and can affect ground water quality.
- Leached water from scarified bituminous waste materials entering into ground.
- Disposal of solid wastes, used POL wastes, oil contained cotton wastes in non-environmentally sound manner and leaching to ground water.

Operational Stage

During the normal operation phase, no impact is anticipated on the ground water quality of the area.

C. Floods Related Impacts

Pre construction phase impacts

The natural drainage channels are crossed by the project road. Pre-construction activities such as tree removal and clearing and grubbing will not lead to any flood related impacts.

Construction Phase

During construction phase, the project activities are unlikely to create localized flood related issues. Nevertheless, various construction activities could temporarily worsen the flooding problem due to improper drainage conditions on account of the contractor's poor engineering practices and negligence. If the high intensity rainfall continues for many days a number of sections along the project road could develop flooding situation.

Operation Phase

During operation phase, flood related impacts would not be appeared as culverts and cross drainage structures will be reconstructed/ constructed and widened to maintain proper drainage. Therefore, no flood related impact is anticipated during operation phase.

5.6 Impact on Air Environment

Construction Phase

During construction phase, there will be two main sources of air emissions *i.e.* mobile sources and fixed sources. Mobile sources are mostly vehicles involve in construction activities while emissions from fixed sources include diesel generator set, construction equipment and excavation/grading activities those produce dust and gaseous emissions.

Certain amount of dust and gaseous emissions will be generated during the construction phase from excavation machines and road construction machines. Pollutants of primary concern include Particulate Matter ($PM_{2.5}$) and Particulate Matter (PM_{10}). However, suspended dust particles may be coarse and will be settled within a short distance from construction area. Therefore, anticipated impact on ambient air quality will be temporary and restricted within the closed vicinity of the construction activities along the project road only.

Considerable amount of emissions of carbon monoxide (CO), unburned hydrocarbon, sulfur di-oxide, particulate matters, nitrogen di-oxide (NO_2), etc, will be generated from the hot mix plant and may cause air pollution problem in nearby areas.

Summarily, generation of dust is likely due to:

- Site clearance and use of construction vehicles and machinery, etc.
- Transport of raw materials, borrow and quarry materials to construction sites,
- Earthworks,
- Stone crushing operations at the crushers,
- Handling and storage of aggregates at the asphalt plants,
- Concrete batching plants, and
- Asphalt mixing plants due to mixing of aggregates with bitumen.

Generation of dust is a critical issue and is likely to have adverse impact on health of workers and vegetation in surrounding areas. Generation of exhaust gases is likely due to movement of heavy machinery for clearance of the RoW for construction. High concentration of HC and NOx are likely from hot mix plant operations. Toxic gases are released through the heating process during bitumen production. Although the impact will be much localized, it can be dispersed downwind depending on the wind speeds.

Air Pollution Modelling for Construction Phase

During the construction phase, the activities related to earthwork, borrow area operations, transport of material, storage and handling of construction materials, quarrying and/or stone crushing operations, movement of construction vehicles on unpaved roads, hot-mix plant, handling of cement in batching plants and other others would contribute to the increased dust levels in terms of PM_{10}, PM 2.5, and other air pollutants like SO_2, and NO_2, and carbon monoxide levels.

Considerable amount of emissions of carbon monoxide (CO), unburned hydrocarbon, sulfur di-oxide, particulate matters, nitrogen di-oxide (NO2), etc, will be generated from the hot mix plant & DG sets and may cause air pollution problem in nearby areas.

The American Meteorological Society/Environmental Protection Agency Regulatory Model Improvement Committee (AERMIC) was formed to introduce state-of-the-art modeling concepts into the EPA's air quality models. Through AERMIC, a modeling system, AERMOD, was introduced that incorporated air dispersion based on planetary boundary layer turbulence structure and scaling concepts, including treatment of both surface and elevated sources, and both simple and complex terrain.

AMS/EPA Regulatory Model (**AERMOD**) is a steady-state plume model. It is designed to apply to source releases and meteorological conditions that can be assumed to be steady over individual modeling periods (typically one hour or less). AERMOD has been designed to handle the computation of pollutant impacts in both flat and complex terrain within the same modeling framework. In fact, with the AERMOD structure, there is no need for the specification of terrain type (flat, simple, or complex) relative to stack height since receptors at all elevations are handled with the same general methodology. To define the form of the

AERMOD concentration equations, it is necessary to simultaneously discuss the handling of terrain.

AERMET is an input data processor that is one of the regulatory components of the AERMOD modeling system. It incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts.

Quantitative assessment for predicted level of pollutants concentration has been done using ISC-AERMOD, a recommended model by USEPA for prediction of air quality from point, area and line sources. It is based on Gaussian dispersion which incorporates the Pasquile-Gifford (P-G) dispersion parameters for estimating horizontal cross wind and vertical dispersion.

After drawing the road alignment and putting the information related to carriageway width, vertical dimension, source elevation, base elevation and release height, the model converts the road alignment to the number of volume sources. The model then simulates the effect of emissions from continuous/variable volume sources on neighbourhood air quality and identified uniform carticien grid receptors. The model is an hour-by-hour steady state Gaussian model which takes into account special features like Terrain adjustments, Gradual plume rise, Buoyancy-induced dispersion, Complex terrain treatment, etc. The total road alignment has been taken into consideration for the prediction of vehicular exhaust emission.

Major criteria pollutants generated due to vehicular exhaust is CO and hence is taken into consideration in this study.

Details	Emission factor (g/km)
	CO
Year 2020	3.56
Year 2045	4.61

Predicted Incremental Concentrations

Details	Parameter(mg/m^3)	Parameter(mg/m^3)
	2020	2045
	CO	CO
Maximum Concentrations (Pilibhit)	0.800	1.1

Carbon Monoxide (CO) predictions for the year 2020

The predicted 1st high 8 Hour values of CO are varying from place to place in Bewar – Pilibhit project road stretch. The maximum concentration of CO predicted is 800 µg/m^3 (0.800 mg/m^3). When compared with the National Ambient Air Quality Standard (NAAQS) of 4 mg/m^3 (4000 µg/m^3) for 8 hour, predicted values are well below the prescribed standard limit near the project corridor.

Carbon Monoxide (CO) predictions for the year 2045

The predicted 1st high 8 Hour values of CO are varying from place to place in Bewar – Pilibhit project road stretch. The maximum concentration of CO predicted is 1100 µg/m^3 (1.1 mg/m^3). When compared with the National Ambient Air Quality Standard (NAAQS) of 4 mg/m^3 (4000 µg/m^3) for 8 hour, predicted values are well below the prescribed standard limit near the project corridor.

In the existing scenario, due to lesser width and higher roughness, the average vehicle speed is low, which results in more exhaust gas emissions. In the post- project scenario, improved road conditions and congestion free traffic movement will reduce emissions.

Furthermore, lower growth of traffic and better road conditions with improved average speed, which constitutes about 95% of the total project road length, will not have any significant increase in concentration of CO even after 25 years of operation, subject to regular maintenance of the road condition and maintaining the average speed of traffic. However, in Bewar –Pilibhit road project, the emissions will increase significantly due to increase in traffic density.

The Isopleths of CO concentration along the project stretch are given below in **Figures 5.1 to 5.4.**

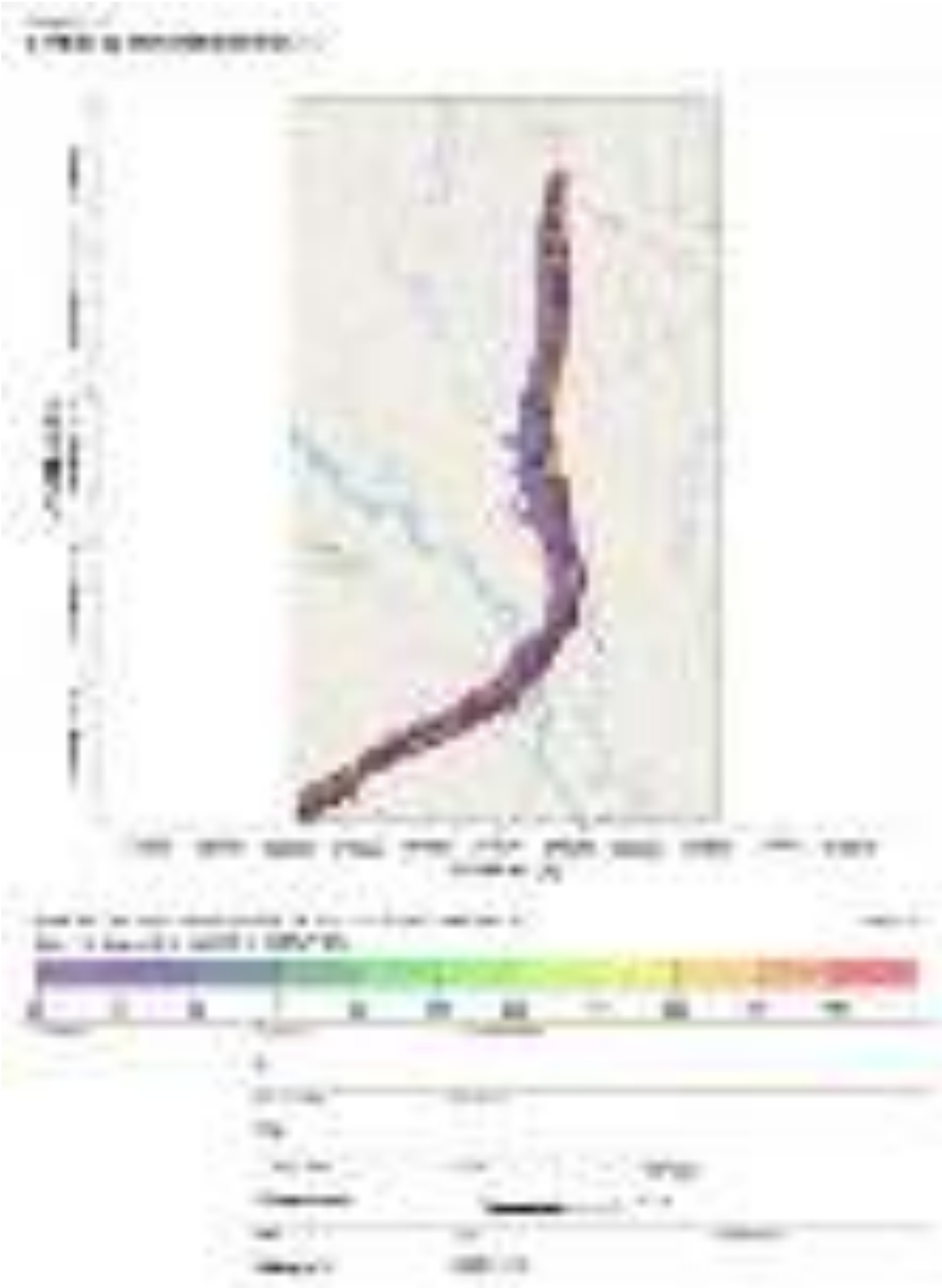


Figure 5.1: Isopleth of Incremental GLC of Carbon Monoxide (CO) from Bewar - Pilibhit Road Project for the year 2020

Figure 5.2: Isopleth of Incremental GLC of Carbon Monoxide (CO) from Bewar - Pilibhit Road Project for the year 2020 (Google Earth)

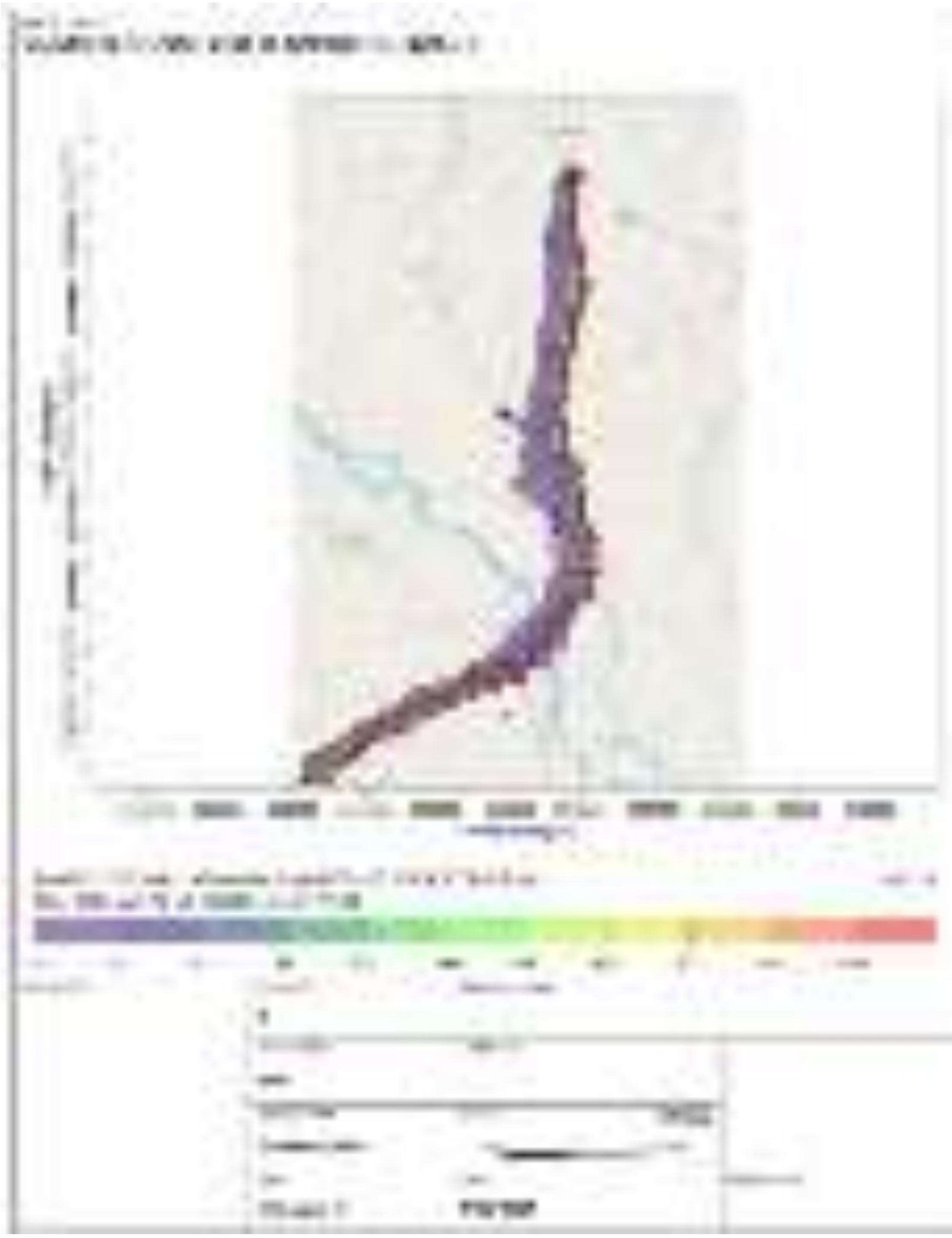


Figure 5.3: Isopleth of Incremental GLC of Carbon Monoxide (CO) from Project Road for the year 2045

Figure 5.4: Isopleth of Incremental GLC of Carbon Monoxide (CO) from Project Road for the year 2045 (Google Earth)

GHG Calculations and Carbon Foot Print for the Construction of the Project

GHG calculations and carbon foot print for the construction phase of the project road have been carried out and presented in the **Table 5.4**

Table 5.4: GHG Calculations and Carbon Foot Print for Construction Phase

Component	Value	Unit	Project Value	Total GHG in kg/Co2
At Materials Manufacturing Stage				
Aggregates	0.003	kg/CO_2/m^3	1058153	2963
Bitumen	0.43	kg/CO_2/m^3	18841000	8101630
Cement	0.82	kg/ CO_2/m^3	5345000	4382900
Steel	4.67	kg/ CO_2/m^3	32000	149440
At Materials Manufacturing Stage				12636933
At Transportation Stage				
Truck Transport (14 T capacity)	1.1	kg/ CO_2/(Veh*km)	800	880
At Construction Stage				
Clearance for road Construction	6.56	kg/ CO_2/Ha	160	1050

Operational Phase

During operational phase, the congestion will be relieved to an optimum level on the project road. Widening and improvement along the project road could result in improved surface condition and traffic capacity. During the operation phase, vehicular emission will be emitted from vehicular movement on the roads.

5.7 Impact on Noise Environment

Construction Phase

Highway traffic noise is a complex phenomenon because its intensity and characteristics vary with time depending upon the frequency as well as type of vehicles on the road. The impacts of noise due to the project roads will be of temporary significance locally in the construction phase. **Table 5.5** below present the source of noise pollution and the impact categorization.

Table 5.5: Source of Noise Pollution and Impact Categorization

Sn.	Phase	Source of Noise pollution	Impact categorization
1.	Pre-construction	• Man, material & machinery movements • establishment of labor camps, onsite offices, stock yards and construction plants	• all activities will last for a short duration and also shall be localized in nature
2.	Construction Phase	• **Plant Site** - stone crushing, asphalt production plant and batching plants, diesel generators etc • **Work zones** - Community residing near to the work zones	• **Plant Site:** Impact will be significant within 250m. • **Work zones**: Such impacts again will be of temporary nature as the construction site will go on changing with the progress of the works.

Construction - Related Noise

With regards to noise related impacts, construction phase is a difficult stage. During this period noise impacts will be high due to operation of construction machineries and the conflict with the regular traffic requiring more honking of vehicle horns and more stop and go (acceleration and deceleration process).

All temporary noise related impacts in the immediate vicinity of the project roads will occur during the construction activities. This will be occurred along the construction zones as well as construction camps, hot mix plants, WMM plants, crusher and quarry sites (if required).

- Increase in noise level due to construction activities like operation of construction equipment & vehicular traffic.

- Operation of construction machinery will lead to rise in noise level to the range between 80-95 dB(A). The magnitude of impact from noise will depend upon types of equipment to be used, construction methods and also on work scheduling. Typical noise level of various activities associated with highway projects is presented below in **Table 5.6.**

Table 5.6:Typical Noise Level of Various Activities Associated With Highway Projects

Sl. No.	Construction Activity	Noise Level dB(A)
1.	Grading & Clearing	84
2.	Excavation	89
3.	Foundations	88
4.	Erection	79
5.	Finishing	84

Note: Measured at Leq assuming 70 dB(A) ambient noise level

Noise levels will be based on the types of construction work anticipated and the likely equipment required for construction.

The construction noise is generally intermittent and depends on the type of operations, location and function of the equipment and the equipment usage cycle, it attenuates quickly with increases in distance. The noise level generated from a source will decrease with distance as per the following empirical formula (inverse square law).

$SPL2 = SPL1 - 20Log_{10}(r_2/r_1)$

where, SPL1 and SPL2 are the sound pressure levels at distance r_1 and r_2 respectively.

Considering the stationary construction equipment as a point source generating 90 dB(A) at a reference distance of 2 m, computed minimum distance required from the stationery source to meet the permissible noise limits during day time for different land use categories are given in **Table 5.7**.

Table 5.7: Minimum Distance Required from Stationary Noise Source

Category	Permissible Limits in Day Time (CPCB)	Distance Required (m)
Silence zone	50 dB(A)	200
Residential	55 dB(A)	113

Commercial	65 dB(A)	36
Industrial	75 dB(A)	11

From the above table it may be noted that residence within 113 m from the road will be exposed to a noise higher than the permissible limit. The impacts will be significant on construction workers, working close to the machinery.

Project Road Noise Modeling

Dhwani-pro noise model has been developed to undertake construction, industrial and traffic noise propagation studies for noise assessment. This model is used to predict the impact of noise on receptors from the noise generation source. It is also used to predict impact due to group noise sources in the industrial complex (multiple sound sources) and traffic.

A noise propagation modeling study has been conducted to find out the impact from the noise generated because of the estimated total traffic flow as well as the significance of these impacts. The noise modeling has been done taking into account the design speed at various stretches and the stretches with restricted speeds have also been considered.

Noise modeling for the project road was conducted for Bewar to Allahganj section based on the traffic predictions for the year 2020 and 2045. The average noise level predicted for 2020 and 2045 are 48 dB(A) and 53 dB(A) respectively at a distance of 45m from the center line at Bewar location. The maximum noise level predicted is 79 dB(A) at 15m distance from the center line in the year 2020 and will be 83 dB(A) also within 15m from the center line in the year 2045. The predicted average noise levels are below the stipulated limits for residential / commercial areas at the selected road project stretch.

The contour map showing noise levels due to traffic at the project stretch has been shown in for year 2020 and 2045 **Figure 5.5** and **Figure 5.6**, respectively**.**

Operational Noise

During operation phase, noise levels will be reduced due to smooth flow of traffic on reconstructed/upgraded road. However, traffic will be increased on the road in due course of time and subsequently noise levels are expected to increase.

Figure 5.5: Contour Map Showing Noise Levels Due to Traffic at the Project Stretch in 2020

Figure 5.6: Contour Map Showing Noise Levels Due to Traffic at the Project Stretch in 2045

5.8 Impact on Biological Environment

5.8.1 Anticipated Impacts

Forest Area

The proposed up-gradation of the project road involves 192.777 ha protected forest area, therefore diversion of 192.777 ha protected forest land will be required. Package wise details of forest land diversion for the Project Road are given in **Table 5.8**.

Table 5.8: Forest Land Diversion Required for the Project Road

Package	Project Length (km)	Forest Division	Forest Area (ha)
NH-730C Package-1	52.770	Social Forestry Division Mainpuri	5.55
		Social Forestry Division Farrukhabad	68.588
		Total Area	74.138
NH-730C Package-2	61.230	Social Forestry Division Shahjahanpur	74.263
NH-730C Package-3	23.250	Social Forestry Division Shahjahanpur	Forest area diversion not required for the package as land acquisition does not involve any notified forest
NH-731K Package-4	10.350	Social Forestry Division Pilibhit	Forest area diversion not required for the package as land acquisition does not involve any notified forest
	35.780	Social Forestry Division Pilibhit	44.376

The major impact in this project on flora involves the removal of trees to permit construction and to provide clear zone for safety of the road users. **Table 5.9** below presents the major adverse impacts on the flora & fauna and the indicators chosen to assess the impacts for this study.

Table 5.9: Impacts Due To Construction and Indicators

Impacts Due To Construction	Indicators
Diversion of Forest Land	192.777 Protected Forest Land
Tree felling	32437
Vegetation	Vegetation Loss with PROW

Wildlife

There is no wildlife sanctuary, national park or bioreserve along the project roads. Therefore, no impact is anticipated on wildlife due to up-gradation of the project road.

Tree Cutting

Existing road side vegetation and trees were recorded during the field survey. Crops fields and open land are observed on both sides of the project road. Indigenous of trees are likely to be cut down due to the upgradation. Depending on the final design for upgradation/widening of the project road, the tree cutting and resultant pressure on flora and fauna (mainly avifauna) could be the potential impact during preconstruction/ construction. Along the project road, approximately 75391 trees are growing within the ROW/PROW. Necessary efforts have been made for minimisation of tree cutting during finalisation of widening scheme and design of the alignment of the project road. Approximately 42955 have been saved by optimisation of widening scheme. Package wise details of trees along the project road, trees saved and trees cutting required for the project road are given in **Table 5.10.**

Table 5.10: Package Wise Details of Trees Along the Project Road, Trees Saved and Trees Cutting Required

Package	Length in km	District	Trees Within RoW	Common Tree species	Trees to be felled	Trees saved
I (Bewar to Allahganj)	52.77	Mainpuri	927	Bakain,Chitvan,Kanji, Neem,Papi & Sheesham	610	317
		Farrukhabad	12511	Babool,Jamun,Kadam,Kaisiya,Kanji,Neem,Papdi,Peepal,Shehtoot & Sheesham	8086	4425
II (Allahganj to Miranpur Katra)	61.23	Shahjahanpur	20451	Chandni,Chitwan,Chukrasia,Sheesham,Gulmohar,Jamun,Kachnar,Kanji, Neem	7226	13226
III (Miranpur Katra to Radhaita)	23.25	Shahjahanpur	5031	Aam,Arjun,Babool,Chandni,Eucalyptus,Gulhad,Jamun,Kanji,Neem,Pakad,Shehtoot,Sheesham	4527	504
IV (Radhaita to Pilibhit)	46.13	Pilibhit	36471	Arjun,Eucalyptus,Jamun, Kadam,Sheesham,Kaisiya & Gulhad	11988	24483
Total			**75391**		**32437**	**42955**

Source: Joint Tree Survey with Forest Officials Nov-2020

Approximately 32437 trees are likely to felled for upgradation of the project. Trees growing within the proposed toe line (bottom of formation) will need to be removed for upgradation of the project road. Roadside trees with strong and rigid stems can pose safety hazards. Some trees obstruct clear sight distances. Others have a propensity to overturn when old and are potential safety hazards depending upon age and decay condition. All such trees that are safety hazards need to be cleared.

There will be a significant, direct impact due to cutting of the roadside trees, it includes:

- The loss of shade.
- Loss of tree products.
- Loss of birds nesting place.
- Removal of roadside trees will also reduce comfort levels for slow moving traffic and pedestrians.
- The removal of trees would lead to erosion and contributes to the loss of the micro-ecosystems developed on the roadside.
- Besides these trees act as noise barrier, dust absorption, pollutant sequester, etc.

Removal of Vegetation

Clearing and grubbing is the foremost requirement to start the construction activities of the project roads. The impact due to removal of vegetation includes:

- Dust generation during windy atmosphere.
- Loss of productive top soil.
- Soil erosion during rainy season, may lead to water contamination.

Measures have been taken in reducing and curtailing the clearing and grubbing of excess land.

Impact of Dust on the Vegetation Growth

During the construction activities, dust will be emitted and deposited on the leaves of vegetation/crops along the project roads. Dust deposition on the leaves will affect the photosynthesis process and subsequently hamper the growth of the plants.

5.9 Impact on Socio-Economic Environment

Construction and operation phases of the project road will have some beneficial impact on social environment. Some increase in income of local people is expected as some local unskilled, semiskilled and skilled persons will gain direct or indirect employment during construction phase. Since the immigration of work force during construction phase is likely to be very small, the social impacts on literacy, health care, transport facilities and cultural aspect are expected to be insignificant.

The impacts of the construction of the project road on the socio-economic environment are systematically discussed under the following categories:

- Influx of construction workers,
- Economic impacts,
- Relocation of community structures within the proposed ROW.

Influx of Construction Workers

Although the construction contractors are likely to use un-skilled labour drawn from local communities, use of specialized road construction equipment will require trained personnel not likely to be found locally. Sudden and relatively short-lived influxes of construction workers to communities along the project will have the potential to 'skew' certain demographic variables and the traditional social coherence.

It is anticipated that the construction labour inputs for the construction of the project road will be in the order of about 100 to 150 persons per day. However, this number will fluctuate and the number in any particular activities will be lower.

Economic Impacts

The relatively short-lived economic impacts of the construction phase are likely to be experienced in local communities for the duration of construction, as workers will make everyday purchases from local traders. This is likely to give a short-lived stimulus to these traders that will disappear as soon as the construction is complete. Wider, flow-on economic impacts will be experienced in other sectors of economy as a result of purchase of construction materials and the payment of wages and salaries.

Impact on Religious Structures and Cultural Properties

Few religious structures are located along the project road. Some of these religious structures may be partially or fully affected during up-gradation of the project road. Shifting of religious structures is sensitive issue, therefore, local community and followers of religious structures should be taken in to confident.

Common Property Resources

Along the project road, few community structures are located, which are used by local communities. The partial or total impact on these common property resources is anticipated due to up-gradation of the project road. These should be properly relocated and rehabilitee before start the construction or proper access to such common properties should be provided.

Adverse socio-economic impacts include all disruptions on the social and economic interactions of communities due to the road project. This involves effect on both the adjacent communities (mostly direct) as well as the nearby communities (mostly indirect).

5.10 Impacts Relating To Human Health & Safety

Poor sanitation arrangement and improper methods used for collection and disposal of solid wastes and effluent, accommodation without ventilation, unhygienic food, electrical safety, risk from mosquito and reptile etc at the construction workers camp will impact human health and safety.

5.11 Road Safety Aspects

Increase of incidence of accidents is anticipated due to disruptions of traffics movements on the in construction work zones on the project road.

5.12 Safety and Health Related Issues

Safety and health related issues for the project road are given below:

- Occupational health and safety risks to workers due to inadequate housekeeping and unsafe work practices at work sites.
- Health problems to workers due to inadequate sanitation and un-healthy environment at labour camps/plant sites.

5.12.1Key Impacts Health and Safety Impacts on Workers and Community

Health and Safety Issues Related to Workers

- Unsafe acts and practises in work zone affecting safety of workers.
- Working on the road without traffic management plan and road safety signages.
- Health impacts due to exposure to dust emissions and high noise levels.
- Working on the road and plants/crushers without personal protective equipment.

- Health and safety issues while working with hot bitumen.
- Health issues due to poor ventilation in accommodation and sanitation at labour camps.
- Improper manual handling and lifting of construction materials and equipment.
- Allowing workers in construction works without proper training.
- Safety and health issues during excavation and earth cuttings.
- Electrical hazards on the works and plant sites.
- Fire in flammable materials like diesel, bitumen, wielding gases, etc.

Issues Related to Community Health and Safety

- Dust emissions and high noise levels from road works and plants/crushers during construction phase.
- Odour due to release of raw sewage from camps without treatment.
- Obstructing access to houses during road and drains construction.
- Accidents due to poor work zone safety and lack of safety signages on the road.
- Accidents/injuries due to improper work zone safety.
- Water logging in front of houses due to rise in embankment.
- Health issue dues to stagnation of water in roadside drains.

CHAPTER 6: ANALYSIS OF ALTERNATIVES

The mandate of the current project is to widen the existing road to 2 lanes with provision of paved shoulder in the build-up sections and hence there is no alternative site is involved. However, the chapter discusses about the "With" and "Without" project scenarios. The methodology that has been adopted for the evaluation of the alternates route for construction of project road and the selection is based on engineering, economic, environmental and social considerations. The minimization of environmental impacts by considering design alternatives determines the extent of mainstreaming of the environmental component. This chapter looks at the decisions made during the project when alternatives were available and describes the rationale behind each decision.

6.1 Project Improvement

The improvement/up-gradation proposals of the existing road to two lane paved shoulder include the provisions geometric improvements, realignments, widening proposals and reconstruction, pavement, road junctions, bridges and cross-drainages, special problems and road appurtenances. The adopted cross sectional elements as per the design standards and salient features of the project are presented below **Table 6.1.**

Table 6.1: Project Improvement

S.N.	Particulars	Existing	Proposal
1	Project Stretch	Km 0.000 to Km 183.650	Km 0.000 to Km 183.380
2	Project Length	183.650 km	183.380 km
3	Carriageway	3.50 to 7.0 m	7.0 m + paved shoulders+ earthen shoulders
4	ROW (m)	20 to 35 m	As shown in typical cross sections
5	Realignment	Nil	Nil
6	Junctions	10 major and 243 minor	All are improved as per IRC SP:41
7	Major Bridges	3 (Two in Pkg.1 and One in Pkg. 2)	3 Retained
8	Minor Bridges	12	6 Reconstruction, 6 Retained with minor repairs
9	Culverts	261	Reconstruction – 261 New Construction – 118
10	Pontoon Bridge	Nil	1 in Pkg. 3
11	Toll Plaza	Nil	3
12	Bypass	Nil	Nil
13	ROB	1 in Pkg. 1	1 No. Retained
14	Way side amenities		Bus bays: 92 Nos. Truck lay byes: 3Nos.

6.2 With and Without Project Alternatives

6.2.1 Without Project Scenario

The road is passing through many settlements and the traffic flow is impacted by narrow carriageway. The existing unsafe conditions and the adverse environmental consequences in terms of the environmental quality along the road would continue to worsen in the absence of the proposed improvements. Moreover, if it is decided not to proceed with the project, then it will result into continuation of unsafe road conditions, more travel time and more fuel consumption, reduced socio-economic development of this area and region. Therefore, the no-action or do minimum alternative is neither a reasonable nor a prudent course of action for the proposed project, as it would amount to failure to initiate any further road improvements and impede economic development of the area.

6.2.2 With Project Scenario

The 'with project' scenario is found to have a positive impact in the long run on social, environmental, economic and financial matters. This scenario includes the widening and improvement to two/four lanes of the existing single intermediate lane stretch as envisaged in the project objectives. The scenario would thereby, contribute to enhance the growth potential of the region.

In spite of the various development benefits likely to accrue due to the project, as is the case of every road development project, the project would be accompanied by certain impacts on the natural, social and environmental components. The potential impacts on the various environmental components can be avoided through implementation of best environmental practices. Wherever negotiation of negative impact has not been possible, appropriate mitigation and enhancement measures will be taken for effective offset of the environmental damages inflicted due to the project. Comparative assessments of the "with and without" project scenarios are presented in the **Table 6.2.**

Table 6.2:Comparative Analysis of With and Without Project Scenario

Component	"With" Project Scenario	'Without" Project Scenario
Highway Geometrics	Two lane configuration carriageway with paved and earthen shoulders and geometric improvements	Existing 5.5m to 6m carriageway with 0.9 m to 1.5 m earthen shoulder
Design Speed	80 - 100 kmph in plain topography	Average speed is 40 - 50 kmph
Congestion in Settlements	Free flow of traffic due to widened carriageway	Congestion in urban areas
Felling of road side trees	Felling of both old and young trees. Old and weak trees near the road edge shall be a safety hazard and need to be tree plantation will be carried out as	No felling of trees. The old trees may become a safety hazard to the road users with passage of time.

Component	"With" Project Scenario	'Without" Project Scenario
	per condition imposed by the forest department.	
Pedestrian safety	Along the settlement, road with significant pedestrian footpath has been provided in urban sections.	Pedestrian safety an issue of major concern especially along the settlements and congested sections.
Road Safety Measures	Provision of proper road markings, footpath, median and improvement of geometry to reduce accidents.	Incidents of accident shall rise with an increased traffic volume and poor quality of road.
Environmental Quality	Road design improvements through-out the stretch will improve environmental quality within the urban areas due to lowered pollution levels compared to blockage scenario and relieving of congestion.	Environmental quality will be poor due to congestion and high emission levels because of slow movement of traffic. A further deterioration is expected due to increase in traffic volumes and further congestion in due course of time.
Drainage	Drainage will be improved due to reconstruction of culverts with adequate hydraulics.	These issues remain unaddressed without the project.
Sanitation	Sanitation will be improved due to provision of lined and unlined drain along the throughout the stretch	Domestic waste water handling and safe disposal is a major issues in project area
Environmental Enhancement	Environmental enhancement for , community and cultural properties	No environmental enhancement measures involved.
Social Development	Higher potential for social development due to improvement in access and consequent increase in connectivity	Social development activities will be greatly hampered by the gross inadequacy of infrastructure.
Road Side Amenities	Appropriate roadside amenities will be provided as per IRC Guidelines at various locations along the project road.	Continue to remain inadequate and unsafe road conditions.
Better Transportation Facilities	Reduction in travel time and fuel consumption for easy and fast movement. Better access to famous tourist spots and business centers.	Increased vehicle operating costs and high fuel consumption due to reduced speeds.
Enhancement of water bodies	Enhancement of water bodies, community and cultural properties	No enhancement proposal for without project scenario.

Component	"With" Project Scenario	'Without" Project Scenario
Trade and Tourist Development	Higher potential for development due to improvement in access and consequently increase in trade and tourist movement	Development activities will be severely hampered by the gross inadequacies
Economic Development	There will be increased access to markets/educational/health facilities. Local people will be employed during construction of the project road	The economy will remain static.
Financial and Economic Analysis	The project is financially viable and the cost of operation and maintenance, Vehicle Operating Cost (VOC) and other ancillary cost are moderate	The cost of maintenance while catering to the projected higher traffic, accident cost, vehicle operating cost & travel
Access to basic facilities such as Markets, schools, Hospitals etc.	Easy access to basic facilities due to fine road	Difficulty in accessing the basic facilities due to heavy traffic and congestion under settlement areas.

Therefore, “With” project scenario, with its minor adverse impacts is more acceptable than the “Without” project scenario which would mean an aggravation of the existing problems. The potential benefits of the proposed road improvements are substantial and far-reaching both in terms of the geographical spread and time. Hence, it is clear that the implementation of the project will be a definite advantage to State of Uttar Pradesh in order to achieve all-round development of its economy and progress of its people.

The project will have multiple benefits. The project will release the potential of the area and fast connectivity between Uttar Pradesh, Uttarakhand and Nepal.

This project will also reduce the travel time substantially. In addition, this project road will provide further other benefits like:

- Fast and safe connectivity resulting in saving in fuel, travel time and Total Transportation cost to the society;
- Employment opportunities to local people during road construction;
- Development of local industries and agriculture;
- Development of tourism and pilgrimage;
- Transporting, processing and marketing of agricultural products;
- Reduction in accidents;
- Reduction in pollution;
- Opening of opportunities for new occupations;
- Better approach to medical & educational services and quick transportation of perishable goods like fruits, vegetables and dairy products; and
- Improved quality of life for people and so on

However, there would be an increase in the vehicular pollution-air and noise, in the vicinity of the highway. This road construction will result in loss of private properties and loss of living.

If the project is not implemented, there is likelihood that the roads presently carrying the traffic between Bewar and Pilibhit will deteriorate further and rampant traffic disruptions will hinder the free flow of the traffic. Increased air pollution, due to slow moving traffic and congestion, will follow suit. Noise levels in built up portions will rise due to deterioration of the pavement as well as increased honking.

6.3 Safety Aspects

While assessing the impacts, safety of the road users and the roadside communities has been found to be a major concern. A number of measures have been proposed to reduce the risk of traffic accidents. In some places, these safety measures are co-terminus with the project's impact minimization measures. Horizontal profile correction and intersection improvement has been suggested for betterment of the project corridor. Other safety measures taken are:

- Improvement of existing sharp curves,
- Improvement of existing Curve at bridge approaches.
- Provision of adequate traffic signage,
- Widening of bridge with footpath in built-up location,
- Embankment protection in approaches to bridge,
- Foot path and pedestrian guard rails in built up zone,
- Improvement of existing highway junction
- Retro-reflective painting on roadside plantations.

6.4 Analysis of Alternatives Alignment

After having examined the feasibility of the road-improvement in the existing alignment, it is concluded that some of the project segment (mainly thickly built-up stretches) may have technical, social and environmental constrains during construction because these critical stretches are experiencing congestion, encroachment of RoW and poor geometry. Therefore, it is pertinent to develop alternative alignment to these critical stretches. These alternatives have been analyzed keeping in view social, environmental and technical parameters and thus the best alternative has been finalized.

Criteria for Fixing Realignment

Obligatory sensitive reasons through which realignment options should not pass, are detailed in sections below.

Habitations: Proposed alignment has been fixed in such a way that it traverses at a minimum distance of 200-300m from built up areas and avoiding important buildings and structures.

Wildlife Sanctuaries, National Parks, Reserve Forest and other Eco Sensitive zones: No ecologically protected area (Wildlife Sanctuaries, National Parks, etc.) are located within 10 Km distance from the project road.

Water Bodies: The alignment has been fixed taking due consideration & importance of retaining the existing water bodies, ponds, tanks etc. as far as feasible. Important.

Structures: The components which increases the project cost are the presence of the major bridges and other structures. In order, to reduce the project cost, number of structures and their respective lengths were given due consideration while finalising the option.

Alignment should follow the existing alignment /unused / barren land to the extent possible to reduce the cost of land acquisition and carbon foot print.

Justification for Selection Present Alignment

The project mostly involves concentric widening of the existing alignment to fully utilise the available RoW. The project road shall be flexible pavement throughout the stretch. Geometric improvements at various locations have been suggested along the project corridor, where the poor geometrics warrant a deviation from the existing alignment. Care though has been taken to minimise the impact on sensitive, cultural and community features like water bodies, schools, hospitals etc.

6.5 Alternate Routes

Alternate routes for the project road are as given below:

i) Etawah-Mainpuri-Badaun-Bareilly-Pilibhit (275.00 km)
ii) Etawah-Guhasganj-Farukhabad- Shahjahanpur-Pilibhit (287.00 Km)
iii) Etawah-Kannauj-Hardoi-Shahjahanpur-Pilibhit (316.00 km)
iv) Project Road:
   a. Etawah-Bewar (57.00 km)
   b. Bewar-Farrukhabad-Miranpur-Katra-Bisalpur-Pilibhit (183.380 km) – Current project road

Total length (57+183.380 km) = 240.38km

In these alternatives, road length is exceeding 57 km from the project alignment (which 183.380 km). Therefore, other alignments are not viable.

6.5.1 Project Alignment Description

The project road starts from T-Junction with NH- 34 near bus stand at Bewar (Distt. – Mainpuri) and passes through Madanpur, Mohammdabad, Farrukhabad, Jalalabad, Miranpur Katra, Khudaganj, Bisalpur and ends at Pilibhit (Junction with NH 730). The design length of the project road is 183.380 km.

The project road is divided into four packages for construction purpose as given in **Table 6.3**:

Table 6.3: Proposed Project Packages

Package-No	From Chainage	To Chainage	Length Km)	District
Package-I	Km 0+000	Km 52+770	52+770	Mainpuri&Farukhabad
Package-II	Km 52+770	Km 114+000	61+230	Shahjahanpur
Package-III	Km 114+000	Km 137+250	23+250	Shahjahanpur
Package-IV	Km 137+250	Km 183+380	46+130	Pilibhit

The project road alignment is shown in **Figure 6.1**:

Figure 6.1:Proposed Alignment of the Project Road

Figure 6.2 : Alternate Routes for the Proposed Project Road

Environment Considerations

The various avoidance measures for minimising the extent of environmental impacts and avoiding the sensitive environmental features have been worked out. **Table 6.4** provides the measures that have been adopted for offsetting the environmental impacts.

Table 6.4: Environment Impact Minimization Options

Criteria	**Means**
Maintenance of design speed for through traffic	Improved geometrics
Improvement of road safety	Intersection Improvements; Geometric improvements at curves
Adequate drainage	Provision of side drain and improvement in the cross drainage structures
Reduction of air and noise pollution	Intersection improvements; speed optimization near sensitive receptors
Minimization of direct impact on sensitive receptors, cultural and religious properties	Public consultations, mitigation measures

Criteria	Means
Minimization of property acquisition	Utilization of existing RoW to the maximum extent possible, Concentric widening in habitats areas
Displacement of commercial properties	Utilization of existing RoW to the maximum extent possible, concentric widening in habitats areas
Minimizationof tree loss	Maximum effort shall be given to avoid tree felling and plantation will be carried out along the corridor
Stabilization of slope	Turfing / Stone Pitching in slope/high embankment

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 92 nos. of bus bays & shelters and 3 nos. of truck lay byes, facilities for pedestrian movement, traffic sign boards 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.

6.5.2 Alternatives for Minimization of Use of Water in Construction Activities

Alternatives considered for minimization of use of water in construction activities are given below:

- Low heat emission cement (Portland Pozzolana Cement) shall be used for construction of roads and structures;
- Plastic Sheeting and Membrane-Forming Curing Compounds shall be sprayed directly over the concrete surface and allowing it to dry. The compound forms an impermeable membrane that retards the loss of moisture from the concrete. Hence, saving the water requirement for curing activity.

6.5.3 Alternatives for construction Materials to Minimize Use of Aggregate, Bitumen, Borrow Earths

Alternatives considered for construction materials to minimize use of aggregate, bitumen, borrow earths are given below:

- Recycle of existing pavement by cold milling of existing bituminous layers;
- The new pavement in the reconstruction and realignment sections have been designed considering minimum aggregate requirements in pavement layers by using Cement Treated Sub Base (CTSB);
- Low heat emission cement (Portland Pozzolana Cement) shall be used for construction of roads and structures;
- Use of plastic waste has been proposed in wearing coat as per IRC-SP-98-2013;
- Use of fly ash at high embankment locations as per the Special Publication 58 of the Indian Roads Congress, IRC:SP:58-2001.

6.5.4 Alternatives for Protection of Slopes

Alternatives considered for protection of slopes have been considered for high embankment road sections like bridges approaches and described below:

- The provision of slope protection on high embankment have been made to conform to IRC-SP-56:2011 by providing plantation of vetiver grass on slopes, turfing of grass and provision of chute drains.
- Toe walls have been proposed at high embankment locations.

6.5.5 Alternatives for Saving Existing Community Structures

For the widening and upgrading of the existing project corridor, there is need for displacement of many community structures. As per the Bank's operational Directives the displacement should be avoided or minimized. While the land acquisition on the account of widening the road and new alignment is unavoidable, the area with the high population density could be marginalized and displacement could be minimized.

While preparing the engineering design, the prime consideration has been to minimize the social negative impacts within the limitations of technical requirements and cost effectiveness and to enhance the benefits. Despite the best efforts to minimize the negative social impact, however, land take at few places and resettlement have been unavoidable.

The existing ROW except at certain locations is wide enough to accommodate proposed developments; therefore there is no need to acquire land for improvement of existing roads. Minimum impact corridor is considered in order to minimize displacement in the project road within the ROW. Provision has been made in the RAP to address the issues related to non-title holders affected persons.

Realignments have been proposed at various locations to avoid displacement of people as above table provided in chapter 2 along the road, at maximum locations squatters are present on project ROW, who will be compensated as per World Bank policy and RFCT LARR ACT 2013.

It has been cautioned that school and colleges located along the road are minimum impacted. The religious structure which are located within the project ROW and are impacted due to project will be reconstructed or compensated as per public opinion and mutual consent.

6.5.6 Alternatives Considered for Green Initiatives

Alternatives considered for green initiatives for the project road under the green highway have been considered for conventional approach v/s green highway approach.

The comparison statement for conventional approach v/s green highway approach for the Bewar - Pilibhit Section (Km 0.000 to Km 183.380) is presented in **Table 6.5.** Package wise comparison statement for conventional approach v/s green highway approach for the project road are presented in **Table 6.6** to **Table 6.14.**

Table 6.5: Comparison Statement - Conventional Approach v/s Green Highway Approach Km 0.000 to Km 183.380 – (Bewar Pilibhit Road)

Sr.no.	Description		Quantity by Conventional Approach
1	Embankment	Use of Excavated Material	356133
		Use of Soil Borrow Area	1128239
		Use of Flyash	-
2	Subgrade (500 mm thick)		600878
3	GSB (200/250 mm thick)		342838
4	WMM (200/250 mm thick)		357783
5	Recycled Asphalt Pavement		-

Sr.no.	Description		Quantity by Green Highway Approach	Savings	Remarks
1	Embankment	Use of Excavated Material	356133	934 cum of soil due to use of fly ash	
		Use of Soil Borrow Area	1127305		
		Use of Flyash	934		
2	Subgrade (500 mm thick)		600878	NIL	
3	GSB (200/250 mm thick)		275822	30274 cum of GSB and WMM due to use of CTSB	GSB-200 mm in total stretch
4	CTSB (200 mm thick)		66816		Use of CTSB-200 mm From Km 0+000 to Km 12+000, & Km 114+000 to Km 136+740 only
5	WMM (150/250 mm thick)		327709		WMM-250 mm in total stretch except (Km 12+000 to 40+000 i.e 200 mm) & (Km 0+000 to 12+000 and 114+000 to 136+740 i.e 150 mm)
6	Recycled Asphalt Pavement: DBM (50/90/95 mm thick)		105312	13363 cum of DBM due to use of CTSB and RAP	RAP DBM in PKG I & II (DBM 50 mm From Km 0+000 to Km 12+000),

Sr.no.	Description	Quantity by Conventional Approach	Sr.no.	Description	Quantity by Green Highway Approach	Savings	Remarks
							(DBM 90 mm From Km 12+000 to 40+000), (DBM 95 mm From Km 40+000 to 114+000)
6	DBM (90/95 mm Thick)	149481	7	DBM (50/90 mm Thick)	30806		(DBM-50 mm from Km 114+000 to 136+740), (DBM-90 mm From Km 136+740 to 183+380)
7	BC (30 mm thick)	63508	8	BC (30 mm thick)	60291	-	-
				BC with plastic waste (30 mm thick)	3217	-	
8	Structure Concrete	-	9	Structure Concrete			

Sl. No.	Material	Quantity required as per conventional approach	Quantity required as per Green Highway approach	Savings	Average Lead in km (PKG I/ II/III/IV)
1	Borrow Soil (cum)	1128239	1128239	0	10/10/10/10
2	Flyash (cum)	-	934	(-)934	-/-/50/-
3	Aggregates (cum)	1205215	1058153	147062	240/181/180/160
4	Bitumen (ton)	22203	18841	3362	208/270/290/250 Km (Mathura Refinery)
5	Cement (ton)	-	5345	(-)5345	30/-/50/-
6	Sand (cum)	-	-	-	-
7	Water (KL)	49184	50787	(-)1603	-
8	Plastic waste (ton)	-	38	(-)38	30/-/-/30

Table 6.6: Comparison Statement - Conventional Approach v/s Green Highway Approach
Package – 1 – km 0.000 to km 52.770 – (Bewar Pilibhit Road)

Sr. No.	Description		Quantity by Conventional Approach	Rate/Cum	Amount
1	Embankment	Use of Excavated Material	154006	**150**	23100900
		Use of Soil Borrow Area	162879	**262**	42674298
		Use of Flyash	-		
2	Subgrade (500 mm thick)		200872	**303**	60864216
3	GSB (200/250 mm thick)		102089	**3154**	321988706
4	WMM (200/250 mm thick)		133254	**3497**	465989238
5	Recycled Asphalt Pavement				
6	DBM (90 mm Thick)		50988	**8496**	433194048

Sr.no.	Description		Quantity by Green Highway Approach	Rate/cum	Amount	Savings
1	Embankment	Use of Excavated Material	154006	150	23100900	NIL
		Use of Soil Borrow Area	162879	262	42674298	
		Use of Flyash	-			
2	Subgrade (500 mm thick)		200872	303	60864216	
3	GSB (200 mm thick)		78239	3154	246765806	
4	CTSB (200 mm thick)		23850	3986	95066100	11925 cum of GSB and WMM due to use of CTSB
5	WMM (150 mm thick)		121329	3497	424287513	
6	Recycled Asphalt Pavement: DBM (50/90/95 mm thick)		46218	8019	370622142	4770 cum of DBM due to
7	DBM (50 mm Thick)					

										use of CTSB
7	BC (30 mm thick)	18023	**9327**	1681005 21		8	BC (30 mm thick)	16221	9327	1512932 67	
							BC with plastic waste(30 mm thick)	1802	9023	1625944 6	
8	Structure Concrete	-				9	Structure Concrete	-			

Sl. No.	Material	Quantity required as per conventional approach	Quantity required as per Green Highway approach	savings	Average Lead in km
1	Borrow Soil (cum)	162879	162879	0	10
2	Flyash (cum)	0	0	0	-
3	Aggregates (cum)	395275	363251	32024	240
4	Bitumen (ton)	7123	5671	1452	208 Km (Mathura Refinery)
5	Cement (ton)	-	1908	(-)1908	30
6	Sand (cum)	-	-	-	-
7	Water (KL)	16782	17259	(-)477	2
8	Plastic waste (ton)	-	21	(-)21	30
	Total Civil cost (Crores)	**250.65**	**242.16**	**8.49**	-

Table 6.7: Comparison Statement - Conventional Approach v/s Green Highway Approach
Package– 1 – Km 0.000 to Km 12.000 – Reconstruction portion (Bewar Pilibhit Road) (Composite Pavement)

Sr.no.	Description		Quantity by Conventional Approach
1	Embankment	Use of Excavated Material	
		Use of Soil Borrow Area	
		Use ofFlyash	-
2	Subgrade (500 mm thick)		
3	GSB (200 mm thick)		38927
4	WMM (250 mm thick)		34710
5	Recycled Asphalt Pavement		-
6	DBM (90 mm Thick)		10732
7	BC (30 mm thick)		3577
8	Structure Concrete		-

Sr.no.	Description		Quantity by Green Highway Approach	Savings
1	Embankment	Use of Excavated Material		
		Use of Soil Borrow Area		
		Use ofFlyash	-	
2	Subgrade (500 mm thick)			
3	GSB (200 mm thick)		15077	11925cum of GSB and WMM due to use of CTSB
4	CTSB (200 mm thick)		23850	
5	WMM (150 mm thick)		22785	
6	Recycled Asphalt Pavement: DBM (50 mm thick)		5962	4770 cum of DBM due to use of CTSB
7	DBM (50 mm Thick)			
8	BC (30 mm thick)		1775	-
	BC with plastic waste (30 mm thick)		1802	
9	Structure Concrete		-	-

Sl. No.	Material	Quantity required as per conventional approach	Quantity required as per Green Highway approach	savings	Average Lead in km
1	Borrow Soil (cum)				
2	Flyash (cum)	0	0	-	-
3	Aggregates (cum)	106706	90980	15726	240
4	Bitumen (ton)	1474	883	591	208 Km (Mathura Refinery)

5	Cement (cum)	0	1908	(-)1908	30
6	Sand (cum)	-	-	-	-
7	Water (KL)	5111	5588	(-)477	-
8	Plastic waste (ton)	0	21	(-)21	30

Table 6.8: Comparison Statement - Conventional Approach v/s Green Highway Approach
Package– 1 - Km 12.000 to Km 40.000–Widening and Strengthening Section (Pavement)

Sr.no.	Description		Quantity by Conventional Approach
1	Embankment	Use of Excavated Material	
		Use of Soil Borrow Area	
		Use ofFlyash	
2	Subgrade (500 mm thick)		
3	GSB (250 mm thick)		43434
4	WMM (200 mm thick)		80062
5	Recycled Asphalt Pavement		
6	DBM (90 mm Thick)		28543
7	BC (30 mm thick)		9514
8	Structure Concrete		-

Sr.no.	Description		Quantity by Green Highway Approach	Savings
1	Embankment	Use of Excavated Material		
		Use of Soil Borrow Area		
		Use ofFlyash		
2	Subgrade (500 mm thick)			
3	GSB (250 mm thick)		43434	-
4	WMM (200 mm thick)		80062	-
5	Recycled Asphalt Pavement: DBM (90 mm Thick)		28543	-
6	DBM (90 mm Thick)			-
7	BC (30 mm thick)		9514	-
8	Structure Concrete		-	-

Sl. No.	Material	Quantity required as per conventional approach	Quantity required as per Green Highway approach	savings	Average Lead in km
1	Borrow Soil (cum)				
2	Flyash (cum)				-
3	Aggregates (cum)	215287	203730	11557	240
4	Bitumen (ton)	3920	3318	602	208 km (Mathura Refinery)

5	Cement (cum)	-	-		-
6	Sand (cum)	-	-	-	-
7	Water (KL)	9010	9010	-	5
8	Plastic waste (tons)	0	0	0	0

Table 6.8: Comparison Statement - Conventional Approach v/s Green Highway Approach
Package– 1 - Km 40.000 to Km 52.770 – Widening and Strengthening Section (Pavement)

Sr.no.	Description		Quantity by Conventional Approach
1	Embankment	Use of Excavated Material	
		Use of Soil Borrow Area	
		Use of Flyash	
2	Subgrade (500 mm thick)		
3	GSB (200 mm thick)		19728
4	WMM (250 mm thick)		18482
5	Recycled Asphalt Pavement		
6	DBM (95 mm Thick)		11713
7	BC (30 mm thick)		4932
8	Structure Concrete		-

Sr.no.	Description		Quantity by Green Highway Approach	Savings
1	Embankment	Use of Excavated Material		
		Use of Soil Borrow Area		
		Use ofFlyash		
2	Subgrade (500 mm thick)			
3	GSB (200 mm thick)		19728	-
4	WMM (250 mm thick)		18482	-
5	Recycled Asphalt Pavement: DBM (95 mm Thick)		11713	-
6	DBM (95 mm Thick)		-	-
7	BC (30 mm thick)		4932	-
8	Structure Concrete		-	

Sl. No.	Material	Quantity required as per conventional approach	Quantity required as per Green Highway approach	savings	Average Lead in km
1	Borrow Soil (cum)				
2	Flyash (cum)	-	-	-	-
3	Aggregates (cum)	73282	68541	-	240
4	Bitumen (ton)	1729	1470	-	208 km (Mathura Refinery)

5	Cement (cum)				-
6	Sand (cum)			-	-
7	Water (KL)	2661	2661	-	5
8	Plastic waste (tons)		0	0	15

Table 6.9: Comparison Statement - Conventional Approach v/s Green Highway Approach
Package – 2 - km 52.770 to km 114.000 – Widening and Strengthening Section (Pavement)

Sr. no.	Description		Quantity by Conventional Approach	Rate/ cum	Amount
1	Embankment	Use of Excavated Material	150402	**160**	24064320
		Use of Soil Borrow Area	232835	**272**	63331120
		Use of Flyash	-		
2	Subgrade (500 mm thick)		118412	**303**	35878836
3	GSB (200 mm thick)		105536	**3071**	324101056
4	WMM (250 mm thick)		115184	**3412**	393007808
5	Recycled Asphalt Pavement				
6	DBM (95 mm Thick)		59094	**8424**	497807856
7	BC (30 mm thick)		24882	**9258**	230357556
8	Structure Concrete		-		

Sr. no.	Description		Quantity by Green Highway Approach	Rate/ cum	Amount	Savings
1	Embankment	Use of Excavated Material	150402	**160**	24064320	-
		Use of Soil Borrow Area	232835	**272**	63331120	
		Use of Flyash	-			
2	Subgrade (500 mm thick)		118412	**303**	35878836	
3	GSB (200 mm thick)		105336	**3071**	323486856	
4	WMM (250 mm thick)		115184	**3412**	393007808	
5	Recycled Asphalt Pavement: DBM (95 mm thick)		59094	**7970**	470979180	
6	DBM (95 mm Thick)					
7	BC (30 mm thick)		24882	**9258**	230357556	
8	Structure Concrete		-			-

Sl. No.	Material	Quantity required as per conventional approach	Quantity required as per Green Highway approach	savings	Average Lead in km
1	Borrow Soil (cum)	232835	232835	0	-
2	Flyash (cum)	-	-	0	-
3	Aggregates (cum)	406385	382456	23929	181
4	Bitumen (ton)	8728	7715	1013	270
5	Cement (cum)	-	-	0	-
6	Sand (cum)	-	-	0	-
7	Water (KL)	15546	15546	0	10
8	Plastic waste (tons)	-	-	0	-
	Total Civil cost (Crores)	**237.46**	**234.72**	**2.74**	-

Table 6.10: Comparison Statement - Conventional Approach v/s Green Highway Approach
Package – 3 - Km 114.000 to Km 136.740 – Reconstruction Section (Pavement)

Sr. no.	Description		Quantity by Conventional Approach	Rate/ cum	Amount (Rs.)
1	Embankment	Use of Excavated Material	18164	150	2724600
		Use of Soil Borrow Area	452697	262	118606614
		Use of Flyash	-		
2	Subgrade (500 mm thick)		86136	303	26099208
3	GSB (200 mm thick)		66104	3158	208756432

Sr. no.	Description		Quantity by Green Highway Approach	Rate/ cum	Amount (Rs.)	Savings
1	Embankment	Use of Excavated Material	18164	150	2724600	934 cum of Soil due to use of Fly ash
		Use of Soil Borrow Area	451763	262	118361906	
		Use of Flyash	934	180	168120	
2	Subgrade (500 mm thick)		86136	303	26099208	
3	GSB (200 mm thick)		23138	3158	73069804	
	CTSB (200 mm thick)		42966	3688	158458608	

Sr. no.	Description	Quantity by Conventional Approach	Rate/ cum	Amount (Rs.)	Sr. no.	Description	Quantity by Green Highway Approach	Rate/ cum	Amount (Rs.)	Savings
4	WMM (250 mm thick)	54823	3198	175323954	4	WMM (150 mm thick)	36674	3198	117283452	
5	Recycled Asphalt Pavement		-		5	Recycled Asphalt Pavement				
6	DBM (90 mm Thick)	19334	8177	158094118	6	DBM (50 mm Thick)	10741	8177	87829157	
7	BC (30 mm thick)	6445	9005	58037225	7	BC (30 mm thick)	6445	9005	58037225	
8	Structure Concrete	-			8	Structure Concrete	-			-

Sl. No.	Material	Quantity required as per conventional approach	Quantity required as per Green Highway approach	savings	Average Lead in km
1	Borrow Soil (cum)	452697	451763	934	-
2	Flyash (cum)	0	934	(-)934	-
3	Aggregates (cum)	193562	102453	91109	180
4	Bitumen (ton)	2656	1814	842	290
5	Cement (ton)	-	3437	(-)3437	50
6	Sand (cum)	-	-	0	-
7	Water (KL)	8351	9477	(-)1126	10
8	Plastic waste (tons)	-	-	0	-
	Total Civil cost (Crores)	**145.39**	**134.83**	**10.56**	-

Table 6.11: Comparison Statement - Conventional Approach v/s Green Highway Approach
Package – 4 - Km 136.740 to Km 183.380 – Bewar Pilibhit Road (Pavement)

Sr. no.	Description		Quantity by Conventional Approach	Rate/ cum	Amount (Rs.)	Sr. no.	Description		Quantity by Green Highway Approach	Rate/ cum	Amount (Rs.)	Savings
1	Embankment	Use of Excavated Material	33561	150	5034150	1	Embankment	Use of Excavated Material	33561	150	5034150	NIL

Sr. no.	Description		Quantity by Conventional Approach	Rate/ cum	Amount (Rs.)
		Use of Soil Borrow Area	279828	262	73314936
		Use of Flyash	-		
2	Subgrade (500 mm thick)		195458	303	59223774
3	GSB (200 mm thick)		69109	2677	185004793
4	WMM (250 mm thick)		54522	3006	163893132
5	Recycled Asphalt Pavement				
6	DBM (90 mm Thick)		20065	7981	160138765
7	BC (30 mm thick)		14158	8810	124731980
8	Structure Concrete		-		

Sr. no.	Description		Quantity by Green Highway Approach	Rate/ cum	Amount (Rs.)	Savings
		Use of Soil Borrow Area	279828	262	73314936	
		Use of Flyash	-			
2	Subgrade (500 mm thick)		195458	303	59223774	
3	GSB (200 mm thick)		69109	2677	185004793	
4	WMM (150 mm thick)		54522	3006	163893132	
5	Recycled Asphalt Pavement					
6	DBM (50 mm Thick)		20065	7981	160138765	
7	BC (30 mm thick)		12743	8810	112265830	
8	BC with plastic waste(30 mm thick)		1415	8503	12031745	
9	Structure Concrete		-			-

Sl. No.	Material	Quantity required as per conventional approach	Quantity required as per Green Highway approach	savings	Average Lead in km
1	Borrow Soil (cum)	279828	279828	0	10
2	Flyash (cum)	-	-	-	-
3	Aggregates (cum)	209993	209993	0	160
4	Bitumen (ton)	3696	3641	55	250
5	Cement (ton)	-	-	-	-
6	Sand (cum)	-	-	-	-
7	Water (KL)	8505	8505	0	-
8	Plastic waste (tons)	-	17	(-)17	

	Total Civil cost (Crores)	**153.91**	**153.87**	**0.04**	-

Table 6.12: Comparison Statement - Conventional Approach v/s Green Highway Approach
Package – 4 - km 136.740 to km 144.400 – Widening and Strengthening Section (Pavement)

Sr.no.	Description		Quantity by Conventional Approach
1	Embankment	Use of Excavated Material	
		Use of Soil Borrow Area	
		Use of Flyash	
2	Subgrade (500 mm thick)		
3	GSB (200 mm thick)		11474
4	WMM (250 mm thick)		16066
5	Recycled Asphalt Pavement		
6	DBM (90 mm Thick)		6894
7	BC (30 mm thick)		2298
8	Structure Concrete		-

Sr.no.	Description		Quantity by Green Highway Approach	Savings
1	Embankment	Use of Excavated Material		
		Use of Soil Borrow Area		
		Use of Flyash		
2	Subgrade (500 mm thick)			
3	GSB (200 mm thick)		11474	-
4	WMM (250 mm thick)		16066	-
5	Recycled Asphalt Pavement			
6	DBM (90 mm Thick)		6894	-
7	BC (30 mm thick)		2298	-
8	Structure Concrete		-	-

Sl. No.	**Material**	**Quantity required as per conventional approach**	**Quantity required as per Green Highway approach**	**savings**	**Average Lead in km**
1	Borrow Soil (cum)				10
2	Flyash (cum)				-
3	Aggregates (cum)	48937	48937	0	160
4	Bitumen (ton)	946	919	27	255
5	Cement (ton)	-	-	-	-
6	Sand (cum)	-	-	0	-

7	Water (KL)	1973	1973	0	10
8	Plastic waste (tons)	-	-	-	45

Table 6.13: Comparison Statement - Conventional Approach v/s Green Highway Approach
Package – 4 - Km 144.400 to Km 147+650– Widening and overlaying in Existing Intermediate Section (Pavement)

Sr.no.	Description		Quantity by Conventional Approach
1	Embankment	Use of Excavated Material	
		Use of Soil Borrow Area	
		Use of Flyash	
2	Subgrade (500 mm thick)		
3	GSB (200 mm thick)		6142
4	WMM (250 mm thick)		5236
5	Recycled Asphalt Pavement		
6	DBM (90 mm Thick)		2251
7	BC (30 mm thick)		962
8	Structure Concrete		-

Sr.no.	Description		Quantity by Green Highway Approach	Savings
1	Embankment	Use of Excavated Material		
		Use of Soil Borrow Area		
		Use of Flyash		
2	Subgrade (500 mm thick)			
3	GSB (200 mm thick)		6142	
4	WMM (250 mm thick)		5236	
5	Recycled Asphalt Pavement			
6	DBM (90 mm Thick)		2251	
7	BC (30 mm thick)		962	
8	Structure Concrete		-	

Sl. No.	Material	Quantity required as per conventional approach	Quantity required as per Green Highway approach	savings	Average Lead in km
1	Borrow Soil (cum)				10
2	Flyash (cum)				-
3	Aggregates (cum)	20233	20233	0	160
4	Bitumen (ton)	396	384	12	255
5	Cement (ton)	-	-		-
6	Sand (cum)	-	-		-

7	Water (KL)	786	786	0	10
8	Plastic waste (tons)	-	-	-	45

Table 6.14: Comparison Statement - Conventional Approach v/s Green Highway Approach
Package– 4 - Km 147+650 to Km 183+380– Widening and Overlaying in Existing Two Lane Section (Pavement)

Sr.no.	Description		Quantity by Conventional Approach
1	Embankment	Use of Excavated Material	
		Use of Soil Borrow Area	
		Use of Flyash	
2	Subgrade (500 mm thick)		
3	GSB (200 mm thick)		51493
4	WMM (250 mm thick)		33220
5	Recycled Asphalt Pavement		
6	DBM (90 mm Thick)		10920
7	BC (30 mm thick)		10898
8	Structure Concrete		-

Sr.no.	Description		Quantity by Green Highway Approach	Savings
1	Embankment	Use of Excavated Material		
		Use of Soil Borrow Area		
		Use of Flyash		
2	Subgrade (500 mm thick)			
3	GSB (200 mm thick)		51493	
4	WMM (250 mm thick)		33220	
5	Recycled Asphalt Pavement			
6	DBM (90 mm Thick)		10920	
7	BC (30 mm thick)		10898	
8	Structure Concrete			

Sl. No.	Material	Quantity required as per conventional approach	Quantity required as per Green Highway approach	Savings	Average Lead in km
1	Borrow Soil (cum)				0
2	Flyash (cum)				0
3	Aggregates (cum)	140823	140823	-	160
4	Bitumen (ton)	2354	2338	16	255
5	Cement (ton)	-	-		-
6	Sand (cum)	-	-		-

7	Water (KL)	5746	5746	-	10
8	Plastic waste (tons)	-	17	(-)17	40

CHAPTER 7: CONSULTATION WITH KEY STAKEHOLDERS

7.1 Objective

The Stakeholders' Consultation is an important tool to inform and educate stakeholders about the proposed development and also to consider their suggestions in the decision-making process. In order to assess the existing environment and likely impacts on Environment, informal meetings have been organized with various Government officials like the Forest & Wildlife Officials.

Stakeholders' consultations in the project were undertaken with objectives, which may be grouped into:

- Information sharing,
- Assessment of the environmental issues in the region, and
- Appraisal and assessment of the stakeholders' needs, and
- Development of specific design solutions and enhancement measure

7.2 Consultation with key Stakeholders

Stakeholders participation and community consultation was taken up as an integral part of environmental assessment process of the project. Stakeholders Consultation with key Stakeholders was used as a tool to inform and educate stakeholders about the proposed action both before and after the development decisions are made. This assists in identification of the problems associated with the project as well as the needs of the population likely to be impacted. This participatory process is helpful in reducing the stakeholders resistance to change and to enable the participation of the local people in the decision-making process.

7.3 Definition of Stakeholder

Stakeholder consultation involves the interaction of various stakeholders and the project proponent. It is highly desirable for all key stakeholders to arrive at a consensus on sensitive features, impacts and remedial actions. Stakeholder identification was done by examining the potential impacts of the project in terms of:

- Who may be affected directly (project affected people);
- Which agencies might have responsibility for the impact management;
- Which other organizations might have an interest in monitoring proponent activities or have local knowledge to contribute; and
- Which private/ non-government sector entities might face financial and social hardships if the predicted impacts occur?

7.4 Classification of Stakeholders

Stakeholder analysis typically classifies stakeholders or all those who have an interest in the project, into three categories:

Primary stakeholders are those who are directly or indirectly affected by a project, such as the project beneficiaries and the people who are likely to be adversely affected by a project.

Secondary stakeholders are those who are involved in the delivery of the project outputs, such as the government, the implementing agency, the executing agency (e.g., contractors, consultants), if any and NGOs, etc.

External stakeholders are those who are "outside" the ambit of the project activities, but who can influence the outcome of the project, such as the media, politicians, religious leaders and other opinion leaders.

7.5 Need and Usefulness of Stakeholders Consultation with key Stakeholders

Consultation with key Stakeholders is useful for gathering environmental data, understanding likely impacts, determining community and individual preferences, selecting project alternatives and designing viable and sustainable mitigation plan.

Information Sharing

- To promote public/ stakeholder awareness about the proposed project especially amongst the potentially impacted communities/individuals.
- To educate the individuals/interested groups about the proposed course of action;
- To solicit the views of affected communities/individuals on environmental components and the significance of impacts;
- To serve as an important tool for collecting information about natural and the human environments, much of which would never be accessible through more traditional approaches of data collection;
- To ensure lessening of stakeholder/public resistance to modify the proposed activity, by involving them in the decision-making process; and
- To achieve the basis for an Environment Management Plan for the project, with the incorporation of felt needs views and preferences of the people likely to be impacted.

Appraisal & Assessment

- To inform Project Affected Communities about the provision of EMP, and to settle their felt need with mutual consent and to assist them during relocation of community property, if any
- Deduce information from the people about the local environmental issues and their dependence upon them.
- Collect peoples' perceptions about the project and how the negative effects of the project should be mitigated.

Devising Specific Solutions

- To solicit the views of affected communities/individuals on environmental and social problems.

- Receive suggestions from the affected communities about the preferences and options about the project in general and avoidance measures, mitigation/compensation measures, and benefits being provided, in particular.
- To ensure lessening of public/ stakeholder resistance to change by providing them a platform in the decision-making process.

Thus, constructive participation by the affected population can influence not only environmental and social impacts of the project corridor, but also the costs, success and duration of the main investment project itself.

7.6 Levels of Consultation

7.6.1 Local/Village level Consultations

These consultations were held in rural, suburban and urban areas along the corridor of impact of the project road to inform people about the purpose and preliminary design of the project. Such consultations provided a means to get the opinion of the people and their issues of concern at different stages of the project. Village/local level consultations were held at selected locations to understand the implication of the project impacts on various groups, especially those with a distinct degree of vulnerability.

The details of consultations carried out are:

Date	Locations
28.12.2020	Barkheda (Pilibhit District)
28.12.2020	MiranpurKatra (Shahjahanpur District)
30.12.2020	Panchaalghat (Farrukhabad District)
30.12.2020	Allahganj (Shahjahanpur District)
13.03.2020	Bisalpur, Barkhera, JasoliDiwari, Johra Kalyanpur, Pilibhit Near Assam chowk
14.03.2020	Jalalabad, Mohamdabad, Nagla Kalal
15.03.2020	Allahganj
15.09.2019	Katra
11.09.2019	Kasrak
08.09.2019	Kamlapur
12.09.2019	Jogither and Tikri
07.09.2019	Khudaganj
05.09.2019	Madanpur

The attendance sheets of stakeholder consultations are given in **Annexure 7.1** and photographs of these consultations are shown below:

	
Stakeholders Consultation at Miranpur Katra	Stakeholders Consultation at Barkhera
	
Stakeholders Consultation at Allahganj	Stakeholders consultation at Panchalghat
	
Consultation with PAPs at Jogither&Tikri	Consultation with PAPs at Khudaganj
	
Stakeholders Consultation with PAPs at Papihapur	Stakeholders Consultation with PAPs at Mohamdabad

	
Stakeholders Consultation with PAPs at Kamlapur	Stakeholders Consultation with PAPs at Kasrak
	
Consultation with Women at Bewar at Mainpuri	Consultation with Women at Wahidpur in Farrukhabad District
	
Stakeholder Consultation with PAPs at Bisalpur in Pilibhit District	Stakeholder Consultation with PAPs at Barkhera in Pilibhit District
	
Stakeholder Consultation with PAPs at Jasoli Diwari in Pilibhit District	Stakeholder Consultation with PAPs at Johra Kalyanpur in Pilibhit District

	
Stakeholders Consultation with PAPs at Pilibhit near Assam chowk in Pilibhit District	Stakeholders Consultation with PAPs at Jalalabad in Shahjahanpur District
	
Stakeholders Consultation with PAPs at Mohamdabad in Shahjahanpur District	Stakeholders Consultation with PAPs atNaglaKalal in Shahjahanpur District
	
Stakeholders Consultation with PAPs at Allahganj in Shahjahanpur District	Stakeholders Consultation with PAPs at Madanpur in Farrukhabad

During the consultation matters related to environment included air quality, water quality, noise, drainage and removal of trees, the findings of which are given below in **Table 7.1**

Table 7.1: Outcome of Stakeholder Consultations

S.N.	Issues discussed	Views and Suggestion	Mitigation Measures suggested
1	Date: 28.12.2020, Time: 02:00PM, Location : MiranpurKatra		
	Widening on both side	Local people asked that widening should be on both side of the road.	The existing road is being widened on both sides.
	Safety	Local villages people happy with the proposed project	Appropriate measures will be taken for safety.

S.N.	Issues discussed	Views and Suggestion	Mitigation Measures suggested
		and they are demanding for signage along the roadside	
	Tree cutting	Existing trees will be cut resulting in reduction in greenery of the area	Compensatory afforestation will be carried out as per forest department norms
	Movement of construction vehicles	Nuisance due to movement of construction vehicles	Construction activities will be planned such that there is minimal disturbance due to construction activities
	Compensation	Compensation should be on current market price.	Compensation will be given based on RFCTLARR Act, 2013
	Water	Main source of the water is hand pump only.	It will be ensured that user conflicts do not arise at time of project construction.
2	Date: 28.12.2020, Time:11:00AM, Location:Barkhera		
	Drainage system	Drainage system should be developed, and proposed road should not be raised from the existing road otherwise village will be bound with water during rainy season.	Accordingly drain has to be constructed
	Widening on both side	Local people asked that widening should be on both side of the road.	The existing road is being widened on both sides.
	Movement of construction vehicles	Nuisance due to movement of construction vehicles	Construction activities will be planned such that there is minimal disturbance due to construction activities
	Air quality of the area	Stakeholders are of the view that air quality is not an issue in the area	-
	Water requirement	There will be water requirement for construction activities and will result in conflict with local people's requirements	Water will be sourced only from approved sources with prior permissions from concerned authorities.
	Compensation	Compensation should be calculated on market rate.	Compensation will be given based on RFCTLARR Act, 2013
3	Date: 30.12.2020, Time:11:00AM, Location:Allahganj		

S.N.	Issues discussed	Views and Suggestion	Mitigation Measures suggested
	Dust during construction	Dust emissions during construction will be health hazard and safety hazard	Water sprinkling will be carried out at least three times a day to supress dust
	Road accidents	Construction activities shall be carefully carried out as the area is prone to accidents	Necessary road safety measures will be adopted
	Water needs	There will be water requirement for construction activities and will result in conflict with local people's requirements	Water will be sourced only from approved sources with prior permissions from concerned authorities.
	Structures	Loss of Commercial as well as Squatters structure, mean a psychological disturbance to the affected families. They demanded to save their structures.	The existing road is being widened as per the final design.
	Removal of trees	Road projects development would result in removal of large number of trees of common occurrence.	Efforts will be made to minimize tree cutting. Compensatory afforestation will be carried out as per forest department norms
4	Date: 30.12.2020, Time: 05:00PM, Location:Panchalghat		
	Tree cutting	Road projects development would result in removal of large number of trees of common occurrence.	Efforts will be made to minimize tree cutting. Compensatory afforestation will be carried out as per forest department norms
	Dust during construction	Dust emissions during construction will be health hazard and safety hazard	Water sprinkling will be carried out atleast three times a day to supress dust
	Compensation	Compensation should be calculated on market rate.	Compensation will be given based on RFCTLARR Act, 2013
	Occupation	Local people of the village are involved in agriculture and labor work therefore demanded employment opportunity during construction.	Local labour will be preferred during construction.
5	Date: 13.03.2020, Time: 2:00PM, Location:Barkhera		

S.N.	Issues discussed	Views and Suggestion	Mitigation Measures suggested
	Removal of trees	Road projects development would result in removal of large number of trees of common occurrence.	Efforts will be made to minimize tree cutting. Compensatory afforestation will be carried out as per forest department norms
	Air quality of the area	People were concerned about air pollution due to vehicular traffic during operational stage.	Trees present along the project will result in absorption of pollutants
	Compensation	Compensation should be calculated on market rate.	Compensation will be given based on RFCTLARR Act, 2013
	Occupation	Local people of the village are involved in agriculture and labour work therefore demanded employment opportunity during construction.	Local labour will be preferred during construction.
6	Date:13.03.2020, Time: 3:00PM, Location : Jasoli Diwari		
	Widening on both side	Widening of the road should be equal on both side of the road.	The existing road is being widened as per the final design and all construction activities will be confined within existing RoW.
	Noise Pollution	Vehicular movement will be a cause of noise generation	Trees present along the project road will act as sound absorbers
	Dust during construction	Dust emissions during construction will be health hazard and safety hazard	Water sprinkling will be carried out atleast three times a day to supress dust
	Water availability	There will be water requirement for construction activities and will result in conflict with local people's requirements	Water will be sourced only from approved sources with prior permissions from concerned authorities.
	Drainage system	Drainage system should be developed as per area need	Drains will be constructed according to hydrology of the area following the IRC guidelines.
	Safety	Concern about heavy traffic during school time. There	Appropriate measures will be taken for safety.

S.N.	Issues discussed	Views and Suggestion	Mitigation Measures suggested
		should be signboard for crossing the road	
	Compensation	Compensation should be given as per market rate	Compensation will be given based on RFCTLARR Act, 2013
7	Date:13.03.2020, Time: 4:15PM, Location:Johra Kalyanpur		
	Widening on both side	Local people asked to widening should be on both side of the road.	The existing road is being widened on both sides.
	Safety	Local villages people happy with the proposed project and they are demanding for signage along the roadside	Appropriate measures will be taken for safety.
	Tree cutting	Existing trees will be cut resulting in reduction in greenery of the area	Compensatory afforestation will be carried out as per forest department norms
	Movement of construction vehicles	Nuisance due to movement of construction vehicles	Construction activities will be planned such that there is minimal disturbance due to construction activities
	Compensation	Compensation should be on current market price.	Compensation will be given based on RFCTLARR Act, 2013
	Water	Main source of the water is hand pump only.	It will be ensured that user conflicts do not arise at time of project construction.
8	Date:13.03.2020, Time: 6:15PM, Location: Pilibhit Near Assam Chowk		
	Air Pollution	Pollution will increase in the area due to higher movement of traffic	Trees around the project road will help in curbing the pollution issues.
	Noise	There will be noise during construction	Activities will be planned such that noise levels do not cross permissible threshold.
	Loss of structure	Local people will lose their residential as well as commercial structure due to widening of the road.	The existing road is being widened as per the final design.
	Safety	Both men and Women were showing their concern	Appropriate measures will be taken for safety.

S.N.	Issues discussed	Views and Suggestion	Mitigation Measures suggested
		regarding the safety of children and animal.	
	Compensation	Compensation should be calculated on market rate.	Compensation will be given based on RFCTLARR Act, 2013
	Water	Main source of the water is a hand pump only.	It will be ensured that user conflicts do not arise at time of project construction.
9	Date:14.03.2020, Time: 10:30AM, Location: Jalalabad		
	Removal of trees	Road projects development would result in removal of large number of trees of common occurrence.	Efforts will be made to minimize tree cutting. Compensatory afforestation will be carried out as per forest department norms
	Dust during construction	Dust emissions during construction will be health hazard and safety hazard	Water sprinkling will be carried out atleast three times a day to supress dust
	Water needs	There will be water requirement for construction activities and will result in conflict with local people's requirements	Water will be sourced only from approved sources with prior permissions from concerned authorities.
	Structures	Loss of Commercial as well as Squatters structure, mean a psychological disturbance to the affected families. They demanded to save their structures.	The existing road is being widened as per the final design.
	Safety	During consultation it was recorded that PAPS are showing their concern regarding the safety of their small children and animals.	Appropriate measures will be taken for safety
	Occupation	Local people of the village are involved in agriculture and labor work therefore demanded employment opportunity during construction.	Local labour will be preferred during construction.
10	Date:14.03.2020, Time:12:30PM, Location:Mohamdabad		
	Air Pollution	Pollution will increase in the area due to higher movement of traffic	Trees around the project road will help in curbing the pollution issues.

S.N.	Issues discussed	Views and Suggestion	Mitigation Measures suggested
	Noise quality	There will be noise during construction	Activities will be planned such that noise levels do not cross permissible threshold.
	Occupation	Local people of the village are involved in agriculture and labor work therefore demanded employment opportunity during construction.	Local labour will be preferred during construction.
	Women	Women are involved in agriculture and rearing animal.	
	Structures	Loss of Commercial as well as Squatters structure, mean a psychological disturbance to the affected families. They demanded to save their structures.	The existing road is being widened as per the final design.
	Safety	During consultation it was recorded that PAPS are showing their concern regarding the safety of their small children and animals.	Appropriate measures will be taken for safety
11	Date:14.03.2020, Time:2:30PM, Location:Nagla Kalal		
	Tree cutting	Road projects development would result in removal of large number of trees of common occurrence.	Efforts will be made to minimize tree cutting. Compensatory afforestation will be carried out as per forest department norms
	Dust during construction	Dust emissions during construction will be health hazard and safety hazard	Water sprinkling will be carried out atleast three times a day to supress dust
	Compensation	Compensation should be calculated on market rate.	Compensation will be given based on RFCTLARR Act, 2013
	Occupation	Local people of the village are involved in agriculture and labor work therefore demanded employment opportunity during construction.	Local labour will be preferred during construction.
12	Date:15.03.2020, Time:12:30PM, Location:Allahganj		

S.N.	Issues discussed	Views and Suggestion	Mitigation Measures suggested
	Occupation	Local people of the village are involved in agriculture and labor work therefore demanded employment opportunity during construction.	Local labour will be preferred during construction.
	Structures	Loss of Commercial as well as Squatters structure, mean a psychological disturbance to the affected families. They demanded to save their structures.	The existing road is being widened as per the final design.
	Movement of construction vehicles	Nuisance due to movement of construction vehicles	Construction activities will be planned such that there is minimal disturbance due to construction activities
	Safety	During consultation it was recorded that PAPS are showing their concern regarding the safety of their small children and animals.	Appropriate measures will be taken for safety
13	Date:08.09.2019, Time:02:00PM, Location:Jogither and Tikri		
	Noise problem	There will be noise during construction	Activities will be planned such that noise levels do not cross permissible threshold.
	Removal of trees	Road projects development would result in removal of large number of trees of common occurrence.	Efforts will be made to minimize tree cutting. Compensatory afforestation will be carried out as per forest department norms
	Compensation	Compensation should be calculated on market rate.	Compensation will be given based on RFCTLARR Act, 2013
	Occupation	Local people of the village are involved in agriculture and labour work and demanded for employment during construction.	Local labour and women will be preferred during construction.
14	Date:08.09.2019, Time:11:00AM, Location:Kamlapur		
	Air Pollution	Pollution will increase in the area due to higher movement of traffic	Trees around the project road will help in curbing the pollution issues.

S.N.	Issues discussed	Views and Suggestion	Mitigation Measures suggested
	Compensation	Compensation should be calculated on market rate.	Compensation will be given based on RFCTLARR Act, 2013
	Movement of heavy vehicles	Movement of heavy construction vehicles will obstruct normal traffic flow	Movement of construction vehicles will be planned such that normal traffic is not hampered
	Occupation	Local people demanded employment during construction.	Local labour will be preferred during construction.
15	Date:11.09.2019, Time:10:20AM, Location:Kasrak		
	Dust during construction	Dust emissions during construction will be health hazard and safety hazard	Water sprinkling will be carried out atleast three times a day to supress dust
	Compensation	Compensation should be given on market rate.	Compensation will be given based on RFCTLARR Act, 2013
	Structures	Demanded to save Residential structures.	The existing road is being widened as per the final design
16	Date: 07.09.2019, Time:12:00AM, Location:Khudaganj		
	Compensation	Compensation should be calculated on market rate.	Compensation will be given based on RFCTLARR Act, 2013
	Gender based violence	It has been recorded during the consultation that no gender-based violence has been recorded at the project corridor.	
17	Date: 15.09.2019, Time:11:00AM, Location:Katra		
	Removal of trees	Road projects development would result in removal of large number of trees of common occurrence.	Efforts will be made to minimize tree cutting. Compensatory afforestation will be carried out as per forest department norms
	Movement of construction vehicles	Nuisance due to movement of construction vehicles	Construction activities will be planned such that there is minimal disturbance due to construction activities
	Compensation	Compensation should be calculated on market rate.	Compensation will be given based on RFCTLARR Act, 2013

S.N.	Issues discussed	Views and Suggestion	Mitigation Measures suggested
	Related to revenue record	People demanded that compensation to be given to the person having possession on affected land.	Ownership details of the affected land would be verified during RAP implementation. NGO will be appointed to undertake this activity and accordingly compensation will be paid.
18	Date: 05.09.2019, Time:11:30AM, Location:Madanpur		
	Widening of the road	Agreed with the proposal. During discussion reveals that there is 30-meter land is available in market area. They asked to provide safety signage in the market area	The existing road is being widened as per the final design
	Air Pollution	Pollution will increase in the area due to higher movement of traffic	Trees around the project road will help in curbing the pollution issues.
	Noise quality	There will be noise during construction	Activities will be planned such that noise levels do not cross permissible threshold.
	Compensation	Compensation should be calculated on market rate where land acquisition is applicable.	Compensation will be given based on RFCTLARR Act, 2013
	Occupation	Local people demanded that local labour should be provided with employment opportunities during construction stage.	Local labour will be preferred during construction.
19	Date: 13.03.2020, Time:12:00pm, Location: Bisalpur		
	Widening of the road	Agreed with the proposal. During discussion reveals that there is 30-meter land is available in market area. They asked to provide safety signage in the market area	The existing road is being widened as per the final design
	Air Pollution	Pollution will increase in the area due to higher movement of traffic	Trees around the project road will help in curbing the pollution issues.
	Noise quality	There will be noise during construction	Activities will be planned such that noise levels do

S.N.	Issues discussed	Views and Suggestion	Mitigation Measures suggested
			not cross permissible threshold.
	Compensation	Compensation should be calculated on market rate where land acquisition is applicable.	Compensation will be given based on RFCTLARR Act, 2013
	Structures	Loss of Commercial as well as Squatters structure, mean a psychological disturbance to the affected families. They demanded to save their structures.	The existing road is being widened as per the final design.

7.6.2 Consultations with Project Authorities, forest and wildlife Other Officials

At this stage, consultation was carried out with the U.P. Forest and Wildlife officials of all the divisions in which the alignment was likely to cross the forest areas. The basic aim of consultation was to collect the secondary data w.r.t forest and wildlife areas located near to the project road and to ascertain the location of alignment within these areas. The following secondary data were collected during the visit for carrying out the study.

- Working Plan showing the forest land details
- Details on Flora & Fauna
- Animal Crossing/ Corridor crossing the project area
- Presence of Eco-Fragile zone/ sanctuary/ National park/ Biosphere Reserve/ Ramsar Site or any other Wet Land / Nesting-Breeding Ground
- Whether there is any habitat area of migratory species close to Project Area
- Is there any species which is not seen in recent days (Report on Local Extinction)
- Presence of Endemic / Endangered Species
- Afforestation ratio
- Boundary map of the Wildlife Sanctuaries to scale
- Notification on declaration of Eco-sensitive Zone
- Wildlife Management Plan
- Impacts due to the proposed project and suggestions to improve the Environment of the area
- Forest clearance related queries

Details of consultation with government official carried out are given below in **Table 7.2.**

Table 7.2: Outcome of Consultations with Government officials

S.No.	Consultation with Government Official	Date of Meeting	Key Issues discussed
1.	Divisional Forest Officer, Mainpuri	26th November, 2020 13th March, 2020	Forest diversion proposal, compensatory afforestation, FRA, Details on his jurisdiction boundary, common flora and fauna, presence of any engendered species, tree cutting and forest diversion
2.	Divisional Forest Officer, Farrukhabad	26th November, 2020 13th March, 2020	Presence of Eco-Fragile zone/ sanctuary/ National park/ Biosphere Reserve/ Ramsar Site or any other Wet Land / Nesting-Breeding Ground, Whether there is any habitat area of migratory species close to Project Area, species which is not seen in recent days, Presence of Endemic / Endangered Species, forest diversion proposal, reduction in tree cutting, compensatory afforestation, FRA
3.	Ranger, Farrukhabad	13th March, 2020	Discussion on tree counting, Presence of Eco-Fragile zone/ sanctuary/ National park/ Biosphere Reserve/ Ramsar Site or any other Wet Land / Nesting-Breeding Ground, Whether there is any habitat area of migratory species close to Project Area, species which is not seen in recent days, Presence of Endemic / Endangered Species
4.	Divisional Forest Officer, Shahjahanpur	24th November, 2020 14th March, 2020	Status of protected forest in the area, flora and fauna, process of tree cutting, working plan of forest land, forest diversion proposal, reduction in tree cutting, compensatory afforestation, FRA
5.	Ranger, Shahjahanpur	13th March, 2020	Discussion on tree counting, Presence of Eco-Fragile zone/ sanctuary/ National park/ Biosphere Reserve/ Ramsar Site or any other Wet Land / Nesting-Breeding Ground, Whether there is any habitat area of migratory species close to Project Area, species which is not seen in recent days, Presence of Endemic / Endangered Species
6.	Divisional Forest Officer, Pilibhit	25th November, 2020 14th March, 2020	Working Plan showing the forest land details, Nearest wildlife sanctuary, Boundary map of the Wildlife Sanctuaries to scale, Notification on declaration of Eco-

S.No.	Consultation with Government Official	Date of Meeting	Key Issues discussed
			sensitive Zone, Presence of Eco-Fragile zone/ sanctuary/ National park/ Biosphere Reserve/ Ramsar Site or any other Wet Land / Nesting-Breeding Ground, Whether there is any habitat area of migratory species close to Project Area, species which is not seen in recent days, Presence of Endemic / Endangered Species, forest diversion process, compensatory afforestation, FRA

Photographs of stakeholder consultation with forest official are shown below

7.7 Continued Consultations and Participation

In order that the consultations continue till the implementation of the project, to redress the environmental issues likely to surface during construction and operational phases, a constant communication will be established with the affected communities and the road users. To achieve this, Contractors, in consultation with the Supervision Consultant and Independent Consultant will organize periodical meetings with the communities before the start of work, during and before the completion of work to inform them about the Construction Activities, Traffic Management Plan, Siting of Labour Camps etc. and to invite their Suggestions / Grievances.

CHAPTER 8 GREEN INITIATIVES

8.1 Green Initiatives and GHG Emission Reduction

The proposed project development objective is to enhance the institutional capacity of Ministry of Road Transport and Highways in improving transport connectivity through adopting green and climate resilient construction methods for the national highway network and implementing them in pilot sections of the network.

Ensuring development of a greener transport infrastructure is a must. Connectivity and efficiency are not the only requirements a transport network operation must fulfil. The third requirement is that of managing the 'externalities', *i.e.* the collateral damage suffered by the society or the cost imposed on it because of development and operation of the road network. The externalities, which are difficult to be quantitatively estimated, are health hazards (*e.g.* due to pollution), short and long-term effects of environmental degradation (*e.g.* depletion of natural resources) and adverse socio-economic impacts. Transport sector contributes 13 % of global Green House Gas (GHG) emissions and three-fourths of transport-related emissions are from road traffic. With an expanding National Highway network, it is expected that the emissions because of construction and maintenance activities would continue to rise. It will be critical to ensure that these emissions are limited by adopting construction and maintenance practices/ technologies/materials that are green i.e. resource efficient and low in terms of carbon footprint. Pavements are still designed traditionally, without the use of alternate materials. Consequently, natural resources required for road construction such as soil, aggregates and sand are becoming scarce – and increasingly being brought in over large distances from the construction site, leading to spiralling construction costs. The externalities associated with these could be minimized by use of local and marginal materials and industrial by-products and green technologies by appropriately integrating them into the design of pavements and embankments.

8.2 Green Highway Approach

The project has been designed by adopting the Green Highway Approach, which has led to substantial reduction in amount in raw materials required for the project. Use of flyash in lieu of borrow soil, Cement Treated Sub-Base (CTSB) pavement, Recycled Asphalt Pavement (RAP) and mixing plastic in bitumen for bituminous coating have been proposed to overall reduce the requirement of virgin materials.

<u>Use of Fly Ash</u>

The thermal grade Indian coal contains 35 to 45% of ash resulting in generation of huge quantity of fly ash. Management and disposal of fly ash is an environmental issue. Storage of ash in ponds and mounds also require large amount of land.

The following characteristics of fly ash make it a preferred material for road construction.

- Lightweight as compared to commonly used fill material (local soils), therefore, causes lesser settlements.
- Higher value of California Bearing Ratio as compared to soil provides for a more efficient design of road pavement.
- Amenable to stabilisation with lime and cement.
- Can be compacted over a wide range of moisture content, and therefore, results in lesser variations in density with changes in moisture content.
- Easy to handle and compact because the material is light and there are no large lumps to be broken down.
- Can be compacted using either vibratory or static rollers.
- Offers greater stability of slopes due to higher angle of friction. Value of angle of internal friction increases even more upon compaction.
- High permeability ensures free and efficient drainage. After rainfall, water gets drained out freely ensuring better workability than soil, especially during monsoons. Work on fly ash fills/ embankments can be restarted within a few hours after rainfall, while in case of soil it requires much longer period. •
- Faster rate of consolidation; a major part of decrease in volume occurs during primary consolidation phase, which is generally rapid, thus making it an ideal material for road fills.
- Considerable low compressibility results in ease of compaction and shows negligible subsequent settlement within the fill.
- Conserves good earth, which is precious topsoil, thereby protecting the environment.
- Low sulphur content Indian fly ash (less than 0.6 %) can add long term strength and durability to sub grade.
- Fly Ash effectively dries wet soil and provides an initial rapid strength gain which is very useful during construction in wet, unstable ground conditions.
- Fly Ash decreases swelling potential of expansive soils.

Owing to the good CBR and reasonably low dry density and specific gravity, the fly ash can be considered as good embankment material.

Cement Treated Sub-Base (CTSB) Pavement

CTSB is made up of in-situ soils and aggregates mixed with specific quantities of cement dust. Pavements now constructed in India with CTSB are stronger than older granular base roads that have not been properly stabilized. When constructing with CTSB, it is possible to reduce the thickness of the base for the same weight and traffic volumes and still meet all IRC codes. Properly engineered CTSB pavements can distribute loads over wider surface areas significantly reducing stress on sub-grade and increases the load-carrying specification of flexible pavements. Through various studies, it is observed that the pavement with conventional crust fails for distresses condition such as cracking, and rutting But the CSTB and CTSB better to resist in fatigue and rutting. Using CSTB/CTSB there is reduction in the bitumen consumption and the pavement thickness is reduced up to 100 mm. Also, the life of the pavements is longer than conventional pavement, hence requiring less maintenance.

Recycled Asphalt Pavement

Milling asphalt paved area instead of simply repaving over the existing asphalt surface and then laying a new asphalt pavement is a much more efficient way for a long term performance. Benefits of Recycling Asphalt:-

A. Environmental Benefits

- Recycling old asphalt reduces the amount of new oil needed in the construction process and may reduce dependence on foreign oil.
- Recycling saves on construction material waste since the recycled material is not sent to a landfill.
- Recycling the mineral particles that are produced during the process of asphalt pavement helps conserve natural resources.

B. Economic Benefits

- Save money with asphalt recycling.
- Contractors save by reducing energy, materials, and transportation costs.
- Asphalt can be recycled multiple times, ensuring its value.

C. Asphalt Benefits

The quality of asphalt pavement is improved when recycled pavement is used. There is a stronger cracking resistance because of the added mineral fillers and organic fibers used in the recycled materials. Other benefits include:

- Reduced demand for new asphalt pavement
- Reduced demand on aggregate
- Improved HMA mixes
- Improved asphalt stiffness
- Decreased likelihood for cracking
- Decreased susceptibility to rutting
- Decreased need for “virgin” asphalt

Mixing Plastic in Bitumen for Bituminous Coating

Waste plastics can be used in the production of asphalt mix. Waste plastics, mainly used for packing are made up of Polyethylene Polypropylene polystyrene. Their softening varies between 110^{0}C – 140^{0}C and they do not produce any toxic gases during heating but the softened plastics have tendency to form a film like structure over the aggregate, when it is sprayed over the hot aggregate at 160^{0}C. The added bitumen spreads over the aggregate. At this temperature both the coated plastics and bitumen are in the liquid state, capable of easy diffusion at the inter phase. The shredded plastics on spraying over the hot aggregate melted and spread over the aggregate giving a thin coating at the surface. This process is further helped by the increase in the contact area.

The Plastics Coated Aggregates (PCA) is a better raw material for the construction of flexible pavement. PCA - Bitumen mix showed improved binding property and less wetting property. The cost of bitumen is much higher than that of plastics and this process also helps to save the natural resources. There is no maintenance cost for a minimum period of five years. Hence the process is cheap and eco-friendly as it saves plastic from landing into landfills.

A comparative statement conventional approach v/s green highway approach is given in **Table 8.1**

Table 8.1: Comparison Statement - Conventional Approach v/s Green Highway Approach
Km 0.000 to Km 183.380 – (Bewar Pilibhit Road)

S.N.	Description		Quantity by Conventional Approach	S.N.	Description		Quantity by Green Highway Approach	Savings	Remarks
1	Embank-ment	Use of Excavated Material	356133 cum	1	Embank-ment	Use of Excavated Material	356133 cum	934 cum of soil due to use of fly ash	
		Use of Soil Borrow Area	1128239 cum			Use of Soil Borrow Area	1127305 cum		
		Use of Flyash	-			Use of Flyash	934 cum		
2	Subgrade (500 mm thick)		600878 cum	2	Subgrade (500 mm thick)		600878 cum	NIL	
3	GSB (200/250 mm thick)		342838 cum	3	GSB (200/250 mm thick)		275822 cum	30274 cum of GSB and WMM due to use of CTSB	GSB-200 mm in total stretch
				4	CTSB (200 mm thick)		66816 cum		Use of CTSB - 200 mm from Km 0+000 to Km 12+000 and Km 114+000 to Km 137+250
4	WMM (200/250 mm thick)		357783 cum	5	WMM (150/250 mm thick)		327709 cum		WMM-250 mm in total stretch except (Km 12+000 to 40+000 i.e. 200 mm) and (Km 0+000 to 12+000 and 114+000 to

S.N.	Description	Quantity by Conventional Approach	S.N.	Description	Quantity by Green Highway Approach	Savings	Remarks
							137+250 i.e. 150 mm)
5	Recycled Asphalt Pavement	-	6	Recycled Asphalt Pavement: DBM (50/90/95 mm thick)	105312 cum	13363 cum of DBM due to use of CTSB and RAP	RAP DBM in PKG I & II (DBM 50 mm From Km 0+000 to Km 12+000), (DBM 90 mm From Km 12+000 to 40+000), (DBM 95 mm From Km 40+000 to 114+000)
6	DBM (90/95 mm Thick)	149481 cum	7	DBM (50/90 mm Thick)	30806 cum		(DBM-50 mm from Km 114+000 to 137+250), (DBM-90 mm From Km 137+250 to 183+380)
7	BC (30 mm thick)	63508 cum	8	BC (30 mm thick)	60291 cum	-	-
				BC with plastic waste (30 mm thick)	3217 cum	-	
8	Structure Concrete	-	9	Structure Concrete			

The conventional vs green highway approach representing the savings in raw materials is given below in **Table 8.2:**

Table 8.2: Savings due to Green Highway Approach

S.N.	Material	Quantity required as per conventional approach	Quantity required as per Green Highway approach	Savings	Average Lead in km (PKG I/ II/III/IV)
1	Borrow Soil (cum)	1128239	1128239	0	10/10/10/10
2	Flyash (cum)	-	934	(-)934	-/-/50/-
3	Aggregates (cum)	1205215	1058153	147062	240/181/180/160
4	Bitumen (ton)	22203	18841	3362	208/270/290/250 Km (Mathura Refinery)
5	Cement (ton)	-	5345	(-)5345	30/-/50/-
6	Sand (cum)	-	-	-	-
7	Water (KL)	49184	50787	(-)1603	-
8	Plastic waste (ton)	-	38	(-)38	30/-/-/30

CHAPTER 9 ENVIRONMENTAL MANAGEMENT PLAN

9.1 Introduction

Environmental Management Plan has been prepared which mainly centered on the understanding of the interactions between the environmental setting and the project activities and the assessment of the anticipated impacts. Mitigation measures for anticipated environmental impacts have been elaborated as specific actions which would have to be implemented during the project implementation. The EMP would help the contractors/PIU to implement the project in an environmentally sustainable manner and where contractors, understand the potential environmental impacts arising from the subproject and take appropriate actions/mitigation measures to properly mitigate/manage such environmental impacts. EMP can thus be considered to be an overview document for contractors that will guide environment management of all anticipated impacts in proposed two lane upgradation with paved shoulders of Bewar - Pilibhit Section (Km 0.000 to Km 183.380) of NH 730 C (Package I, II, III) and 731 K (Package IV) in the state of Uttar Pradesh. This EMP may also be considered as flexible and will be further developed by the Contractor in the Contractor's Environmental Management Plan.

9.2 Outline of EMP and its Implementation Strategy

The EMP is a guiding and dynamic/live tool which discusses the potential environmental impacts and specific mitigation/management measures for the proposed two lane upgradation with paved shoulders of Bewar - Pilibhit Section (Km 0.000 to Km 183.380) of NH 730 C and 731 K. It refers to the responsibilities ensuring commitment for implementation and means of verifying/supervision whether the same has been implemented properly. The timing and frequency of monitoring along with the supervision responsibility and reporting requirements are also provided in the Environmental Management Plan. As a part of the EMP, the contractors will commit to identification of the environmental and social impacts at the project road. In case of any future changes in the project road design, the EMP will need to be updated to reflect the new scope of the activities. such revisions will be finalized in consultation with the World Bank.

The PIU/Authority Engineer will be responsible to ensure implementation of EMP by the contractor with the overall accountability resting with the GNHCP-PMU. Where as, the Authority Engineer will ensure periodic quality audit/ guidance to the PIU and by imparting regular training, monitoring and ensuring that all EMP provisions and requirements are translated into 'contract documents and that these requirements are implemented to their full intent and extent.

Overall responsibility will be of Contractor for effective implementation of EMP and adherence to all the mitigation measures as outlined in this EMP associated with their respective activities. The Contractor will require to comply with the provisions of the EMP.

9.3 Environmental Management Plan

The Environmental Management Plan (EMP) will guide the environmentally-sound construction of the project road and ensure efficient lines of communication/co-ordination between the PIU/Authority Engineer, Contractor and GNHCP-PMU. The EMP has been prepared for three stages of project road construction activities as: (i) Pre-construction Stage; (ii) Construction Stage; and (iii) Demobilization Stage. The EMP for the project road have been prepared and presented in **Table 9.1.** Various guidelines, checklists and reporting formats for implementation of EMP are given as **Annexures 9.1** to **9.19** at the end of EIA Report.

The purpose of the EMP is to ensure that the activities are undertaken in a responsible non-detrimental manner with the objectives of: (i) provide a pro-active, feasible and practical working tool to enable the measurement and monitoring of environmental performance on site; (ii) guide and control the implementation of findings and recommendations of the environmental assessment conducted for the subproject; (iii) detail specific actions deemed necessary to assist in mitigating the environmental impacts of the project road; and (iv) ensure that safety recommendations are complied with.

Budgetary provisions for implementation of EMP shall be integrated with the bid/construction contract in the form of technical specifications and environmental performance requirements. The costs to be incurred on implementation of EMP shall be incidental to the civil works and therefore, no separate environment budget/cost will be provided to the contractor for implementation of EMP. The contractor will ensure effective implementation of EMP during pre-construction, construction and demobilization stages. EMP for operation stage will be implemented by PIU/PMU.

Table 9.1: Environmental Mitigation Measures and Management Plan

S. No.	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning and Execution	Supervision/ Monitoring
A.	**Pre-Construction Stage**			
I.	**Pre-construction Activities By the PIU**			
A.1	Tree Cutting Permission	• Approximately 32437 trees are likely to be felled for upgradation of the project. All efforts will be made to minimise cutting of trees. • Prior permission will be obtained for cutting trees required for construction of the road.	PIU	PMU
A.2	Diversion of Forest Land	• The project road passes through protected forest area (road side plantation notified as protected forest area) and 192.777 ha diversion of forest land is required. Prior forest clearance will be obtained before starting the construction in the forest area.	PIU	PMU
A.3	Preservation of Trees	• All efforts will be made to preserve trees including evaluation of minor design adjustments/alternatives (as applicable) to save trees. • In the event of design changes, additional assessments including the possibility to save trees shall be made. Stacking, transport and storage of the wood from trees cuttings will be done as per the norms of Forest Department. • Systematic documentation for the trees cutting and those saved will be maintained.	PIU	PMU
A.4	Natural Hazards			
A. 4.1	Protection for damage from Earthquake	• Design considering relevant IRC guidelines for earthquake resistant measures in bridges	PIU/DPR Consultant	PMU
A 4.2	Protection of Road embankment from flood or water logging	• Improvement in existing culverts and proposal for new culverts to provide cross drainage. • Provision of road side drain (lined and earthen drains) all along the project road. • Mitigation measures as per IRC:34 Recommendations for road construction in waterlogged area and IRC: 75 and MORT&H guidelines for Design of High Embankments	PIU/DPR Consultant	PMU
A 4.3	Pavement to withstand extreme	• Design of pavement to withstand 50 °C ambient temperature in hot summer	PIU/DPR Consultant	PMU

S. No.	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning and Execution	Supervision/ Monitoring
	temperature during hot summer			
A.5	Utility Shifting	• Prior permission will be taken from line departments of Electricity (PDD), Telecommunications (for OFC underground cables etc), water pipeline (PHE) etc. Utility shifting required to be undertaken by PIU.	PIU	PMU
A.6	Orientation of Implementing Agencies	• The PIU/Authority Engineer shall organize orientation sessions for the contractor. This shall include on-site training (general as well as specific) to the context of this project road. In training session PIU officers, project staff, contractors project managers, consultants etc will be involved. • Training of key workers and staff of the contractor about EMP implementation will be ensured before starting the construction works	PIU	PMU
II	**Pre-construction Activities By the Contractor**			
A.7	Appointment and Mobilization of Environment Officer	• The contractor will appoint qualified and experienced Environment Officer, who will dedicatedly work and ensure implementation of EMP including occupational health and safety issues of workers. • Contractor will inform the PIU for the appointment and mobilization each Environment Officer	Contractor	Authority Engineer /PIU
A-8	Regulatory Approvals	• Prior permission will be obtained from concerned department for any works under scope of subproject. • Labour license will be obtained from Department of Labour. • If contractor opens new stone quarry or borrow areas, prior Environmental clearance will be obtained from SEIAA/DEIAA. • For setting–up of stone crusher plant (fix or mobile), hot mix plants, WMM and Batching Plant Consent to Establish and Consent to Operate will be obtained from Uttar Pradesh Pollution Control Board (UPPCB). • If contractor intends to procure construction materials from local authorized third-party agencies, then contractor will collect and submit necessary clearance/approval to PIU/Authority Engineer from authorized third party agencies.	Contractor	Authority Engineer /PIU

S. No.	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning and Execution	Supervision/ Monitoring
		• Permissions for taking construction water from surface water bodies and drilling borewell for extraction of ground water, permission will be obtained from competent authorities.		
A-9	Common Property Resources (CPR's)/ Cultural/ Religious Sites	• All common property resources shall be relocated and restored before the commencement of the road improvement activities. • Before commencement of works, a joint field monitoring will be conducted by the contactor and Authority Engineer/PIU to map out the alignments, to check if any CPR is being impacted due to construction works. • While relocating any CPR/cultural/religious sites, concerned agencies including Contractor shall take necessary precautions and shall provide barricades/delineation of such sites to prevent pedestrian and other road users.	Contractor	Authority Engineer /PIU
A.10	Procurement of Machinery, Crushers, Batching Plants, etc and establishment of Plants/crusher.	• All vehicles and equipment to be procured for the proposed up-gradation works of the project road will conform to the relevant Bureau of Indian Standard (BIS) norms/vehicles emission standards. The discharge standards promulgated under the Environment (Protection) Act, 1986 and Motor Vehicles Act, 2019 will be strictly adhered to. • The silent/quiet equipment like DG set as per regulations will be used at the construction site or labour camp. • The contractor will maintain records of Pollution Under Control (PUC) certificates for all vehicles used during the contract period, which will be produced to PIU for monitoring and whenever required. • Specifications of construction machinery, crushers, batching plants, WWM and hot mix Plants shall comply with the requirements of the relevant environmental legislations. • Batching plant, WMM and hot mix plants shall be located minimum 250m away from population settlements preferably in the downwind direction. • Crusher shall be located as per distance criteria given by Uttar Pradesh Pollution Control Board in Consent to Establish letter.	Contractor	Authority Engineer /PIU
A.11	Construction Camp	• The Contractor will obtain consent from land owners in writing for temporary use of land for construction and labour camps, etc..	Contractor	Authority Engineer /PIU

S. No.	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning and Execution	Supervision/ Monitoring
	Locations Selection, Design & Lay-out	• The Contractor shall submit a detailed layout plan for construction and labour camps and seek prior approval of PIU/Authority Engineer before entering into formal agreement with a land owner for setting-up such sites. • Layout of construction camp will ensure proper planning of plants, materials storage, sufficiently wide roads for free and safe movement of vehicles, construction equipment and workers.		
A.12	Arrangement for Construction Water	• The contractor will not take construction water from public water supply. • The contractor shall source construction water preferentially from surface water bodies in the project area after obtaining necessary permission from the competent authority. • Boring of any tube well for water for the road construction shall be drilled only after obtaining necessary permission from Ground Water Authority. • For new borewell, prior approval will be obtained from CGWA as per latest guidelines dated 01.06.2019. • To avoid disruption/disturbance to other water users, the contractor shall extract water from identified locations in consultation with local community.	Contractor	Authority Engineer /PIU
A.13	Labour Requirement and compliance of labour regulations	• The contractor preferably will deploy unskilled/semiskilled labour from local areas to give the maximum benefit to the local community and to avoid any additional stress on the existing facilities. On an average 350 to 400 labours/ day (in all 4 packages) will be required during construction stage depending upon extent of construction work. • All applicable labour regulations will be complied by the contractor. • Necessary facilities to workers will be provided to workers as per The Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996	Contractor	Authority Engineer /PIU
A.14	Traffic Management Plan- Planning for	• Detailed traffic control plan for construction phase shall be prepared by the contractor before starts the construction and same shall be submitted to the PIU/Authority Engineer for approval.	Contractor	Authority Engineer /PIU

<table>
<tr><th rowspan="2">S. No.</th><th rowspan="2">Environmental Issues</th><th rowspan="2">Environmental Mitigation Measures</th><th colspan="2">Responsibilities</th></tr>
<tr><th>Planning and Execution</th><th>Supervision/ Monitoring</th></tr>
<tr><td></td><td>Traffic Diversions and Detours</td><td>• The traffic control plan shall contain details of temporary diversions, traffic safety arrangements including night time safety measures, details of traffic arrangement after cessation of work each day, safety measures undertaken for transport of construction materials and arrangement of flagmen etc to regulate traffic congestion in narrow stretches in work zones.
• The contractor shall provide specific measures for safety of pedestrians and workers as a part of traffic control plans. The contractor shall ensure that the diversion/detour are always maintained in running condition, particularly during the monsoon to avoid disruption to traffic flow.
• To maintain road safety during the construction necessary signages will be provided as per applicable IRC codes and guidelines.</td><td></td><td></td></tr>
<tr><td>A-15</td><td>Stockyard/Storage of Construction Material and Establishing Equipment Lay-down Area</td><td>• Contractor in consultation with PIU/Authority Engineer shall identify the site for temporary storage of construction materials. These sites shall not cause an inconvenience to local population / traffic movement.
• Selection of locations for materials storage and equipment lay-down areas must take into account prevailing winds, distances to adjacent settlements, general on - site topography and water erosion potential of the soil. Impervious layer on surfaces must be provided wherever necessary.
• Construction materials stockpiles shall be protected from storm water (e.g. by excavating a cut-off ditch around stockpiles to keep away storm water).
• Storage of fuel with non- permeable flooring (cemented floor) will be enclosed to protect from rain-water.
• Equipment lay-down area will be compacted and paved by cement properly to avoid any possibility of percolation of leaked and spilled fuel or lube oils.
• Runoff from Equipment lay-down area will be passed through oil & grease trap.</td><td>Contractor</td><td>Authority Engineer /PIU</td></tr>
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S. No.	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning and Execution	Supervision/ Monitoring
A-16	Information Dissemination and Communication Activities	• Prior to construction activity, information dissemination will be undertaken by contractor at the project site. • Project information boards showing the name of work, project cost, duration, date of commencement, date of completion, executing agency and contact details (including telephone numbers) shall be displayed both sides of the road packages in both in English and Hindi. • Information boards will also be setup at the sites of construction camps and labour camps, plants and stockyard site. • Details of nodal officer with telephone numbers will be displayed for registering compliant/grievances by stakeholder/general public.	PMU Contractor	PMU Authority Engineer /PIU
B.	**Construction Stage**			
B.1	**Procurement of Construction Materials**			
B.1.1	Quarry operations & crushers for procurement for aggregate and other construction materials	• Aggregate will be obtained only from approved stone quarries and crushers having valid clearance and consents. • If contractor plans to open new stone quarry, prior environmental clearance will be obtained from SEIAA/DEIAA. • The crushers will be operated after obtaining consent to establish and consent to operate from UPPCB. • Borrow area (if required) shall be opened without obtaining necessary regulatory permission. The location, shape and size of the designated borrow areas will be as approved by the Environmental Expert of Authority Engineer. • Borrowing earth shall be carried out in accordance with the IRC recommended practice for borrow pits for road embankments (IRC 36: 2010).	Contractor	Authority Engineer /PIU
B.1.2	Utilization of Fly Ash in road construction and chances of ground	• Use of fly ash in road embankment has been designed as per IRC:SP:58-2001 • Approx. Quantity of fly ash is 934 cum. • Four thermal power plants are located within 100km and two are located within 100km to 300km.	Contractor	Authority Engineer /PIU

S. No.	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning and Execution	Supervision/ Monitoring
	water contamination	• Fly ash will be transported to the site in covered dumper • The leaching problem can be minimised by controlling the amount of water, which infiltrates into fly ash embankment • Sides and top of the embankment will be protected using less permeable good earth. This will prevent the seepage the water from the pavement to the embankment. • Surface of the stockpile will be covered with tarpaulins.		
B.1.3	Transporting Construction Materials	• Vehicles delivering fine materials like aggregate, cement, earth, sand, etc, to the site will be covered by tarpaulin to avoid spillage of construction materials and wind blown dust from the top of vehicles. • Existing road used by vehicles of the contractor or any of his subcontractor or suppliers of materials will be kept clear of extraneous construction materials dropped by such vehicles. • The contractor will make effort to transport construction materials to the site in non- peak hours	Contractor	Authority Engineer /PIU
B.2	**Work/Construction Zone Safety**			
B.2.1	Work/Construction Zone Safety	• The Contractor shall prepare work zone construction safety plan as per the provisions under IRC 67-2001, IRC SP-55, which shall be duly approved by the PIU/Authority Engineer prior to start of road works. • Warning, informatory and safety signages for ongoing works shall be erected as per IRC guidelines. • Suitable retro reflective warning signages shall be placed at near construction locations and should be visible at night also. • The contractor shall take necessary measures for the safety of traffic during construction and shall provide, erect and maintain such barricades, including signages, markings, cones, delineators, flagmen, etc as proposed and approved by PIU/Authority Engineer. The contractor shall ensure that all signs, barricades, pavement markings are provided as per applicable IRC Codes and guidelines. • At congested sites necessary signages and flagmen will be ensured to regulate traffic.	Contractor	Authority Engineer /PIU

S. No.	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning and Execution	Supervision/ Monitoring
B.3	**Site Clearance (Clearing and Grubbing)**			
B.3.1	Clearing, grubbing and levelling	• If required vegetation like shrubs and ground flora will be removed from the construction zone only. • All works will be carried out such that the damage or disruption to flora other than those identified for cutting is minimum. Only ground cover/shrubs that impinge directly on the permanent works or necessary temporary works will be removed with prior approval of PIU/Authority Engineer. • The contractor, under any circumstances will not cut or damage trees, which was not marked for cutting.	Contractor	Authority Engineer /PIU
B.3.2	Stripping, stocking and preservation of top soil	The topsoil from areas to be permanently covered will be stripped to a specified depth of 150 mm and stored in stockpiles. A portion of the temporarily acquired area and/or right of use will be earmarked for storing topsoil. The locations for stock piling will be pre-identified in consultation and with approval of Environmental Expert of Authority Engineer/PIU. The following precautionary measures will be taken to preserve top soil till they are used: (a) Stockpile will be designed such that the slope does not exceed 1:2 (vertical to horizontal), and height of the pile is restricted to 2 m. To retain soil and to allow percolation of water, silt fencing will protect the edges of the pile. (b) Stockpiles will not be surcharged or otherwise loaded and multiple handling will be kept to a minimum to ensure that no compaction will occur. The stockpiles shall be covered with gunny bags or vegetation. (c) It will be ensured by the Contractor that the topsoil will not be unnecessarily trafficked either before stripping or when in stockpiles. Such stockpiled topsoil will be utilized for:	Contractor	Authority Engineer /PIU

S. No.	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning and Execution	Supervision/ Monitoring
		• Covering all disturbed areas including borrow areas, only in a case where there are to be rehabilitation • Dressing of slopes of road embankment • Reclamation of debris disposal areas. • Agricultural fields of farmers acquired temporarily land.		
B.4	**Dismantling of Construction & Demolition Wastes**			
B.4.1	Dismantling of old culverts/ bridges	• Demolition wastes from dismantling of culverts/bridges and will be collected and disposed as per the provision of Construction & Demolition Waste Rule 2016. • All necessary measures shall be taken especially while working close to cross drainage channels to prevent earthwork, stonework, materials and appendage as well as the method of operation from obstructing flow of streams, water channels and drainage systems. • Demolition wastes shall not be disposed in drainage channels, water bodies etc. • Demolition wastes will be collected and efforts shall be made to use demolition wastes in road construction works as per design provisions, filling, construction of side/approach roads, etc after approval of Authority Engineer.	Contractor	Authority Engineer /PIU
B.4.2	Generation & disposal of debris from dismantling of existing road	• Debris generated due to the dismantling of the existing road shall be suitably reused in the proposed construction after approval from Authority Engineer. • Scarified asphalts, dismantled road and the other construction wastes shall be appropriately re-used in road construction with the approval from Authority Engineer. • Surplus quantity of scarified bitumen wastes and other construction wastes shall be utilized for the road construction, paving of cross roads, access roads and paving works in construction sites and camps, temporary traffic diversions, or in any other manner approved by the Authority Engineer.	Contractor	Authority Engineer /PIU

S. No.	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning and Execution	Supervision/ Monitoring
		• The Contractor will suitably dispose of unutilized debris and waste materials subject to the approval of the Authority Engineer • All arrangements for transportation during construction including dismantling and clearing debris will be considered incidental to the work and will be planned and implemented by the Contractor as approved and directed by the Environmental Expert of Authority Engineer. • The pre-identified/designed disposal locations will be a part of Solid Waste Management Plan to be prepared by Contractor in consultation and with approval of Environmental Expert of Authority Engineer. • Debris generated from pile driving or other construction activities shall be disposed such that it does not flow into the surface water bodies or form mud puddles in the area.		
B.4.3	Disposal of construction debris	• Debris generated from construction of bridge and culverts will be collected and disposed in environmental sound manner.	Contractor	Authority Engineer /PIU
B.5	**Protection of Drainage and Surface Water Bodies**			
B.5.1	Construction of Bridges	• Construction of cofferdam for pier construction for bridges. • Collection and disposal of piling wastes away from river. • Precautions will be taken during construction of bridges which may cause contamination of the river water due to spillage of construction material, sediment loading & increased turbidity downstream of the bridge location. • Provision of silt fencing will be kept as required. • Debris generated from other construction activities shall be disposed such that it does not flow into the surface water bodies or form mud puddles in the area.	Contractor	Authority Engineer /PIU
B.5.2	Drainage and Control of Accumulation of Water	• Major bridges, minor bridges and culverts are proposed to be constructed in the proposed project: • The contractor shall ensure that natural drainage is not altered due to road construction, disposal of debris/surplus excavated materials, etc	Contractor	Authority Engineer /PIU

S. No.	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning and Execution	Supervision/ Monitoring
		• The Contractor shall ensure that no construction materials/debris shall block the water flow or create water lodging at the culvert and bridge construction sites. • The contractor shall take appropriate remedies to remove accumulated water (if any) from the construction sites, camp sites, storage yard, excavated areas etc. • On completion of construction or before onset of monsoon, debris from bridge and culvert construction sites shall be collected and drainage channels will be cleared properly. • Construction works should be planned well in advance prior to on-set of monsoon to avoid water- accumulation. • The contractor shall take necessary precautions to ensure that construction materials and excavated materials are enclosed in such a manner that erosion or run off in sediments are controlled. • Silt fencing shall be installed prior to the onset of the monsoon at the required locations, as directed by PIU/Authority Engineer.		
B.5.3	Siltation of Water Bodies and Degradation of Water Quality	• The project road is crossing natural streams at places, which remain dry in non-rainy days. • The Contractor will not excavate beds of any stream/ any other water body for borrowing earth for embankment construction. • The Contractor will construct silt fencing at the base of the embankment construction for the entire perimeter of any water body (including wells) adjacent to the project road and around the stockpiles at the construction sites including ancillary sites close to water bodies. • The fencing will be provided prior to commencement of earthwork and continue till the stabilization of the embankment slopes, on the particular sub-section of the road. • The contractor will ensure that construction materials containing fine particles are stored in an enclosure such that sediment-laden water/runoff does not drain into nearby watercourse. • On completion of construction of culverts and bridges, drainage channels will be cleared by collecting debris and disposed suitably.	Contractor	Authority Engineer /PIU

S. No.	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning and Execution	Supervision/ Monitoring
		Detours/diversions constructed for construction of culverts and bridges will be also be cleared before onset of monsoon.		
B.6	**Slope Protection and Control of Soil Erosion**			
B.6.1	Slope Protection and Control of Soil Erosion	• For construction of realignment, earth filling will be required for embankment for new road construction, which will require slope protection and control of soil erosion. • The Contractor will construct slope protection works as per design, or as directed by PIU/Authority Engineer to control soil erosion and sedimentation through use of Breast walls, Retaining Walls, gabion wall, dykes, sedimentation chambers, basins, fibber mats, mulches, grasses, slope, drains and other devices. • In the project road, slope protection and control of soil erosion in high embankment will be required at places as per details given in DPR and schedules. • Slope protection measures shall be provided along the project stretch in the form of: (1) Coco fibre/jute erosion control blanket with shrub/grass plantation, (2) Hydro seeding, (3) Interlink chain mesh with grass strips and (4) gabion wall near water bodies. • The tentative locations for above slope protection provisions are listed in Schedules for project road. Any additional locations shall be provided by Contractor after consultation with authority without any change in scope. • Additionally, the contractor shall consider use of vetiver grass to prevent /control soil erosion.	Contractor	Authority Engineer /PIU
B.7	**Access for Visually Impaired Persons**			
B.7.1	Tactile Tiles and Access Ramp	• The provision for tactile tiles and Access ramp to bus shelters for visually impaired people has been provided and taken in Schedule as per Section 12 of the IRC:SP 73: 2018	Contractor	Authority Engineer /PIU

S. No.	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning and Execution	Supervision/ Monitoring
B.8	**Longitudinal Drains Along Road Sections**			
B.8.1	Construction of longitudinal drains along the road	• Drainage arrangement of earthen drain and RCC drain in built up locations are proposed along the project road. • At the excavation site, warning sign boards will be displayed in Hindi and English languages. • Entry of general public/unauthorized person will be restricted in construction zone. • During excavation for laying of concrete (RCC) cover drains necessary safety measures will be taken by the contractor. • Excavation of 1.5 meters deep or greater requires a sides protection unless the excavation is made entirely in stable rock. • Contractor to follow strict protocol during excavation and construction for longitudinal drain especially along the sensitive receptors like schools, religious places, community buildings, etc. • Excavated earth will be collected and disposed in pre-identified site with the approval of Authority Engineer. Excavated earth shall not be temporarily dump on the carriageway or shoulders. • Casted drain blocks and drain covers will not be stacked on the road. • To ensure elimination of excavation hazards, excavation will be carried in the presence of competent person. • Suitable barricading will be provided around the excavation site. • Proper outfalls will be provided for roadside drains • Drains will be properly covered to avoid unsafe conditions to pedestrian. • Suitable personal protective equipment will be provided to the workers engaged in drain construction works.	Contractor	Authority Engineer /PIU
B.9	**Sensitive Receptors- Impact Management**			
B.9.1	Sensitive Receptors- Impact Management	• At each sensitive receptor like schools, religious places, community resources, etc and near general residential houses, the construction operations in these areas should be limited to time period of 7:30 am to 6:00 pm.	Contractor	Authority Engineer /PIU

S. No.	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning and Execution	Supervision/ Monitoring
		• Periodic maintenance and calibration of construction equipment's/ vehicles to meet applicable CPCB emission standards. • Contractor to ensure regular dust suppression measures by way of standard and efficient water sprinkling through water tankers at these designated sensitive receptors. • Silencers/mufflers fitted construction equipment shall be used to control noise from construction activities. • Construction materials and debris will not be stored or dump near the settlements/populated areas. Debris generated from road /drain construction will be collected and disposed on daily basis. • Adequate barricading and signages will be provided in settlement areas and near schools, religious structures, community buildings, etc.		
B.10	**Pollution Control**			
B.10.1	Control of Water Pollution	The following water pollution control measures will be taken by the contractor: • The contractor will take necessary precautionary measures to prevent entering of wastewater into streams and water bodies during construction. • Contractor will avoid construction works close to the streams or water bodies during monsoon. • Construction vehicles shall not be washed in river water and shall not enter riverbed for that purpose. • Any type of construction wastes will not be disposed in rivers or water bodies. • Workers shall not be allowed to litter/defecate, bath or washing of cloth in the water bodies crossed by the project road. • Proper fixed or portable toilets fitted with septic tank and attached to soak pit will be provided for workers at bridges/culverts sites.	Contractor	Authority Engineer /PIU
B.10.2	Control of Water Pollution from Fuel and Lubricants	• The Contractor will ensure that all construction vehicle parking locations, fuel/lubricants storage sites, vehicle, machinery and	Contractor	Authority Engineer /PIU

S. No.	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning and Execution	Supervision/ Monitoring
		equipment maintenance and refuelling sites will be located at least 250 m away from rivers and water streams. • The Contractor will submit locations and layout plans of such sites prior to their establishment and will be approved by the Environmental Expert of Authority Engineer. • The contractor will ensure that all vehicle/machinery and equipment operation, maintenance and refuelling will be carried out in such a manner that spillage of fuels and lubricants does not contaminate the ground and subsequently water channels. • Wastewater from vehicle parking, fuel storage areas, workshops, wash down and refuelling areas will be treated in an oil interceptor before discharging into on land. • At the construction camp, oil interceptor will be provided to collect used oil generated from the workshop. Details of oil interceptor are given in sub section of EMP. • Contractor will make arrangement for collection, storing and disposal of oily wastes to the pre-identified disposal sites as per guideline of State Pollution Control Board. • Oil spills and used oil from maintenance vehicles engines and of DG sets shall be disposed of in accordance with Uttar Pradesh Pollution Control Board (UPPCB) guidelines.		
B.10.3	Waste Water from Labour Camp	• Wastewater generated from the sanitary facilities at labour camps/construction camps/toilers at bridge construction sites will be treated in septic tank followed by soak pit. • No untreated raw sewage/waste water will be discharged into any river and water body. • Workers will not be allowed for open defecation in any circumstances. • Proper fixed or portable toilets fitted with septic tank and soak pit will be provided for workers at small labour camps for bridges construction sites.	Contractor	Authority Engineer /PIU
B.11	**Air Pollution**			

S. No.	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning and Execution	Supervision/ Monitoring
B.11.1	Control of Dust Pollution	• Road construction works specially earth work and movement of construction vehicles plying on the road during construction phase may add to dust and gaseous air pollution along the project road. • Frequent dust suppression like water sprinkling on the road will be ensured by the use of water tankers. • The contractor will procure the construction machineries, which conforms to the pollution control norms specified by the MoEF&CC/CPCB/UPPCB. • Regular maintenance of vehicles to be used for materials transportation and equipment will be carried and vehicular pollution check will be mandatory. • The excavated earth /construction materials will be stored properly so that it does not generate fugitive emissions. • Cement bags will be stored and emptied in covered area to control fugitive dust emissions. • While handling and emptying cement bags, workers will wear masks, hand gloves and protective goggles. • Mask and other PPE shall be provided as a mandatory effort to the construction workers in dust prone areas.	Contractor	Authority Engineer /PIU
B.11.2	Emissions from Construction Vehicles, Equipment and Machineries	• The contractor will ensure that all vehicles, equipment and machineries used for construction works will regularly maintained and conform that pollution emission levels and comply with the requirements of CPCB and/Motor Vehicles Rules. • Pollution under control certificate (PUC) will be obtained for the all vehicles engaged in the construction, • DG sets will be provided with chimney of adequate height as per CPCB guidelines (Height of stack in meter = Height of the building + 0.2 √KVA). • Environmental monitoring will be carried out as per the monitoring plan.	Contractor	Authority Engineer /PIU
B.12	**Noise Pollution**			

S. No.	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning and Execution	**Supervision/ Monitoring**
B.12.1	Noise Levels from Construction Vehicles and Equipment's	The contractor will ensure the followings to control the noise levels and its impact: • All construction equipment used in excavation, paving, concreting, etc, will strictly conform to the MoEF&CC/CPCB/UPPCB/BIS noise standards. • All vehicles and equipment used for construction works will be fitted with exhaust silencers/mufflers. • Maintenance and servicing of all construction vehicles and machineries will be done regularly. • Only acoustic enclosures fitted DG sets will be allowed at the construction site and labour camp. • At the construction sites within 250 m of the nearest habitation, noisy construction work and use of high noise generation equipment will be stopped during the night time between 6.00 pm to 7.30 am. • Working hours of the construction activities will be restricted around educational institutes/health centers (silence zones) up to distance of 100 m from the sensitive receptors. • Noise monitoring shall be carried out in construction areas through the approved monitoring agency.	Contractor	Authority Engineer /PIU
B.13	**Archaeological Resources and Cultural Properties**			
B.13.1	Chance Found Archaeological Property	• All fossils, coins, articles of value of antiquity, structures and other remains or things of geological or archaeological interest discovered on the site shall be the property of the Government and shall be dealt with as per provisions of the relevant legislation. • The contractor will take reasonable precautions to prevent his workmen or any other persons from removing and damaging any such article or thing. He/She will, immediately upon discovery thereof and before removal inform the Environmental Expert of the Authority Engineer/PIU of such discovery and carry out the PIU's instructions for dealing with the same, waiting which all work shall be stopped.	Contractor	Authority Engineer /PIU

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<tr><th rowspan="2">S. No.</th><th rowspan="2">Environmental Issues</th><th rowspan="2">Environmental Mitigation Measures</th><th colspan="2">Responsibilities</th></tr>
<tr><th>Planning and Execution</th><th>Supervision/ Monitoring</th></tr>
<tr><td></td><td></td><td>• The PIU will seek direction from the Archaeological Survey of India (ASI) before instructing the Contractor to recommence the work in the site.</td><td></td><td></td></tr>
<tr><td>B.13.2</td><td>Impacts Cultural Properties</td><td>• All necessary and adequate care shall be taken to minimize impact on cultural properties which includes cultural sites and remains, religious places, monuments and any other important structures as identified during design stage.
• Relocation and enhancement measures shall be taken up as per design and in consultation with local community.
• Access to such properties from the road shall be maintained clear and clean.</td><td>Contractor</td><td>Authority Engineer /PIU</td></tr>
<tr><td>B.14</td><td colspan="2">Personal Safety and Health</td><td></td><td></td></tr>
<tr><td>B.14.1</td><td>Personal Safety Measures for Labours and Staff</td><td>• The contractor will take necessary measures for the personal safety of workers during construction works:
•
• Protective safety shoes, gum boots, helmet/hard hat, hand gloves, protective goggles, safety belt, etc (as required) will be provided to the workers engaged in construction works including excavation, steel rebaring and bending, concrete works, etc.
• Welder's protective eye-shields will be provided to workers who are engaged in welding works in workshops and bridge construction sites.
• Earplugs/earmuff will be provided to the workers exposed to high noise levels.
• High visibility safety vests will be used by all workers when on construction sites.
• The contractor will comply with all regulations regarding safe scaffolding, ladders, working platforms, gangway, stairwells, excavations, trenches and safe means of entry and egress.
• The contractor will comply with all the precautions as required for ensuring the safety of the workmen as far as those are applicable to this contract.</td><td>Contractor</td><td>Authority Engineer /PIU</td></tr>
</table>

S. No.	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning and Execution	Supervision/ Monitoring
		• The contractor will make sure that during the construction work all relevant provisions of Building and other Construction Workers (regulation of Employment and Conditions of Services) Act, 1996 are adhered to. • The contractor will not employ any person below the age of 14 years for any work. • Contractor' environmental expert will carry out regular audit to identify unsafe conditions and necessary remedial measures will be taken to enhance safe working conditions in construction works.		
B.14.2	Emergency Management	• Emergency numbers will be displayed at the construction sites and camp sites, • First boxes will be made available at construction sites and camp sites, • Fire extinguishers for petroleum oil fire and electrical fire will be made available at camp sites, fuel storage sites, construction sites etc.	Contractor	Authority Engineer /PIU
B.14.3	Risk Force Measure	• The contractor will make required arrangements so that in case of any mishap during, operation of construction machinery/ vehicles, dismantling, excavation, concrete pouring, hot asphalt handling, etc all necessary steps can be taken for prompt first aid treatment. • Construction safety plan for the all the road stretches, embankment development, protection works, longitudinal drains, ancillary sites shall be prepared by the contractor and will identify necessary actions in the event of an emergency.	Contractor	Authority Engineer /PIU
B.14.4	First Aid Facility	• The contractor will arrange for first aid facility during construction works and at plants /camps sites: • A readily available first aid unit including an adequate supply of sterilized dressing materials, burn ointment and appliances as per the state rules will be maintained all the time by the contractor. • Availability of first aid trained persons will be ensured at the project site during construction phase. • Trained person for Cardio Pulmonary Resuscitation (CPR) at construction camps and bridge construction sites will be available.	Contractor	Authority Engineer /PIU

S. No.	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning and Execution	Supervision/ Monitoring
		• Availability of suitable transport will be ensured all times to take injured or sick person(s) to the hospital. • Designated vehicles, which can be used as ambulance will be available at construction site at all the time.		
B.14.5	Occupational Health and Safety of Workers	• The contractor will prepare and follow the Occupational Health and Safety (OHS) plan, including provisions for emergency response plan. • Daily toolbox talks and regular training programs will be conducted for workers on Occupational Health & Safety (OHS) aspects. • All workers will be provided with requisite personal protective equipment. • Before deployment of workers at hot mix plant, WMM and Batching plants health check will be carried out. • Emergency Telephone Numbers shall be displayed at camp and plant site. • Necessary medical facilities shall be provided for workers at Labour camp and plant sites.	Contractor	Authority Engineer /PIU
B.15	**Labour/Construction Camp and Project Site Management**			
B.15.1	Labour Camp	• Proper barricading and boundary walls will be provided around the labour camp. • Project information board will be displayed at the labour camp site. • Emergency numbers and layout plan will be displayed at the entrance of camp site. • Electrical cables and wires will be properly arranged with proper electrical safety. Loose electrical connections will not be allowed at the labour camp. • Red danger sign with bone & skull will be displayed as per The Electrical Rules at three phase motors, electrical panels and electrical machines, DG sets, etc. • Housekeeping at labour camp will be maintained satisfactory. Daily sweeping and cleaning will be done at the labour camp. • HIV Aid awareness posters will be displayed at the camp site.	Contractor	Authority Engineer /PIU

S. No.	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning and Execution	Supervision/ Monitoring
		• Solid waste generated at the camp site will be collected in covered waste bins. Then, it will be segregated as biodegradable (food waste, paper, etc) and non-biodegradable (plastic, polyethylene bag, etc) wastes. Polyethylene/plastic wastes will be stored and to be sent for recycling through scrap dealer. Biodegradable (food waste, etc) solid waste will be disposed in compost pit. Non-biodegradable inert wastes will be sent to nearest land fill site. • Drinking water, well ventilated accommodation with beds, sanitation, canteen facilities will be provided to workers at the labour camp. • Waste water and sewage accumulation will be not be allowed at and around the labour camps. • First aid facilities will be provided at the labour camp. • Wood shall not be used for cooking food for workers. LPG cylinder will be arranged and kept with proper safety. • Suitable signages will be displayed at labour camps. • There will be separate accommodation, toilet and bathrooms in case female worker are staying or working at labour camp.		
B.15.2	Accommodation for Laborers	• Contractor will follow all relevant provisions of 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 labour camp will be submitted to Environmental Expert of Authority Engineer/PIU prior to their construction. • The construction will commence only upon the written approval of the Environmental Expert of Authority Engineer/PIU. • The contractor will provide necessary well ventilated living accommodation, toilets, bath rooms and ancillary facilities functional and in hygienic manner. • Proper ventilation along with standard exhaust fans will be provided in labour accommodation rooms. • Regular cleaning and sweeping will be ensured at the labour camp site.	Contractor	Authority Engineer /PIU

S. No.	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning and Execution	Supervision/ Monitoring
		• Systematic waste collection management at labour /construction camps shall be managed as per Solid Wastes Management Rules 2016. • Standard first aid box including an adequate of sterilized dressing materials. • Mosquito nets shall be provided to all workers in the camps.		
B.15.3	HIV/AIDS Prevention Measures	• Necessary HIV/AIDS prevention measures will be taken at labour camp. • HIV/AIDS awareness program will be organized by the contractor's Environmental Officer.	Contractor	Authority Engineer /PIU
B.15.4	Potable Water for Workers	• The contractor will provide potable water facilities within the precincts of workplace, bridges/culverts construction sites and labour/construction camps at an accessible place, as per standards set by the Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996. • If water storage tank is provided, same will be kept such that the bottom of the tank is at least 1 meter above the surrounding ground level. • If water is drawn from any existing well/ hand pump, which is within 30 meters proximity of any toilet, drain or other source of pollution, the handpump/well water will be disinfected before it is used for the drinking. • Environmental Expert of Authority Engineer/PIU will inspect the labour camp once in a week to ensure the compliance of the EMP.	Contractor	Authority Engineer /PIU
B.15.5	Sanitation and Sewage System at Labour Camp	The contractor will ensure that: • The sewage system for the camp will be designed, built and operated in such a manner that no health hazard occurs and no pollution to the air, soil, ground water or adjacent water courses takes place, • Separate toilets/bathrooms, as required, will be provided for male and female, marked in vernacular language, • Toilets will be provided with septic tank followed by soak pit. • Adequate water supply will be provided in all toilets and urinals,	Contractor	Authority Engineer /PIU

S. No.	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning and Execution	Supervision/ Monitoring
		• Night soil can be disposed of with the help of municipality or will be disposed of in a earthen pit to produce manure.		
B.15.6	Solid Wastes Collection and Disposal	• The contractor will provide garbage bins in the camp & construction site and ensure that these are regularly emptied and disposed of in a hygienic manner according to Solid Waste Management Plan as per Solid Waste Management Rule 2016. • Burning of solid wastes at construction site & labour camp, road-side or at any other places will not be allowed. • Solid waste generated at the construction site & labour camps, will be collected in covered waste bins and segregated as biodegradable (food waste, paper, etc) and non-biodegradable (plastic, polyethylene bag, etc) wastes. Polyethylene/plastic wastes will be stored suitably and to be sent for recycling through scrap dealer. Biodegradable (food waste, paper, etc) solid waste will be disposed in the compost pit.	Contractor	Authority Engineer /PIU
B.16	**Environmental Monitoring**			
B.16.1	Environmental Monitoring-Construction Stage	• Environmental monitoring for ambient air quality, noise levels and ground and surface water quality will be carried out through NABL accredited laboratory as per environmental monitoring plan and in accordance to instruction of Environmental Expert of Authority Engineer/PIU.	Contractor	Authority Engineer /PIU
C.	**Sites Clean-up and Restoration (On Contractor's Demobilization)**			
C.1	Clean-up Operations, Restoration and Rehabilitation	• The contractor will prepare site restoration plan for construction work sites and labour/construction camp sites, which will be approved by the PIU / Environmental Expert of Authority Engineer. • The clean-up and site restoration works shall be implemented by the contractor prior to demobilization from construction site and labour/construction camps. • The contractor will clear all temporary structures, debris, construction wastes, garbage, night soils, etc in environmental sound manner. • All disposal pits or trenches will be filled in and effectively sealed off. • All construction places including camps and any other area used/affected due to the construction works will be left clean and tidy	Contractor	Authority Engineer /PIU

S. No.	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning and Execution	Supervision/ Monitoring
		at the contractor's expense to the entire satisfaction to the PIU/ Environmental Expert of Authority Engineer.		
C.2	Land Rehabilitation	• All surfaces hardened due to construction activities will be ripped & imported materials thereon removed and disposed in environmental sound manner. • All rubbles to be removed from the sites shall be disposed in approved disposal site. Burying of rubble on site is prohibited. • Land surfaces of works sites and camps sites shall be checked for waste materials from activities such as concreting or asphalting and cleared in a manner approved by the PIU/ Environmental Expert of Authority Engineer. • All embankments will be trimmed, shaped and replanted to the satisfaction of the PIU.	Contractor	Authority Engineer /PIU
C.3	Borrow Area Rehabilitation	• Borrow pits shall be closed and rehabilitated in accordance with the pre-approved Borrow Area Rehabilitation and management plan for each borrow area. • The contractor shall maintain record of borrow areas used for the subproject keeping photographs of before after its rehabilitation. • IRC guidelines shall be followed for rehabilitation of borrow areas. Borrow areas shall be rehabilitated by levelling of land for agriculture or other purpose, developing fish or water harvesting ponds, etc as per owner choice and satisfaction.	Contractor	Authority Engineer /PIU
D	**Post Construction Stage**			
D.1	Environmental Monitoring- Post Construction Stage	Environmental monitoring for ambient air quality, noise levels and water quality as per environmental monitoring plan and in accordance to instruction of Environmental Expert of PIU.	PIU	PMU
D.2	Monitoring of bio-engineering and landscaping	• Regular monitoring of bio-engineering measures and landscaping shall be carried for its performance and survival rate. • Provision will be made for manure application and watering as required.	PIU	PMU

S. No.	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning and Execution	Supervision/ Monitoring
D.3	Soil Erosion and Monitoring of Borrow Areas	• Visual monitoring and inspection of erosion of slopes, conditions of slope stabilisation measures will be carried regularly. • Frequency of monitoring and inspection will be increased during monsoon season.	PIU	PMU

Note: Management measures for labour influx management, labour-management procedures and Gender Based Violence (GBV) have been covered in SIA.

9.4 Oil Interceptors

Oil and grease from workshop and fuel storage at construction camp are major concern during construction. During construction, discharge of oil and grease is most likely from workshops, oil and waste oil storage locations, vehicle parking areas of the contractor camps. Therefore, Oil Interceptors has been considered at construction camp. The arrested spilled/used oil shall be disposed as per MoEF&CC and CPCB guidelines. However, number of interceptors will be increased as the situation demands. Actual number of oil interceptor will be decided by the Contractor with the consent of Authority Engineer. Drawing of typical oil interceptor is given in **Figure 9.1** below:

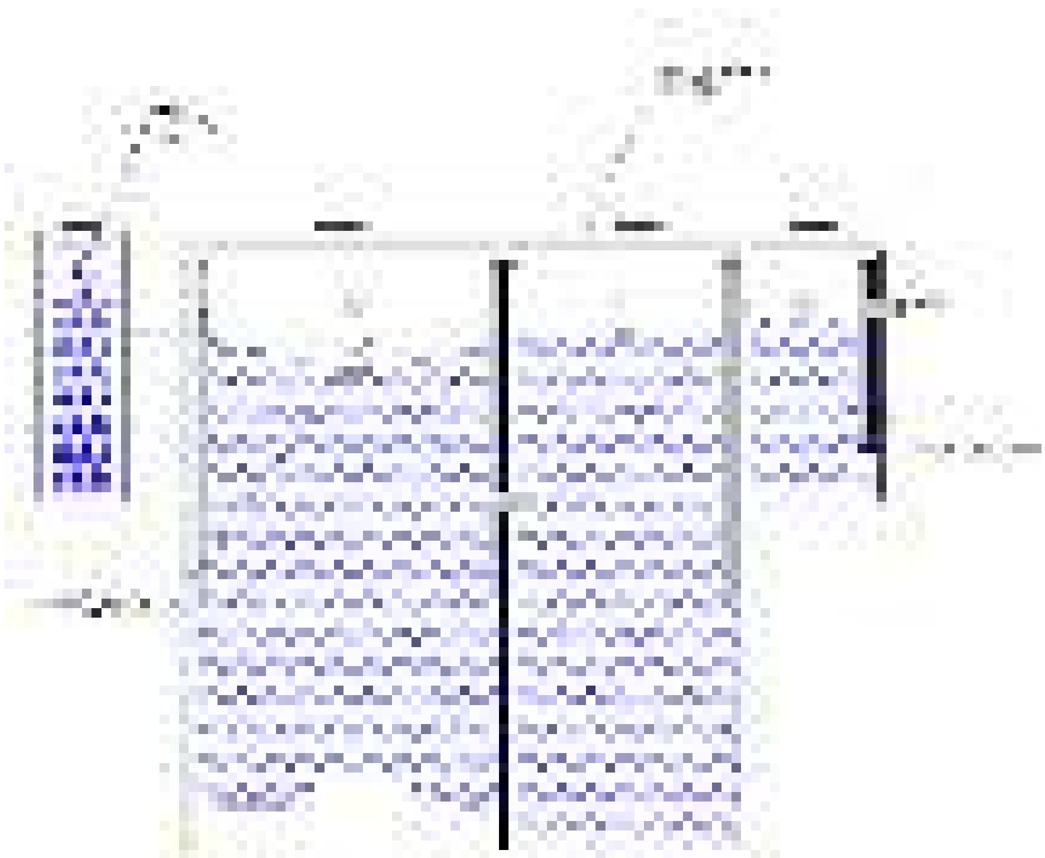


Figure 9.1 : Typical Design of Oil Interceptor

9.5 Rain Water Harvesting/Recharge Recharging

Due to constrain of availability of land within the ROW, ground water recharge pits have been proposed mainly along the proposed realignment section to improve the water table along the project road. Although, as per CGWB data, the water table of the area is generally good.

Ground water recharge pit / rainwater harvesting structure have been proposed at 27 locations as given below:

Package 1: 7 numbers of RWH pits proposed
Package 2: 11 numbers of RWH pits proposed
Package 3: 3 numbers of RWH pits proposed
Package 4: 6 numbers of RWH pits proposed

The package-wise details of RWH pits proposed along the entire project stretch is given in **Table 9.2** below:

Table 9.2: Details of Proposed RWH Pits

S.N.	Chainage (km.)	Side	Number of locations	Remarks
Package-1				
1.	30+000	RHS	4	Building at Toll Plaza
2.	30+000 to 30+700	RHS	3	Rigid Pavement at Toll Plaza
3.	06+140	RHS	1	Culvert
4.	20+090	RHS	1	Culvert
5.	22+620	RHS	1	Culvert
6.	22+760	RHS	1	Culvert
7.	26+650	RHS	1	Culvert
Package-2				
1.	90+800	RHS	4	Building at Toll Plaza
2.	90+800 to 91+500	RHS	3	Rigid Pavement at Toll Plaza
3.	61+060	RHS	1	Culvert
4.	82+750	RHS	1	Culvert
5.	87+350	RHS	1	Culvert
6.	101+400	RHS	1	Culvert
7.	103+100	RHS	1	Culvert
8.	103+830	RHS	1	Culvert
9.	104+225	RHS	1	Culvert
10.	107+410	RHS	1	Culvert
11.	109+380	RHS	1	Culvert
Package-3				
1.	115+620	RHS	1	Culvert
2.	124+850	RHS	1	Culvert
3.	125+070	RHS	1	Culvert
Package-4				
1.	152+380	RHS	4	Building at Toll Plaza
2.	152+380 to 153+100	RHS	3	Rigid Pavement at Toll Plaza
3.	138+510	RHS	1	Culvert
4.	176+530	RHS	1	Culvert
5.	169+190	RHS	1	Culvert

6.	164+320	RHS	1	Culvert

Source: Detailed Project Report

Above locations of the proposed ground water recharge pits will be reviewed by the Environmental Specialist of the Authority Engineer in view of hydro geological investigation in the area. These locations should be permanent and part of maintenance of the project road.

Typical drawing of ground water recharge pit / rainwater harvesting structure is given in **Figure 9.2:**

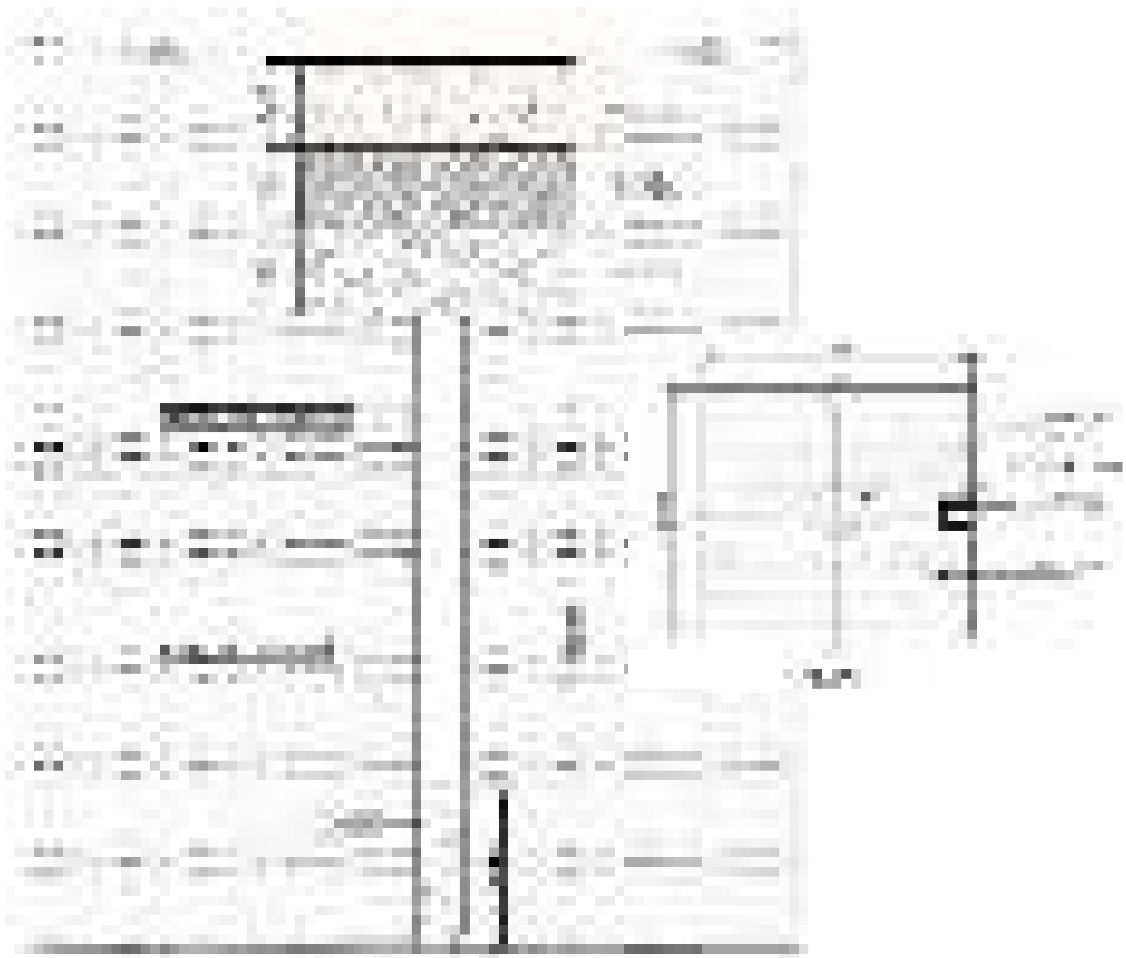


Figure 9.2: Typical Drawing of Ground Water Recharge Pit

9.6 Disposal of Bituminous Wastes

The bituminous waste will be used at the construction camps, approach roads, for filling potholes in nearby village roads.

Non reusable bituminous waste will be dumped in 30 cm thick clay lined pits with the top 30 cm layer covered with good earth for supporting vegetation growth over a period only after obtaining approval of the Authority Engineer. Typical drawing of bitumen disposal pit is shown in **Figure 9.3.**

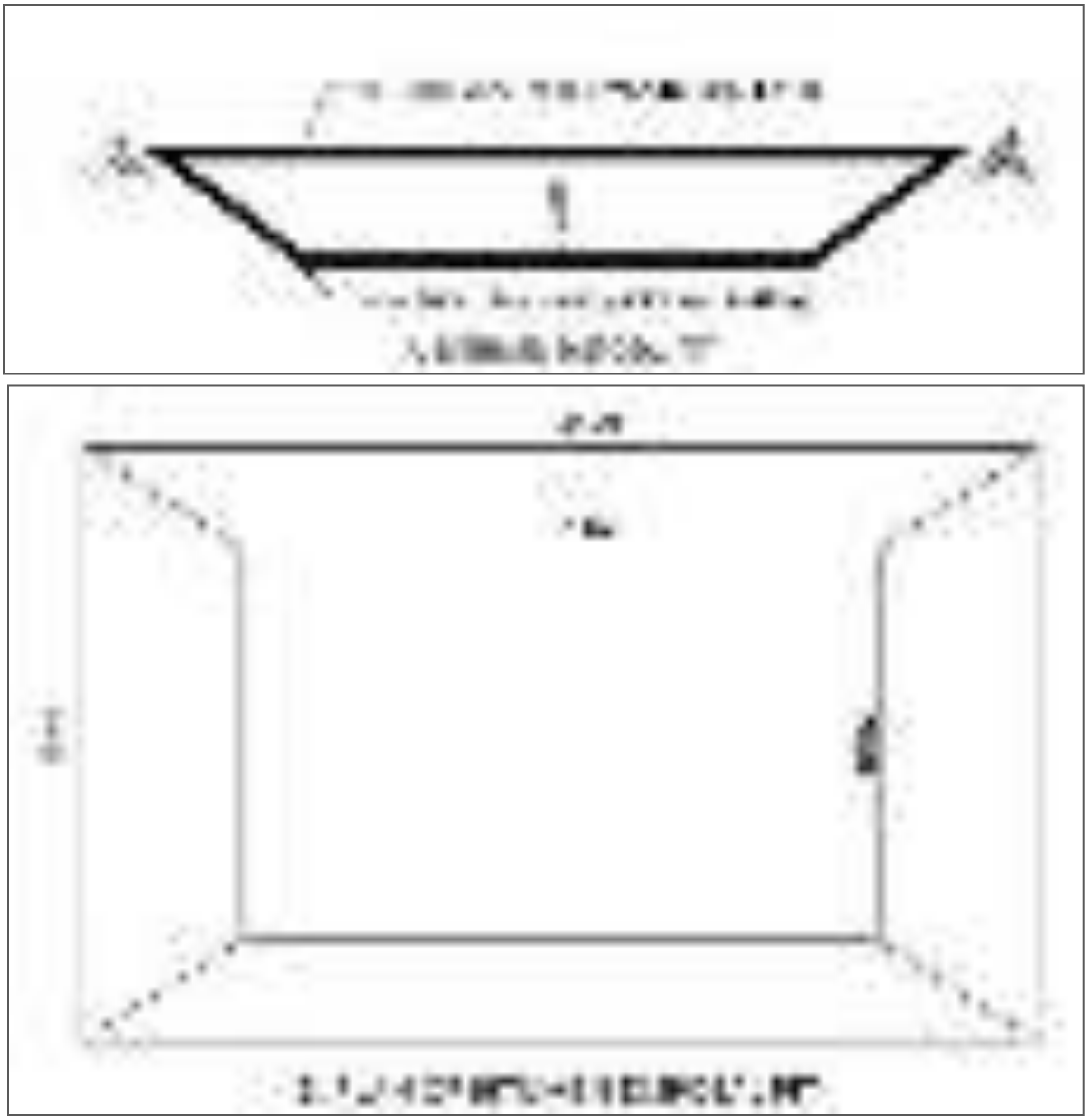


Figure 9.3: Typical Drawing of Bitumen Disposal Pit

9.7 Clause for Nonconformity to Environmental Management Plan (EMP) - Protection of the Environment

The Contractor will implement necessary mitigation measures for which responsibility is assigned to him as stipulated in the EMP. Any lapse in implementing the same will attract the damage clause as detailed below:

- Any complaints of public, within the scope of the Contractor, formally registered with the PIU and communicated to the Contractor, which is not properly addressed within the time period intimated by the PIU shall be treated as a major lapse.
- Non-conformity to any of the mitigation measures like unsafe conditions, non-collection of excavated material (during laying of drainage pipes) regularly and other

unattended Health, Safety & Environment (HSE) issues, as stipulated in the EMP Report (other than stated above) shall be considered as a minor lapse.

- On observing any lapses, PIU shall issue a notice to the Contractor, to rectify the same.
- Any minor lapse for which notice was issued and not rectified, first and second reminders shall be given after ten days from the original notice date and first reminder date respectively. Any minor lapse, which is not rectified, shall be treated as a major lapse from the date of issuing the second reminder.
- If a major lapse is not rectified upon receiving the notice PIU shall invoke reduction, in the subsequent interim payment certificate.
- For major lapses, 10% of the interim payment certificate will be withheld, subject to a maximum limit of about 0.5% of the contract value.
- If the lapse is not rectified within one month after withholding the payment, the amount withheld shall be forfeited immediately.
- To modify the mitigation measures or implementing additional measures, if required

9.8 Performance Monitoring Indicators

Environmental components identified of significance in affecting the environment at critical locations have been suggested as Performance Indicators. For example, near the construction site, a thick layer of dust over the nearby vegetation/leaf is an indication that the dust control measures are not effective. The performance indicators will be evaluated under three heads as mentioned below:

- Environmental condition indicators to determine efficacy of environmental mitigation measures for controlling air, noise and water pollution.
- Environmental management indicators to determine compliance with the suggested environmental management measures.
- Operational performance indicators have also been devised to determine efficacy and usefulness of the proposed mitigation measures for the project road.

The performance indicators and monitoring plan prepared for the project road are presented in **Table 9.3**. Details of the performance indicators parameters for each of the component have to be identified and reported during all stages of the implementation.

Table 9.3: Performance Indicators and Monitoring Plan

Sn.	Description of Item	Indicator	Stage	Responsibility
1.	Identification and verification of the earth borrow areas and stone quarries	Compliance of site selection criteria	Preconstruction	Contractor
2.	Identification of locations for the construction camp and construction plants sites	Compliance of site selection criteria	Preconstruction Phase	Contractor
3.	Progress on the tree cutting	Tree Cutting numbers	Preconstruction Phase	PIU/PMU
4.	Location of the temporary storage areas for excavated	Storage of excavated	Preconstruction and	Contractor

Sn.	Description of Item	Indicator	Stage	Responsibility
	materials to be reused in road construction, embankment and sub grade.		Construction Phase	
5.	Implementation of mitigation measures specified in the EMP	Prevention/ Control of Pollution	Construction Phase	Contractor
6.	Environmental monitoring as per the conditions stipulated in the consents / as described in environmental monitoring plan	Environmental conditions at construction Sites/plants/ camps	Construction Phase	Contractor
7.	Environmental monitoring in accordance with the frequency and duration of monitoring as well as the locations as per the monitoring plan. Before the onset of monsoon all the debris/excavated materials will be cleaned from the work sites and disposed of temporarily stock piled debris for final disposal properly away from the water bodies.	Ambient Air Quality, Ambient Noise Level, Ground and Surface Water Quality, Silting of Water bodies	Construction Phase	Contractor through External agency and will be supervised by the Environmental Expert of Authority Engineer/PIU / PMC
8.	Monitoring of work zone safety	Use of PPEs and signages.	Construction Phase	Contractor and will be supervised by the Environmental Expert of Authority Engineer / PMC
9.	Implementation of the enhancement measures suggested for the pond redevelopment areas, cultural/community properties	Enhancements/ Shifting	Construction Phase	Contractor
10.	Reporting of accidents at work sites/road construction sites	Accidents Reporting	Construction Phase	Contractor
11.	Plantation of shrubs and grass and bio-engineering measures on high embankment/ enhancement sites	Landscaping	Construction and Defect Liability Period	Contractor
12.	Compensatory tree plantation and reporting of the survival rate. The survival rate should	Tree Plantation and Survival Rate	Construction and Post operation Stage	Forest Department and PMU/PIU

Sn.	Description of Item	Indicator	Stage	Responsibility
	be monitored and reported on quarterly basis.			
13.	Inspection and verification of the borrow area redevelopment as specified in the redevelopment plan and satisfaction of the owners/IRC guidelines	Status of Borrow Areas	Construction and Post operation Stage	Contractor & PMU/PIU
14.	Site restoration/de-mobilization of camps and plant on completion of works	Clean-up and restoration of the sites.	De-mobilization	Contractor and will be supervised by the Environmental Expert of Authority Engineer / PMC

9.9 Environmental Monitoring Plan

The monitoring programme consists of performance indicators, reporting formats and necessary budgetary provisions. The contractors monitoring plan should be in accordance with the baseline environmental monitoring, locations provided in the environmental impact assessment report.

The monitoring plan has the following objectives:

- To ensure effectiveness of implementation of EMP
- To evaluate the performance of mitigation measures proposed in the EMP
- To comply with all applicable environmental, safety, labour and local legislation, and
- To ensure that public opinions and obligations are taken into account and respected to the required satisfaction level

9.9.1 Monitoring Parameters and Standards

The environmental monitoring parameters and National Ambient Air Quality Standards are discussed below:

9.9.2 Ambient Air Quality Monitoring (AAQM)

The ambient air quality parameters viz: Sulphur Dioxide (SO_2), Nitrogen Dioxide (NO_2), Carbon Monoxide (CO), Particulate Matters (PM_{10}, $PM_{2.5}$), shall be monitored six monthly at identified locations from the start of the construction activity. The ambient air quality parameters shall be monitored in accordance with the National Ambient Air Quality Standards as given in **Table 9.4**. The duration and the pollution parameters to be monitored and the responsible institutional arrangements are detailed out in the Environmental Monitoring Plan.

Table 9.4: National Ambient Air Quality Standards

Sl. No	Pollutant	Time Weighted Average	Concentration in Ambient Air		
			Industrial, Residential, Rural & other areas	**Ecologically Sensitive Area (Notified by Central Government)**	**Methods of Measurement**
1	Sulphur Dioxide, (SO_2), µg/m³	Annual* 24 hours**	50 80	20 10	-Improved West and Gaeke -Ultraviolet fluorescence
2	Nitrogen Dioxide, (NO_2) µg/m³	Annual* 24 hours**	40 80	30 80	-Modified Jacob & Hochhieser (Na-Arsenite) -Chemiluminescence
3	Particulate Matter(size less than 10 µm), or PM_{10} µg/m³	Annual* 24 hours**	60 100	60 100	-Gravemetric -TOEM -Beta attenuation
4	Particulate Matter(size less than 2.5 µm), or $PM_{2.5}$ µg/m³	Annual* 24 hours**	40 60	40 60	-Gravemetric -TOEM -Beta attenuation
5	Carbon Monoxide (CO), µg/m³	8 hours* 1 hours**	02 04	02 04	-Non Dispersive Infra Red (NDIR) spectroscopy

*Annual arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals **24 hourly or (8 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.*

9.9.3 Noise Quality Monitoring

The noise levels shall be monitored at designated locations in accordance with the Ambient Noise Quality standards given in **Table 9.5**. The duration and the noise pollution parameters to be monitored and the responsible institutional arrangements are detailed in the Environmental Monitoring Plan**.**

Table 9.5: National Ambient Noise Quality Standards

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

Daytime shall mean from 6:000m to 10:00 pm and Night shall mean from 10:00 pm to 6:00 am
***Silence zone is defined an area up to 100 meters around premises of hospitals, educational institutions and courts, Use of vehicles horns, loud speakers and bursting of crackers are banned in these zones*

9.9.4 Water Quality Monitoring

Water quality parameters such as pH, BOD, COD, DO coli form count, total suspended solids, total dissolved solids, Hardness, Conductivity etc. shall be monitored at identified locations during the construction stage as per standards prescribed by Central Pollution Control Board specifications presented in **Table 9.6** The duration and the pollution parameters to be monitored and the responsible institutional arrangements are detailed out in the Environmental Monitoring Plan.

Table 9.6: Surface Water Standards

S. No	Parameters	IS:2296 (Class C)	Method Adopted
1.	pH	6.5-8.5	pH meter
2.	BOD (3 day, 27^0C)	3.0	DO-Azide modification of Wrinkler's Method
3.	Temperature (^{0}C)	NS	Thermometer
4.	Dissolved oxygen	4	Azide modification of Wrinkler's method
5.	Color (Hazen)	300	Visual Comparison method
6.	Chloride (Cl)	600	Argentometric Titration
7.	Total Dissolved Solids	1500	Gravimetric Analysis
8.	Sulphates (SO_4)	400	Barium Chloride method
9.	Oil and Grease	0.1	Partition -Gravimetric method
10.	Nitrates	50	Chromotropic acid
11.	Total Coliform (MPN/100 ml)	5000	Multiple Tube Fermentation Technique

NS: Not specified. All the values in mg/l if otherwise mentioned

9.10 Monitoring Plans for Environment Conditions

For each of the environmental components, the environmental monitoring plan specifies the parameters to be monitored; location of the monitoring sites and duration of monitoring. The monitoring plan also specifies the applicable standards, implementation and supervising responsibilities. The monitoring plan for the various environmental condition indicators of the project in construction stages is presented in **Table 9.7**. Monitoring plan does not include the requirement of arising out of regulation provision such as obtaining Consents for plant site operation.

Table 9.7: Brief Description of Measures

Sl. No.	Locations of Work Site	Site Safety Measures
1	Construction Sites	Caution boards, Safety Cones, Delineators
2	Deep Cutting	The construction zone should be barricaded with G.I Sheet or arrangement to be made as per plan approved by the PIU / PMU. [Provide Safety Sign Boards and Safety Barriers marked with reflective tapes]
3	Temporary Diversion (if any)	Diversion Board, Barricading [Provide ‘Diversion Ahead’ boards at 50m, 100m and 150m ahead of diversions with

		reflective tape for illumination at night at the all diverted locations]
4	Safety for the Workers	Helmets, Safety-Shoes, Goggles, Dusk mask. etc

Furthermore, periodical site monitoring should be carried out by the Environmental Expert of PIU for surveillance & monitoring of road safety during the road construction. The brief description of measures has been given in **Table 9.8**:

Table 9.8: Environmental Monitoring Plan

Attribute	Timing	Parameter	Standards	Frequency	Duration	Location	Implementation
Ambient Air	Construction	$PM_{2.5}$, PM_{10}, SO_2, NO_2 & CO	National Ambient Air Quality Standards (NAAQM) 2009	Two samples for one week (on non consecutive days) for in winter and summer seasons (six monthly).	24 Hours Sampling, 2 Samples in on Week	Construction labour camps, plants sites and settlements along the work zones (Locations will be decided by Environmental Expert of Authority Engineer /PIU)	Contractor
Ground Water	Construction	Organoleptic and Physical, Chemical & Bacteriological Parameters	Potable Water Standards (IS 10500: 2012)	Winter and Summer Seasons	Grab Sampling Once	Construction labour camp, plants sites, settlements along the work zones (locations will be decided by Environmental Expert of Authority Engineer /PIU)	Contractor
Surface Water	Construction	pH, Total Suspended Solids (TSS), Total Dissolved Solids (TDS), BOD, COD, Oil & Grease (O&G) and Turbidity	Indian Standards (IS:2296-1982) for inland surface waters	Winter and Summer Seasons	Grab Sampling Once from	Construction labour camp, plants sites, River and Ponds (locations will be decided by Environmental Expert of Authority Engineer /PIU)	Contractor
Noise	Construction	Level Equivalent L_{Day} and L_{Night} based on hourly Noise Measurements	Ambient Noise Standards	Winter and Summer Seasons	Hourly noise measurements for one day in winter and summer seasons	Construction labour camp, plants sites, settlements along the work zones (locations will be decided by Environmental Expert of Authority Engineer /PIU)	Contractor

9.11 Environmental Reporting System

The environmental reporting system for the suggested monitoring programme will function at two levels:

- Reporting for environmental condition indicators and environmental management indicators
- Reporting for operational performance indicators at the PMU/PIU level. Environmental monitoring involves regular checking of the environmental management issues detailed in the EMP and to ascertain whether the mitigation measures are achieving desired objectives for environmental protection, with the progress of the works. It provides the necessary feedback for the project management to keep the programme on schedule for achieving the expected outcomes.

The contractor, Authority Engineer /PMC and PIU/PMU will operate the reporting system for environmental conditions and environmental management indicators. The reporting schedule for contractors and Authority Engineer have been prepared, which are on the basis of the implementation of EMP by the Contractor and monitoring by the Authority Engineer /PMC and PMU/PIU.

The reporting system will start with the Contractor who is the main executor of the implementation EMP activities. The Contractor will report to the Authority Engineer /PMC, who in turn will report to the PMU/PIU. The reporting system will comprise the following:

- The contractor will submit monthly environmental compliance reports along with formal monthly project progress report to the Authority Engineer
- The Authority Engineer will submit separate quarterly environmental monitoring reports to PMU/PIU in addition to submission of the summary of the activities of the month in the formal monthly report including any deviations and corrective actions
- PMU/PIU will be responsible for the preparation of the targets for identified non compliances for the EMP compliance
- Solutions for further effective implementation may also emerge as a result of the compliance monitoring reports.

The photographic records will be kept providing useful environmental monitoring tools. All material sources points, disposal locations, plants locations, camp locations, crusher locations etc will be photographed (for before and after conditions) and kept as a record will be part of progress report. A full record of construction activities and EMP implementation will be kept as part of normal contract monitoring system. The reporting and monitoring systems for various stages of construction and related activities have been proposed in **Table 9.9**.

Table 9.9: Environmental Reporting System

Item	Contractor	Construction Supervision Consultant (Authority Engineer /PMC)		PMU/PIU	
	Implementation and Reporting to Authority Engineer /PMC	Supervision	Reporting to PMU/PIU	Oversee Compliance Monitoring	Report to World Bank
Pre-construction Stage					
Sites of Camps and Plants	Weekly	Weekly	Monthly	Monthly	Quarterly
Locations of Borrow Area	Weekly	Weekly	Monthly	Monthly	Quarterly
Location of Stone Quarry	Weekly	Weekly	Monthly	Monthly	Quarterly
Shifting of Community/ Cultural Structures	Weekly	Weekly	Monthly	Monthly	Quarterly
Tree cutting and Clearing of Vegetation	Weekly	Weekly	Weekly	Weekly	Monthly
Construction Stage					
Monitoring of construction site and construction camp	Regular	Regular	Monthly	Monthly	Quarterly
Pollution Monitoring	Six Monthly	As required	In Monthly Report	In Quarterly Report	In Quarterly Report
Monitoring of Enhancements	Weekly	Weekly	Monthly	Monthly	Quarterly
Top soil preservations	Weekly	Weekly	Monthly	Monthly	Quarterly
Borrow area/ quarry area/ debris disposal area	Weekly	Weekly	Monthly	Monthly	Quarterly
Bio-engineering and landscaping	Monthly	Monthly	Monthly	Monthly	Quarterly
Site Restoration Demobilization of Plants					
Clean-up of plants & camps sites and Restoration of Sites	Monthly	Monthly	Monthly	Monthly	Quarterly

9.12 Institutional Arrangements for Environmental Management

The environmental management requirements/guidelines/plans need to be applied and implemented at all stages of the project. This requires an institutional mechanism to deal with various processes and requirements at each stage. Within the institutional framework proposed for the project, preparation, implementation, supervision and monitoring of environment functions, particularly the Environment Management Plans (EMP), will be carried out at the three levels - national center, state level and the project/community level with an inbuilt mechanism for coordinating activities between the said levels.

Implementation Structure

The Externally Aided Projects Cell (EAP-Cell) at MoRTH, supported by a Project Management Consultants (PMC), will have the overall project implementation responsibility.

At the central level, the Chief Engineer, Externally Assisted Projects (CE, EAP), MoRTH, Govt. of India will be responsible for the over-all implementation of EMF and EMP. The CE, EAP will have all delegated administrative and financial decisions regarding the implementation of the project as well as environment management and safeguard related functions. CE (EAP) will be assisted by a team comprising Executive Engineer (EE) designated as an Environment and Social Officer (ESO) and a suitable number of technical and secretarial staff. The EE will ensure that all project activities are complied with as per the EMF and EMP.

MoRTH will engage a Project Management Consultant (PMC), which will include an Environment Specialist, to work with the CE, EAP's team. The PMC will be responsible for training, guidance, and recommendations for handling policy and implementation issues at the state and sub-project levels to comply with the EMF and requirements laid out in the EMP.

At the state level, the National Highways (NH) divisions in the state Public Works Department will be responsible for the project execution. In Project Co-ordination Unit, there will be an Environment Officer who will coordinate the preparation/implementation of EMP. He/she will ensure that these comply with requirements laid out in the EMF for GNHCP and are implemented in accordance to provisions laid out in the contract documents.

Finally, for the project road, a Project Site Team (PST) or Project Implementation Unit (PIU) will be responsible. The PST, to be headed by Executive Engineer, will oversee day to day implementation of environment, health and safety plan, including on issues pertaining to tree cutting, plantation works, utility relocation and worksite safety management.

Supervision consultant/ Authority Engineer to be engaged by MORTH will provide the regular supervision and administration services. The Authority Engineer's team will have

Environment and Safety personnel for day-to-day supervision and monitoring. The Environmental and Safety Officer on the Contractor's team must ensure compliance with the environmental contractual clauses and will report on progress or challenges to the Construction Supervisory team, as per the requirements/obligations stated in the Contract Document.

Independent Quality Assurance Consultants (QAC) would be engaged to oversee the quality of the green national highway upgrading contracts, including environment management, health and safety related aspects. This will determine whether the project is complying with regulatory performance standards. It entails a systematic, documented and periodic review of project implementation and could be a useful tool to improve project management performance on EHS aspects.

Environmental and Safety Officer (ESO)

For effective implementation and management of the EMP, the Contractor will depute an Environmental & Safety Officer (ESO) to deal with the environmental issues of the project. The subproject will be divided in package for construction purpose and separate contractor will be deployed and mobilised for each construction packages. Each contractor will deploy one Environmental and Safety Officer (ESO) to look after day to day implementation of EMP/mitigation measures and reporting. However, contractor may deploy two officers, separately for Environmental Management and Safety.

9.13 Grievance Redressal Mechanism

Grievance Redressal Mechanism (GRM) arrangements to address public/workers' grievances have been described in SIA.

9.14 Environmental Management – Budget

Implementation of Environmental Management

The environmental budget for the various environmental management measures proposed for construction and post operation of the project road is detailed in **Table 9.10**. There are several other environmental issues that have been addressed as part of good engineering practices, the costs for which have been accounted for in the engineering cost.

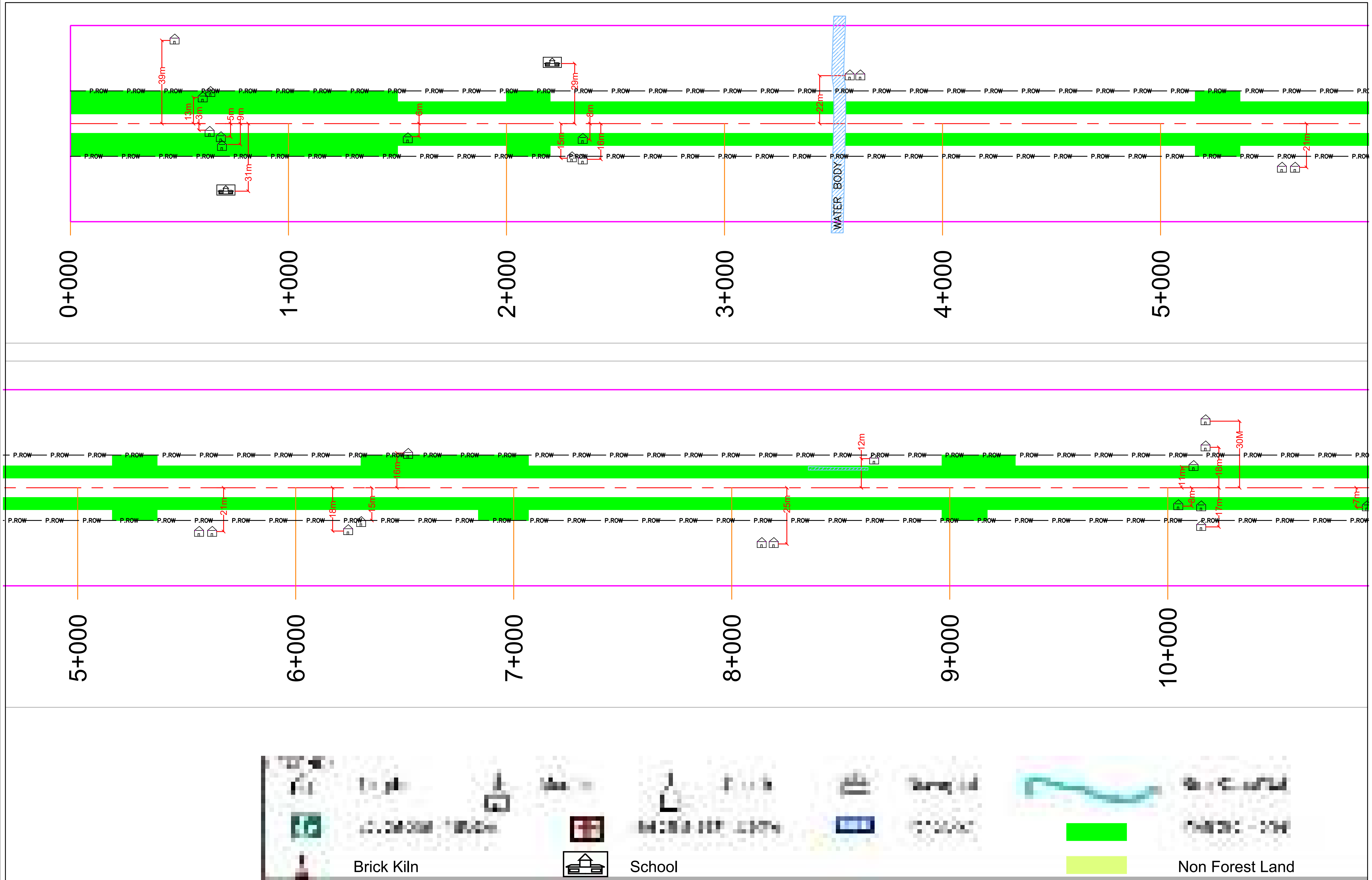
Table 9.10 : Budget for Implementation of Environmental Management Plan

Sr. No	Component	Item	Unit Cost (INR)	Quantity	Total Cost
A. Construction Stage					
1.	Tree Cutting	Cutting of Road Side Trees for construction of road	Cost to be part of DPR		
2.	Environmental Monitoring	Ambient Air Quality noise and surface and ground water Monitoring as per monitoring plan,	Lump sum		800000
3.	Topsoil Management				
4.	Air	Dust Suppression Measures	Cost to be part of DPR		
5.	Labour camp and ancillary facilities	Labour Camp and all associated facilities as per EMP	Cost to be part of DPR		
6.	Personal Protective Equipment's (PPE's)	Personal Protective Equipments like vest, helmet, safety shoe, hand gloves, gumboots, earplug, Harness belt, Welding Glasses etc	Cost to be part of DPR		
7.	First Aid Kits	First Aid Kits at the construction site, camp and ancillary sites	Cost to be part of DPR		
8.	Compensatory Plantation	Replantation of Trees (3:1)	1500	97311	145966500
9.	Oil Interceptor	Oil Interceptor at Workshop at Camp Site	50000	8	400000
10.	Borrow Area Rehabilitation and Quarry Management	Rehabilitation and Restoration	Cost to be part of DPR		
11.	Debris and Waste Disposal	Solid Wastes, Demolition Wastes, Hazardous Wastes	Cost to be part of DPR		
12.	Display of Safety Signages and Work Zone Safety	Sign boards, retro reflective tapes, cones, barriers	Cost to be part of DPR		
	Project Enhancement				
13.	Embankment Strengthening (By way of plantation)	Grass Engraining with indigenous shrubs	Cost to be part of DPR		
14.	Protection on bridges, culvert and on high embankment	Slope Protection Measures	Cost to be part of DPR		
14.	Shifting of Community Property Resources,	Shifting and Relocation	Cost to be part of DPR		
15.	Capacity building	Lumpsum Budget for Capacity Building	400000		
	Contingency Cost @ 5%				**7378325**
	Total Budget Cost				**154944825**

Package Wise Map of Alignment Marked Survey of Toposheet Bewar to Pilibhit 183.380 kms

Package Wise Map of Alignment Marked Survey of Toposheet Bewar to Pilibhit 183.330 kms

Annexure 2 Google Map of the Section Corridor



CLIENT: MINISTRY OF ROAD TRANSPORT AND HIGHWAYS GOVERNMENT OF INDIA.	CONSULTANT: CHAITANYA PROJECTS CONSULTANCY PVT LTD C-5, 2ND FLR, RK TOWER P NO- 21-22, VAISHALI SECTOR-4, DELHI-201010	PROJECT : Consultancy services for feasibility study and preparation of DPR for improvement and up- gradation of in principle declared National Highways in the state of Uttar Pradesh. Section : Bewar - Farrukhabad - Miranpur Katra - Bisalpur - Pilibhit	SCALE : 1:1500	DRAWING TITLE : STRIP PLAN (BEWAR PILIBHIT) CH. (0+000 TO 10+000)	DRAWING NO. : CPC/B/P/STRIP/PLAN/01

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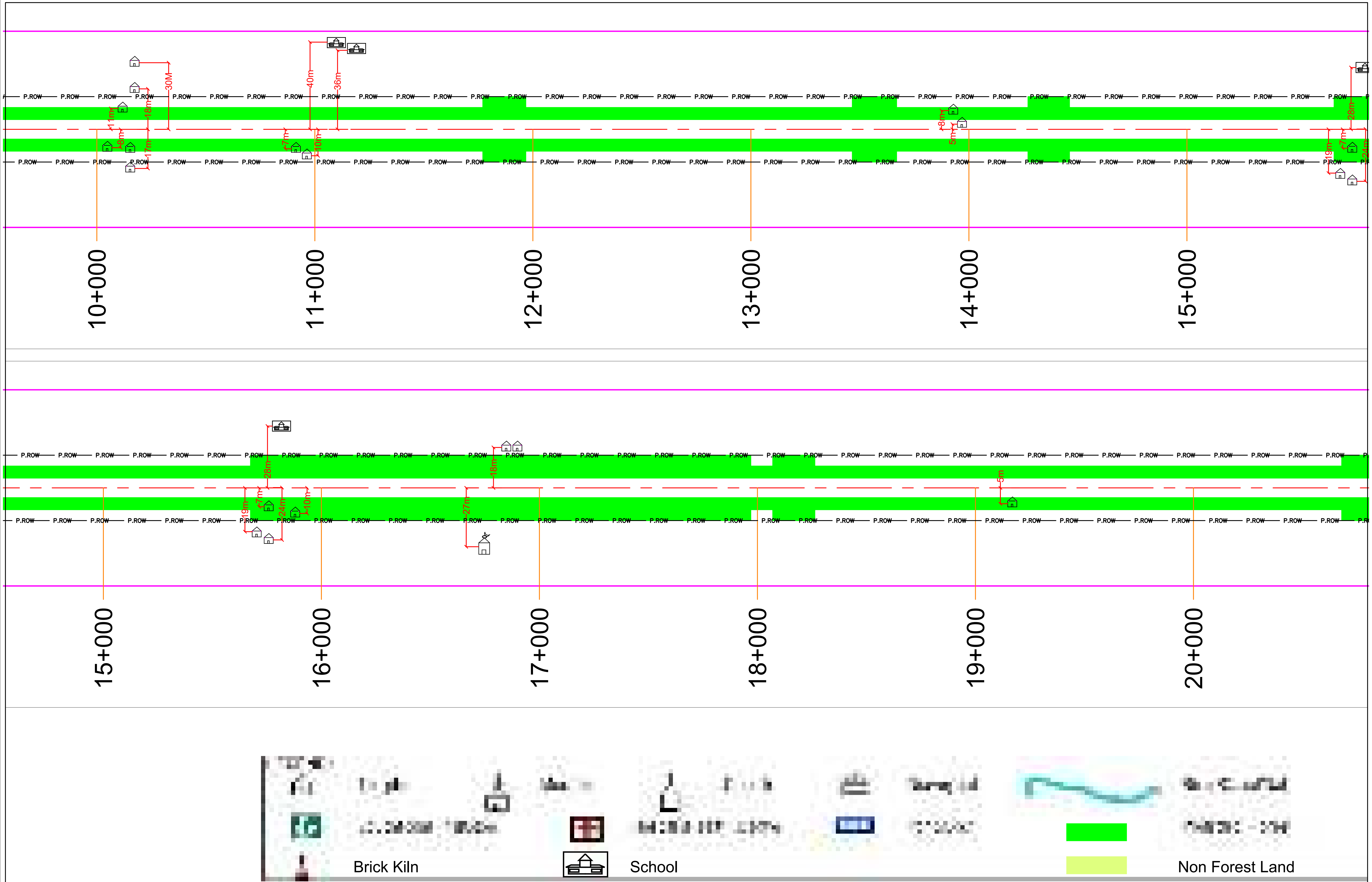

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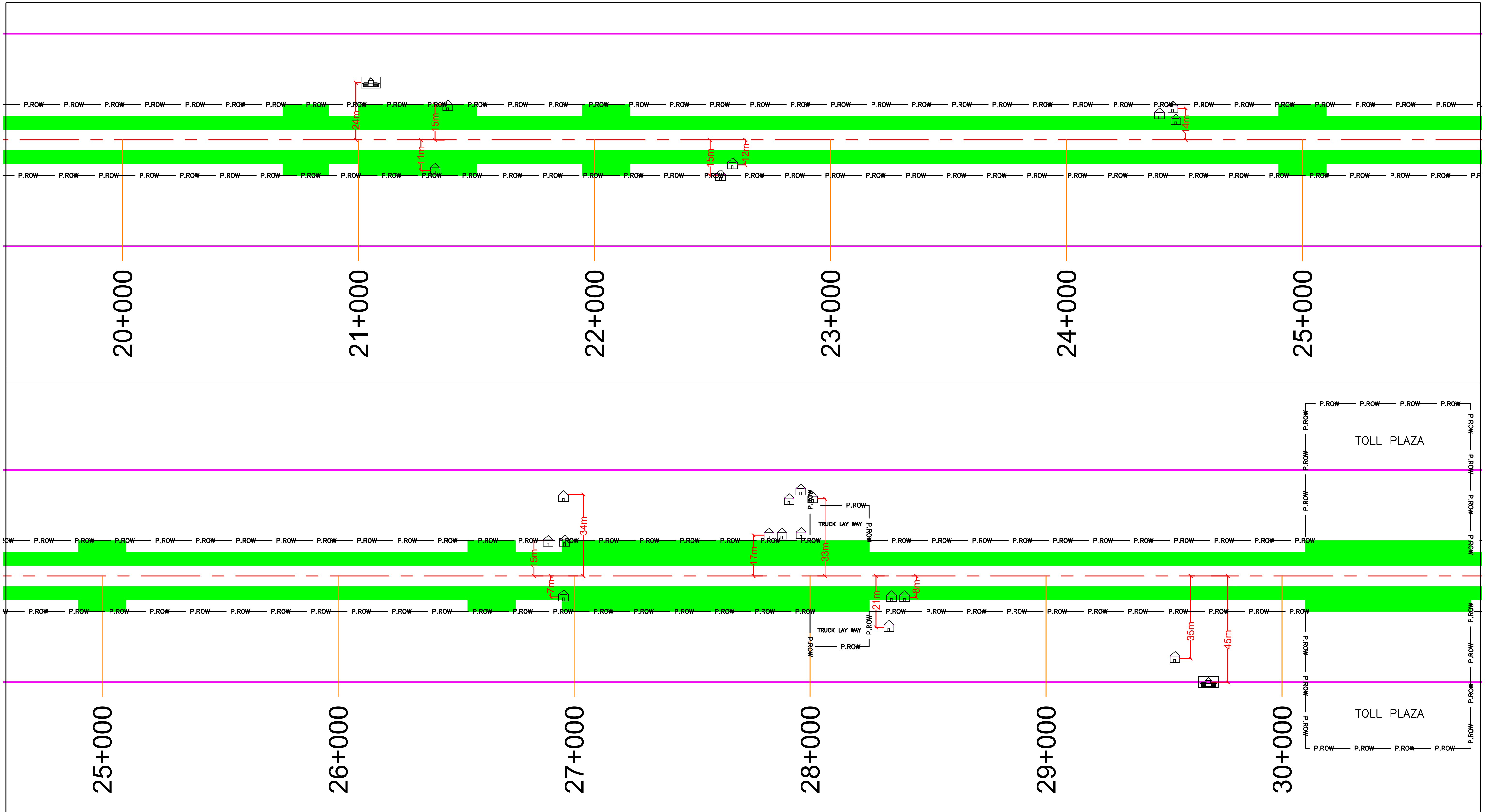

Brick Kiln

School

Non Forest Land

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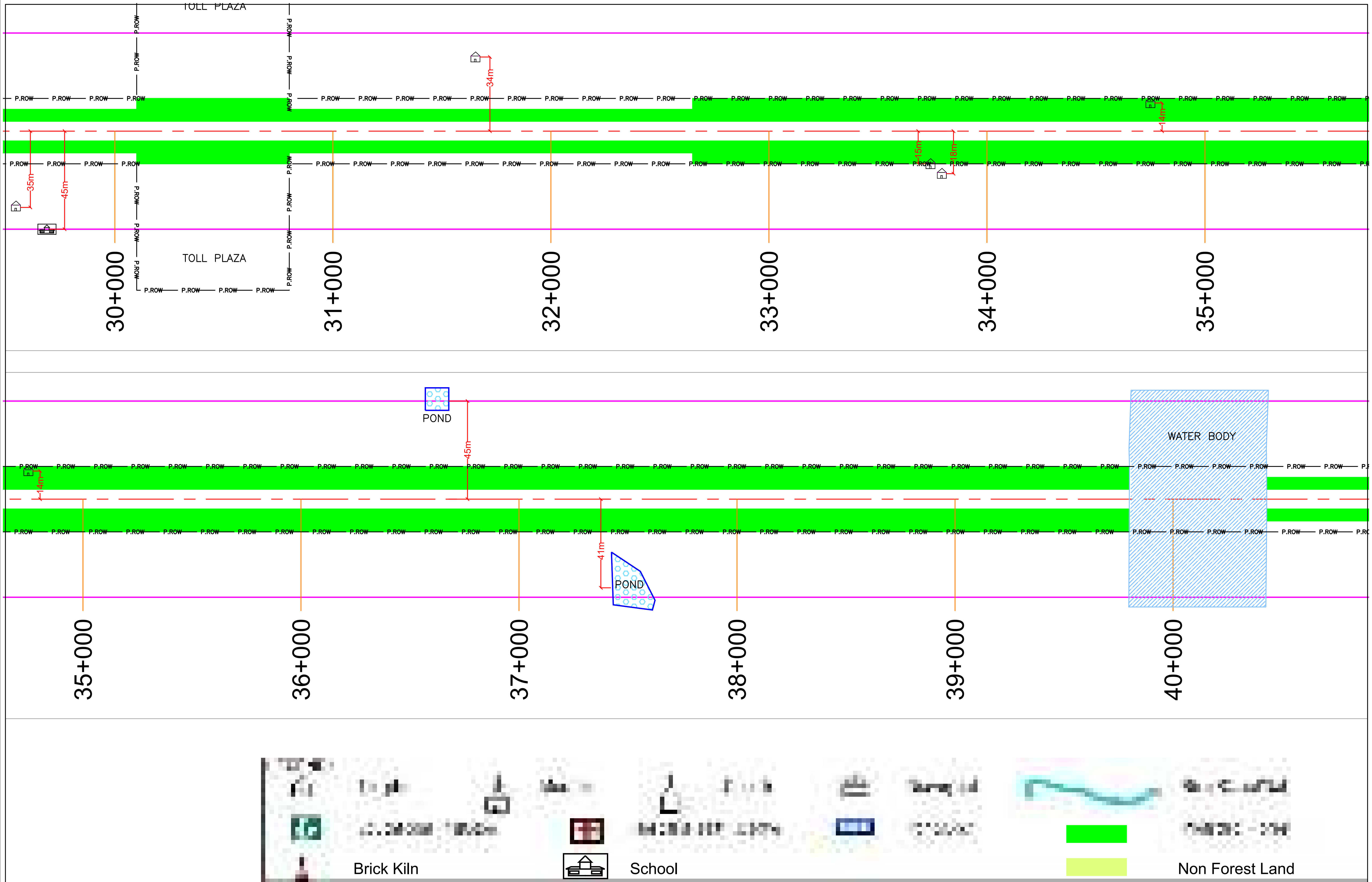

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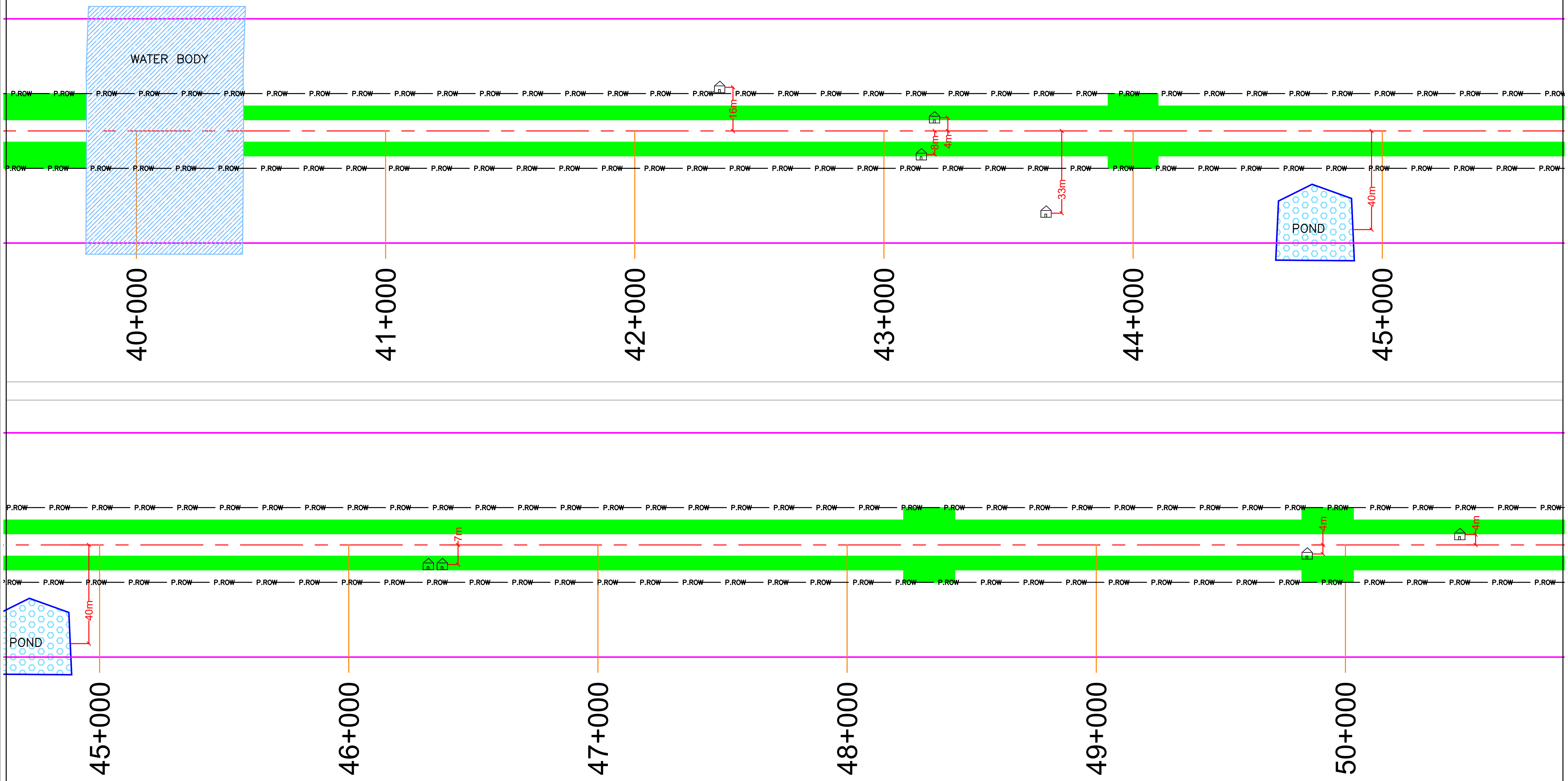

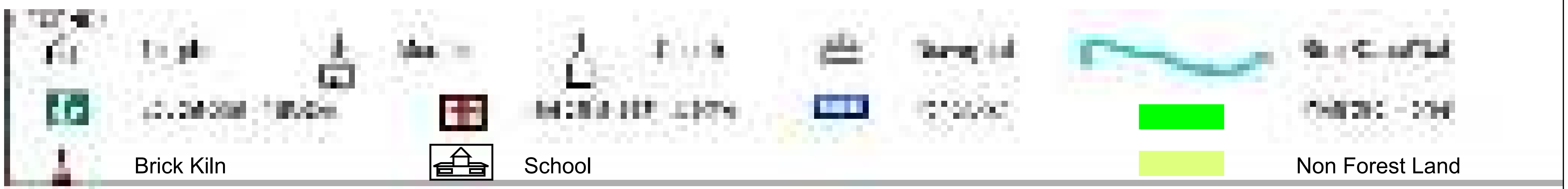

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CONSULTANT:

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C-5, 2ND FLR, RK TOWER P NO- 21-22,
VAISHALI SECTOR-4,
DELHI-201010

PROJECT :

Consultancy services for feasibility study and preparation of DPR for improvement and up- gradation of in principle declared National Highways in the state of Uttar Pradesh.
Section : Bewar - Farrukhabad - Miranpur Katra - Bisalpur - Pilibhit

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CH. (40+000 TO 50+000)

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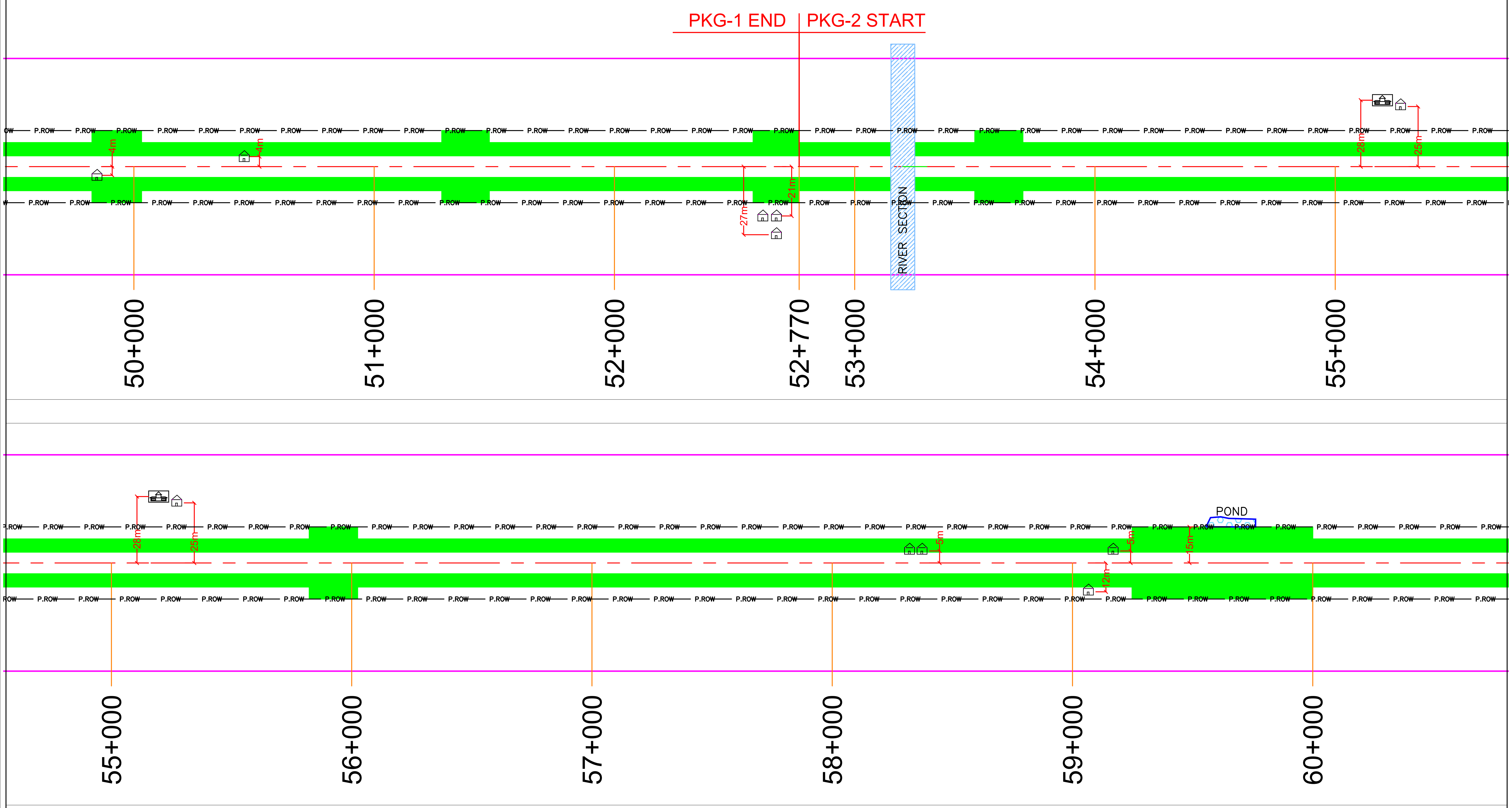

Brick Kiln

School

Non Forest Land

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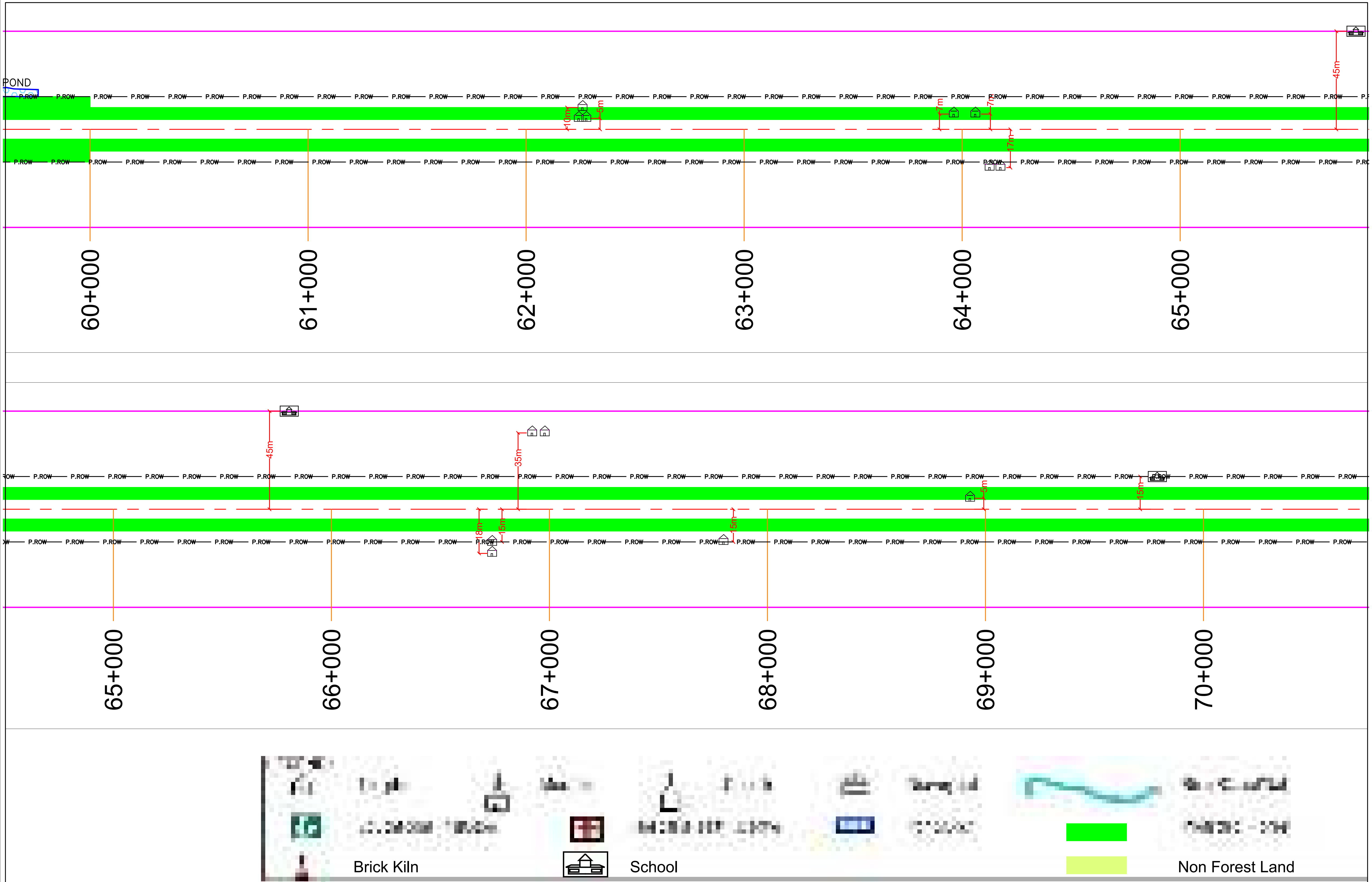

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VAISHALI SECTOR-4,
DELHI-201010

PROJECT :

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Section : Bewar - Farrukhabad - Miranpur Katra - Bisalpur - Pilibhit

SCALE : 1:1500

DRAWING TITLE :

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(BEWAR PILIBHIT)
CH. (60+000 TO 70+000)

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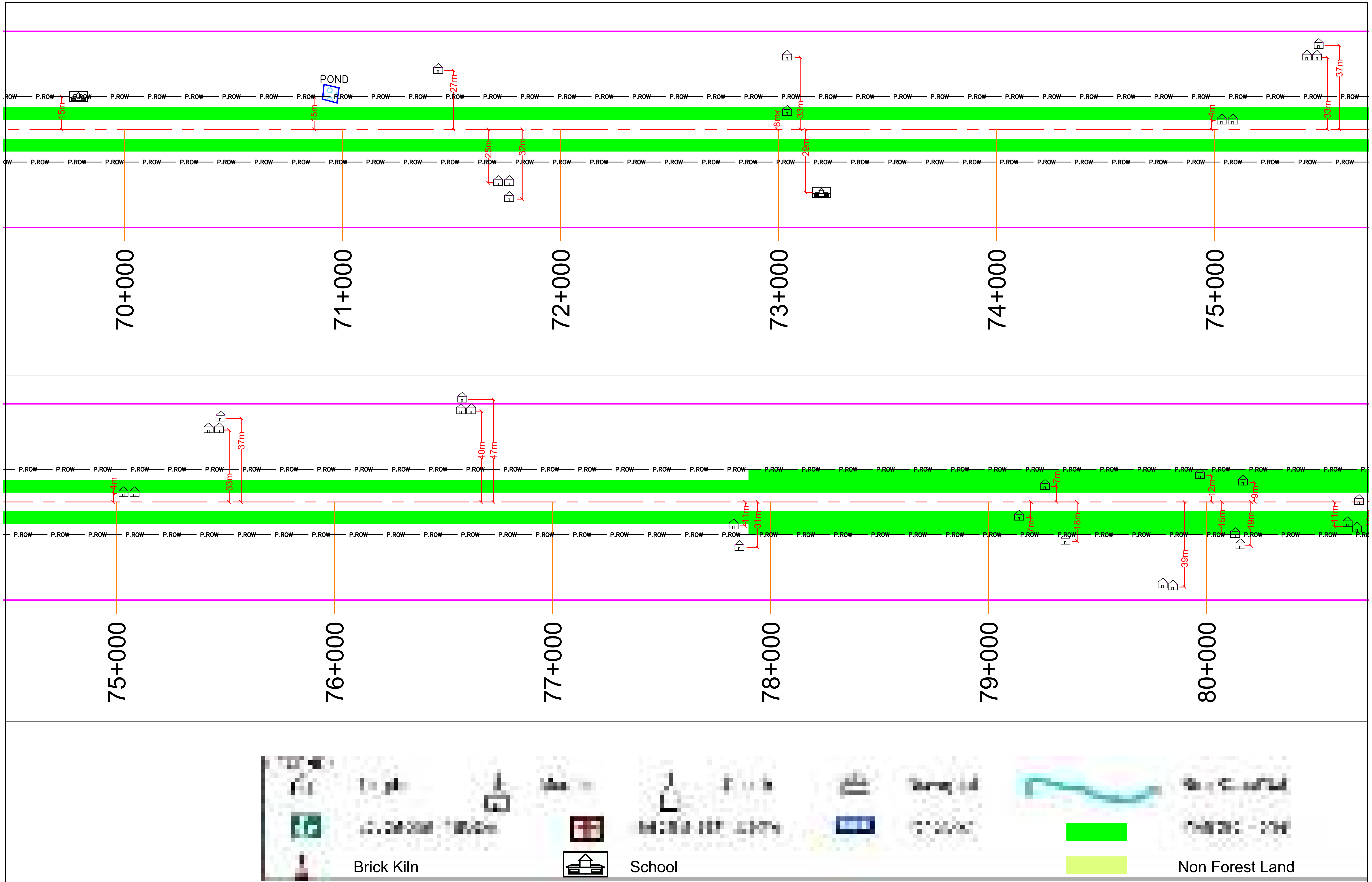

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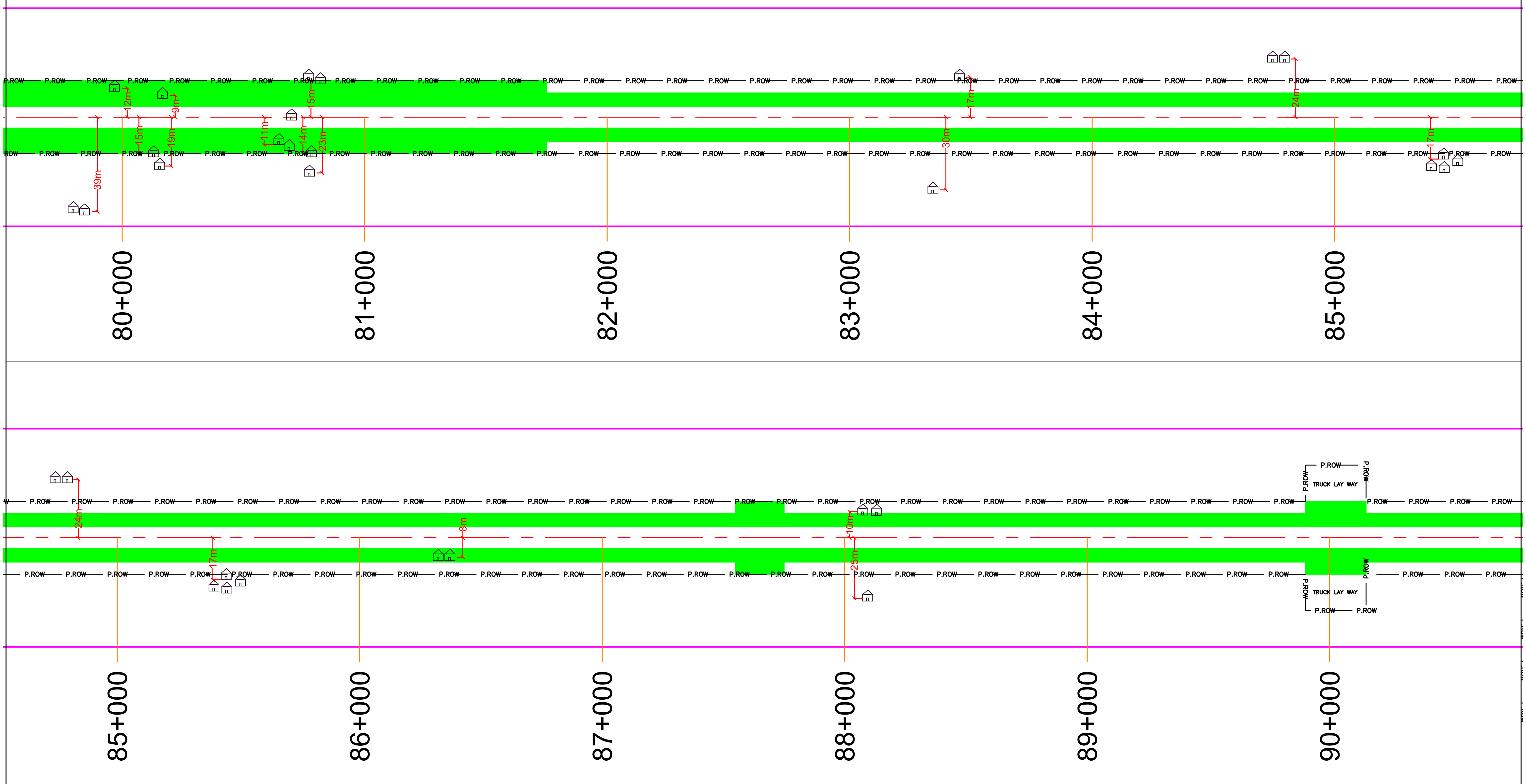

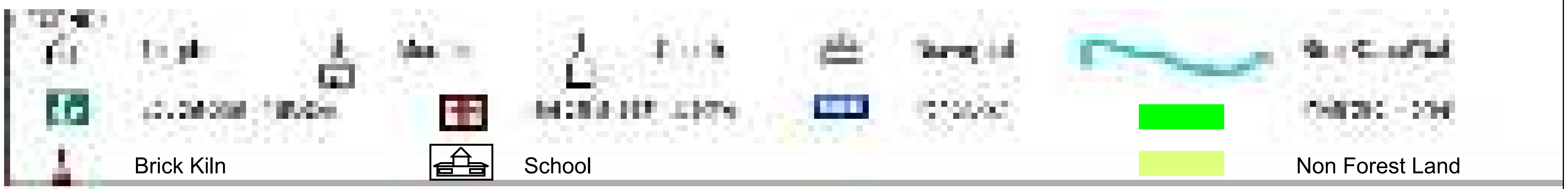

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VAISHALI SECTOR-4,
DELHI-201010

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Section : Bewar - Farrukhabad - Miranpur Katra - Bisalpur - Pilibhit

SCALE : 1:1500

DRAWING TITLE :

STRIP PLAN
(BEWAR PILIBHIT)
CH. (80+000 TO 90+000)

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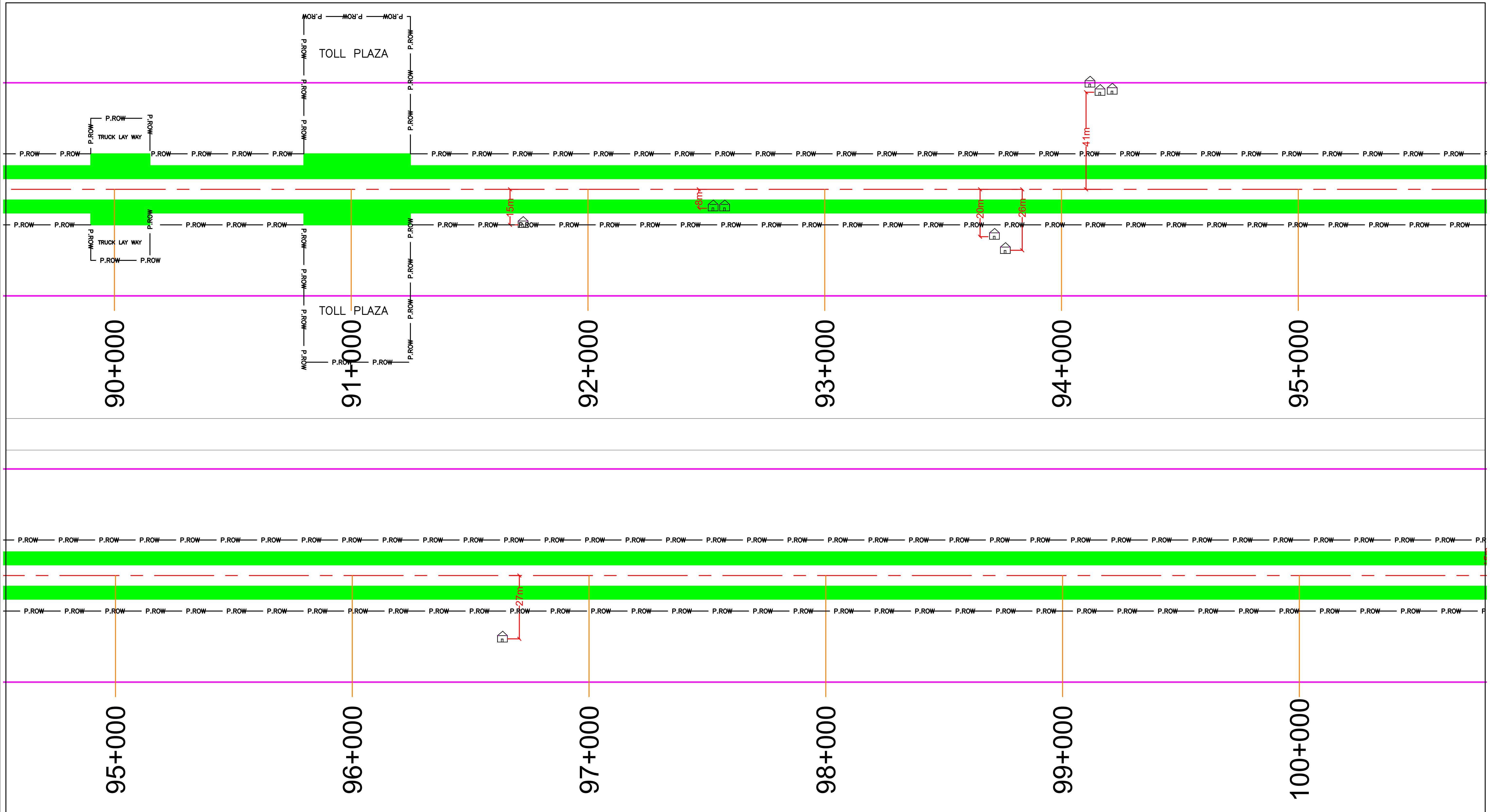

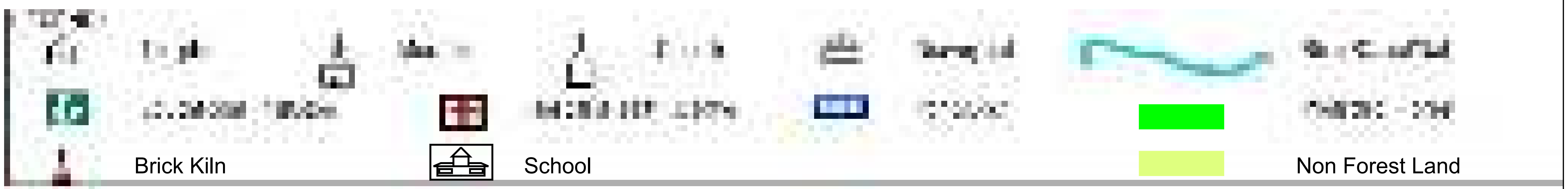

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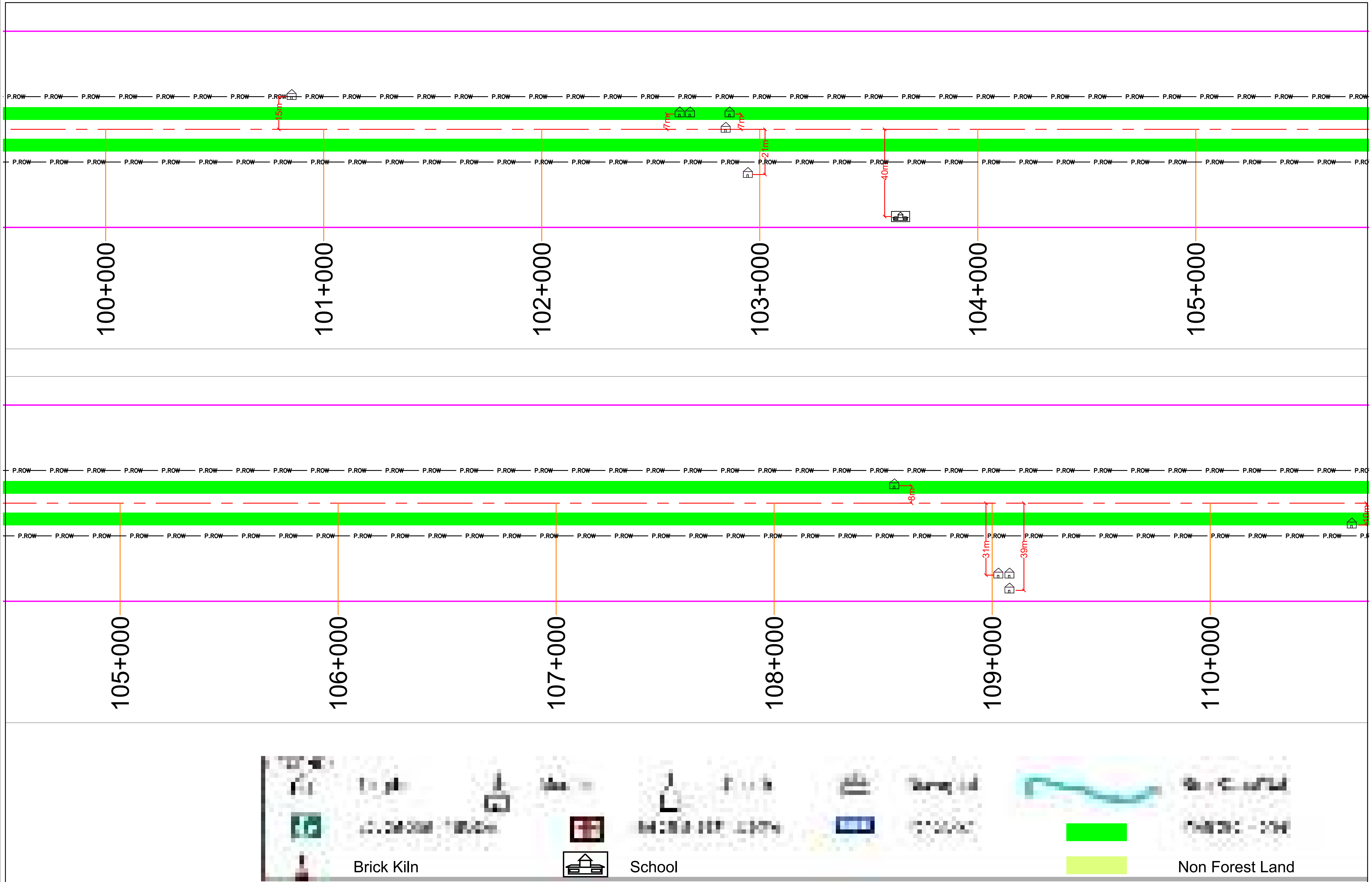

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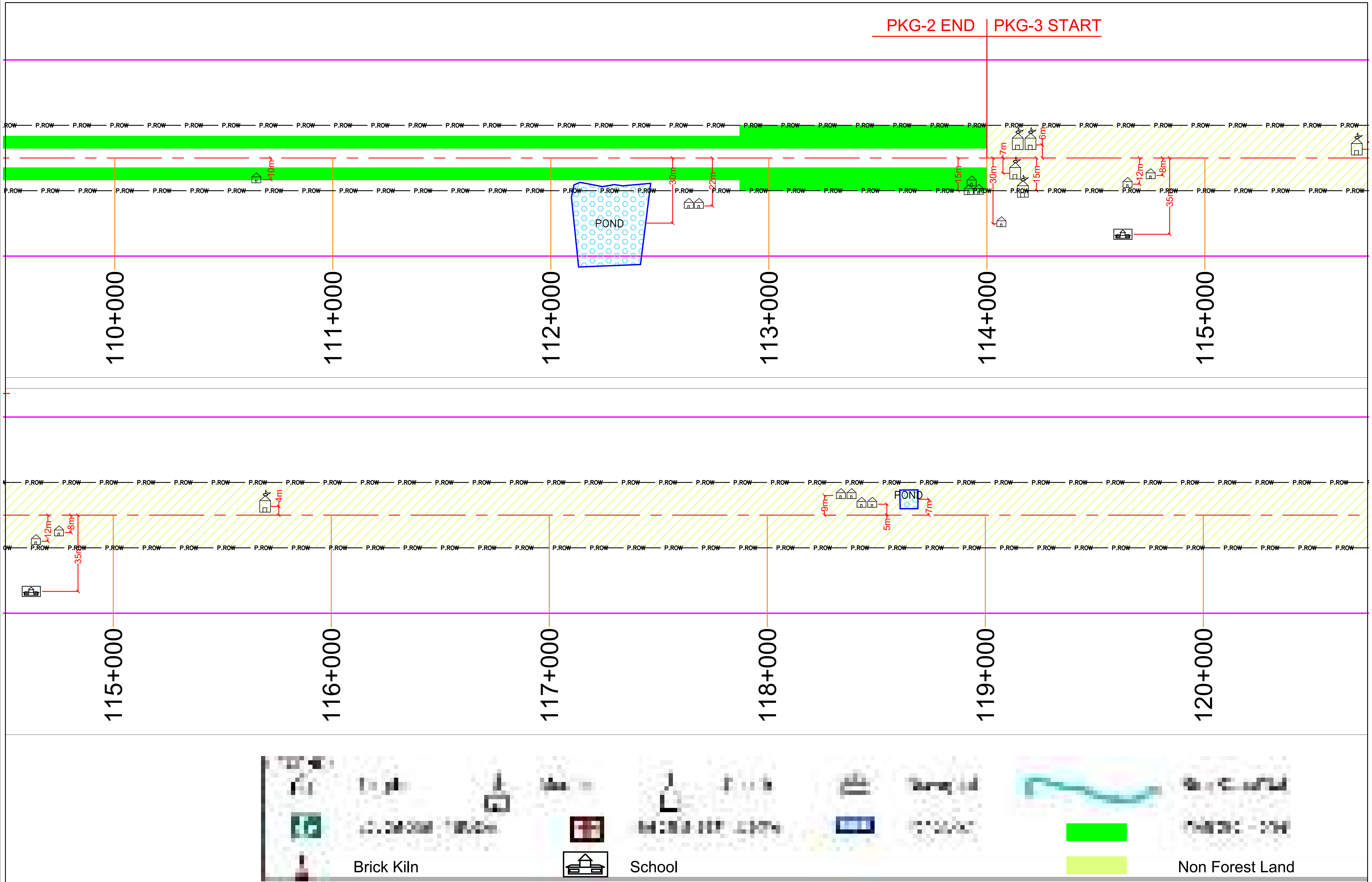

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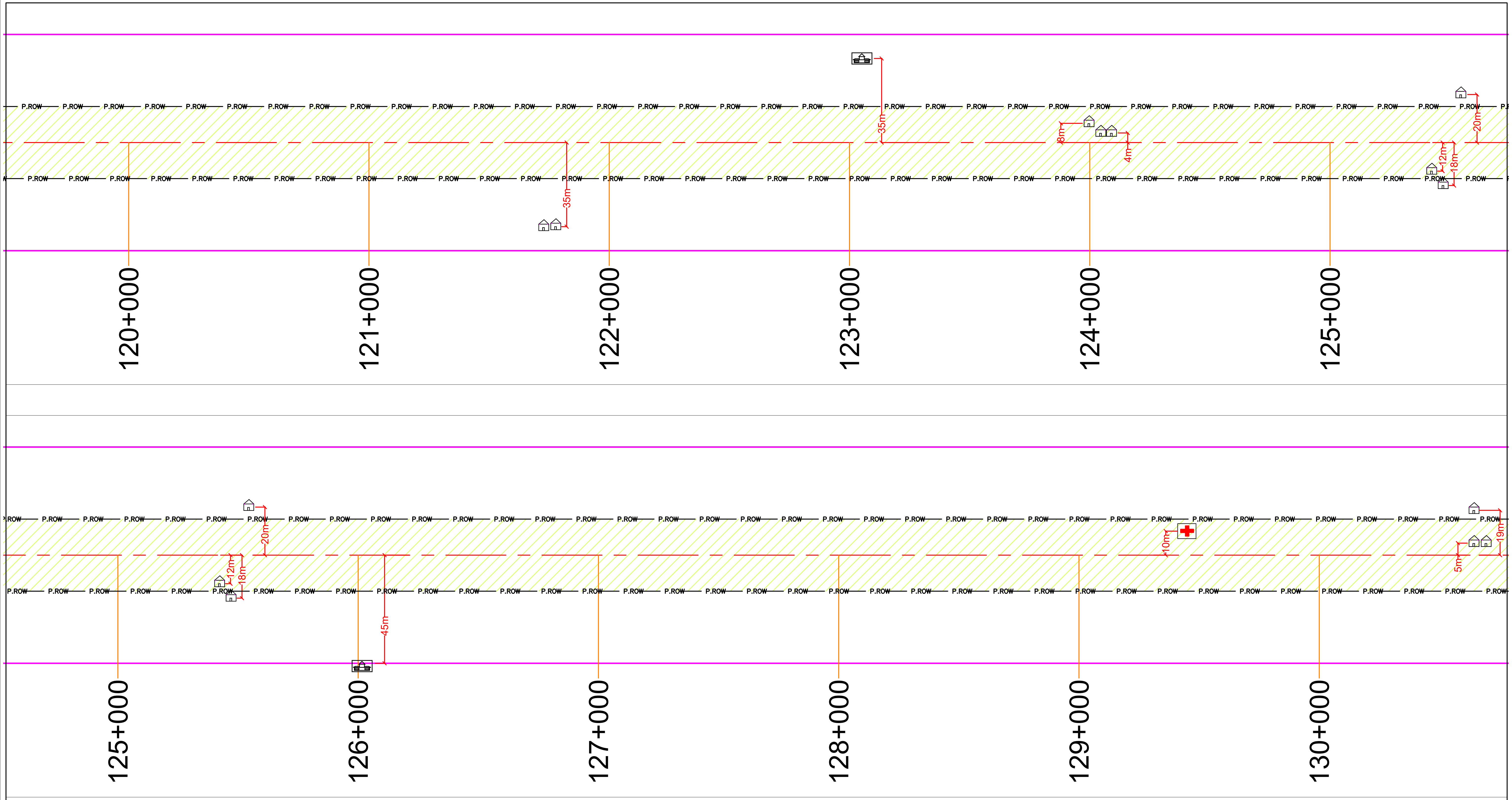

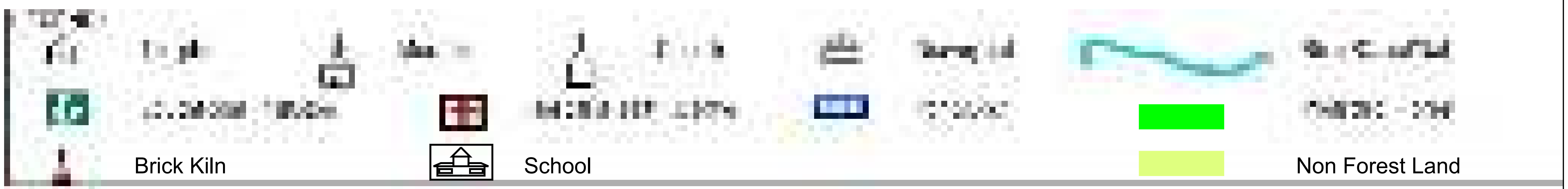

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CONSULTANT:

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C-5, 2ND FLR, RK TOWER P NO- 21-22,
VAISHALI SECTOR-4,
DELHI-201010

PROJECT :

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Section : Bewar - Farrukhabad - Miranpur Katra - Bisalpur - Pilibhit

SCALE :
1:1500

DRAWING TITLE :
STRIP PLAN
(BEWAR PILIBHIT)
CH. (120+000 TO 130+000)

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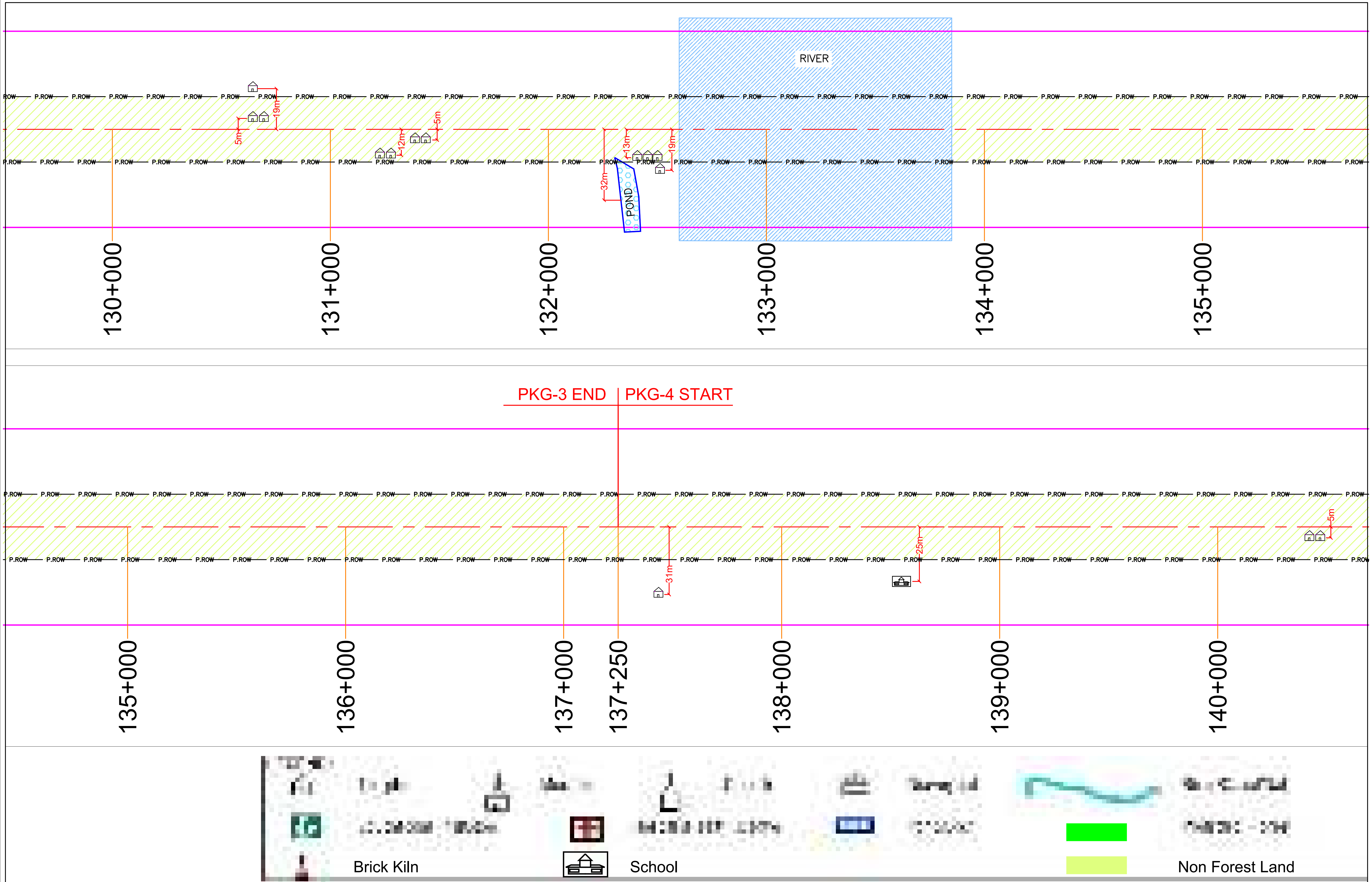

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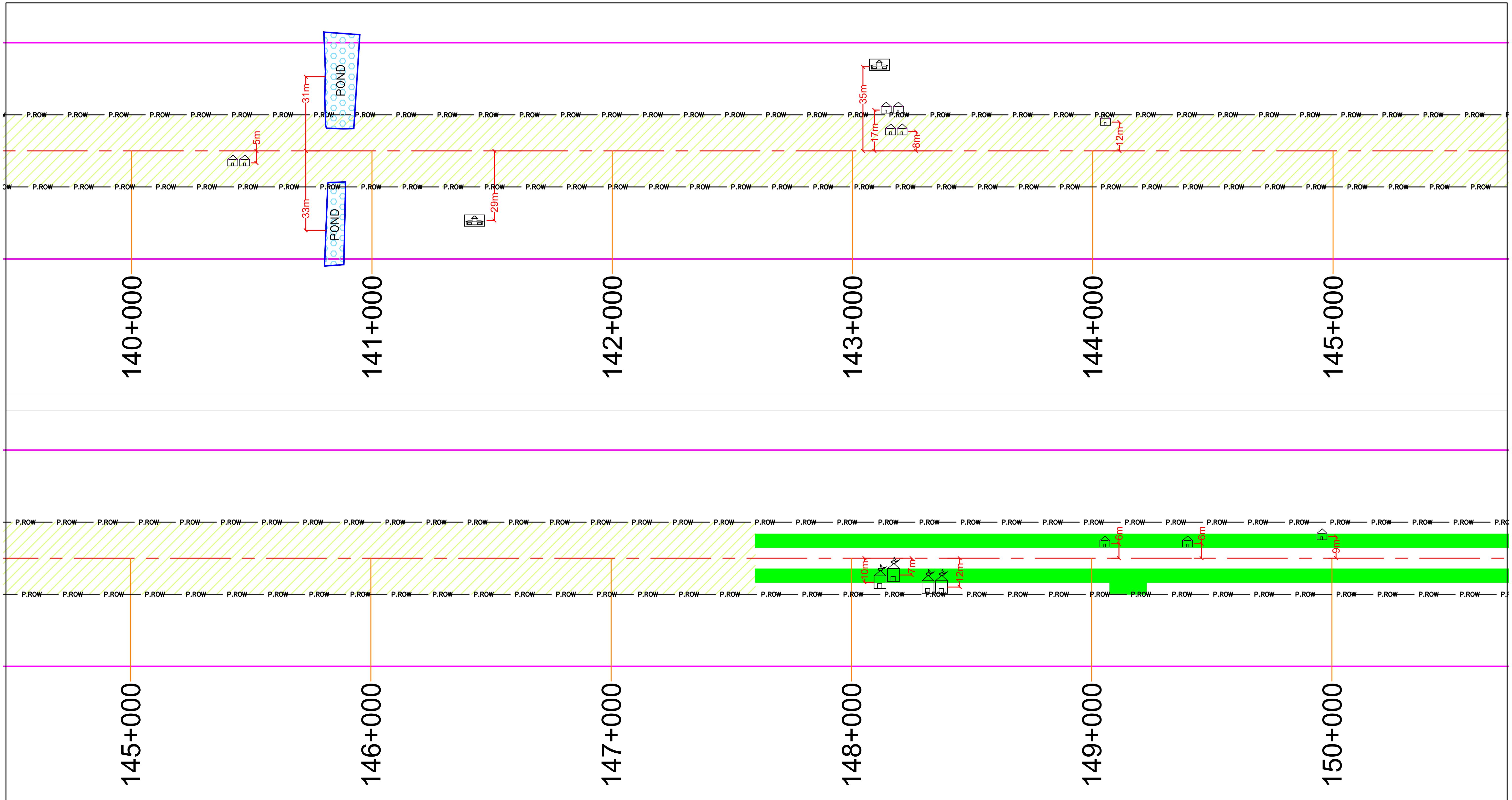
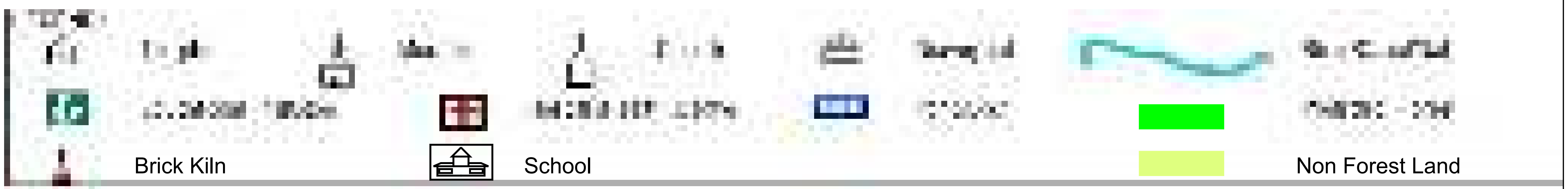
MINISTRY OF ROAD TRANSPORT AND HIGHWAYS GOVERNMENT OF INDIA.	CHAITANYA PROJECTS CONSULTANCY PVT LTD C-5, 2ND FLR, RK TOWER P NO- 21-22, VAISHALI SECTOR-4, DELHI-201010	Consultancy services for feasibility study and preparation of DPR for improvement and up- gradation of in principle declared National Highways in the state of Uttar Pradesh. Section : Bewar - Farrukhabad - Miranpur Katra - Bisalpur - Pilibhit	1:1500	STRIP PLAN (BEWAR PILIBHIT) CH. (130+000 TO 140+000)	CPC/B/P/STRIP/PLAN/14

DATE:	Revision :
SEPTEMBER 2020	R0

DRAWN BY	DESIGNED BY	CHECKED BY	APPROVED BY
SANJAY	JAYA	S.VERMA	NS





CLIENT: MINISTRY OF ROAD TRANSPORT AND HIGHWAYS GOVERNMENT OF INDIA.	CONSULTANT: **CHAITANYA PROJECTS CONSULTANCY PVT LTD** C-5, 2ND FLR, RK TOWER P NO- 21-22, VAISHALI SECTOR-4, DELHI-201010	PROJECT : Consultancy services for feasibility study and preparation of DPR for improvement and up- gradation of in principle declared National Highways in the state of Uttar Pradesh. Section : Bewar - Farrukhabad - Miranpur Katra - Bisalpur - Pilibhit	SCALE : 1:1500	DRAWING TITLE : STRIP PLAN (BEWAR PILIBHIT) CH. (140+000 TO 150+000)

DRAWING NO. :	CPC/B/P/STRIP/PLAN/15		
DATE:	SEPTEMBER 2020	Revision :	R0
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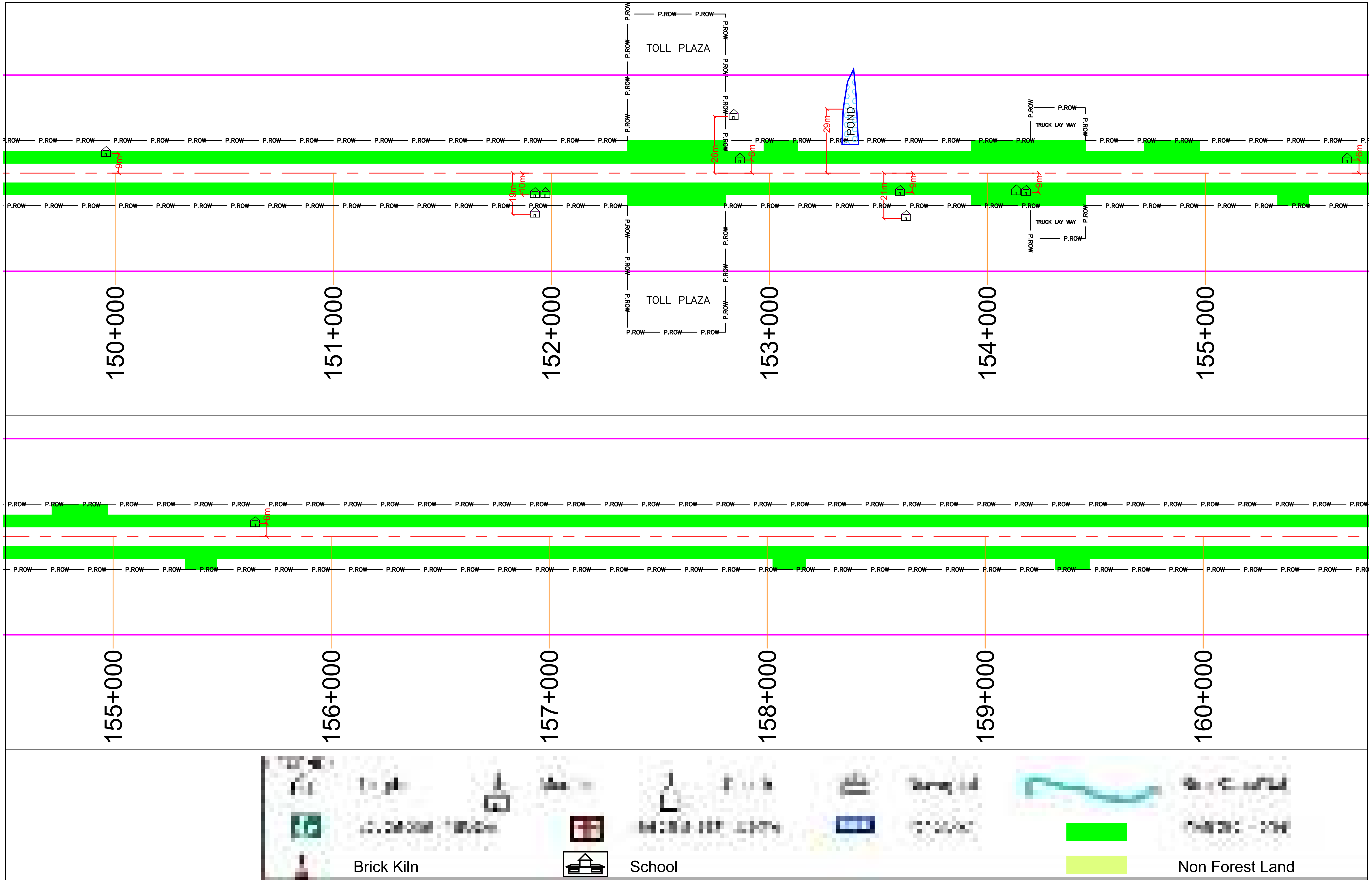
SANJAY	JAYA	S.VERMA	NS



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MINISTRY OF ROAD TRANSPORT AND HIGHWAYS GOVERNMENT OF INDIA.	CHAITANYA PROJECTS CONSULTANCY PVT LTD C-5, 2ND FLR, RK TOWER P NO- 21-22, VAISHALI SECTOR-4, DELHI-201010	Consultancy services for feasibility study and preparation of DPR for improvement and up- gradation of in principle declared National Highways in the state of Uttar Pradesh. Section : Bewar - Farrukhabad - Miranpur Katra - Bisalpur - Pilibhit	1:1500	STRIP PLAN (BEWAR PILIBHIT) CH. (150+000 TO 160+000)	CPC/B/P/STRIP/PLAN/16

DATE:	Revision :		
SEPTEMBER 2020	R0		
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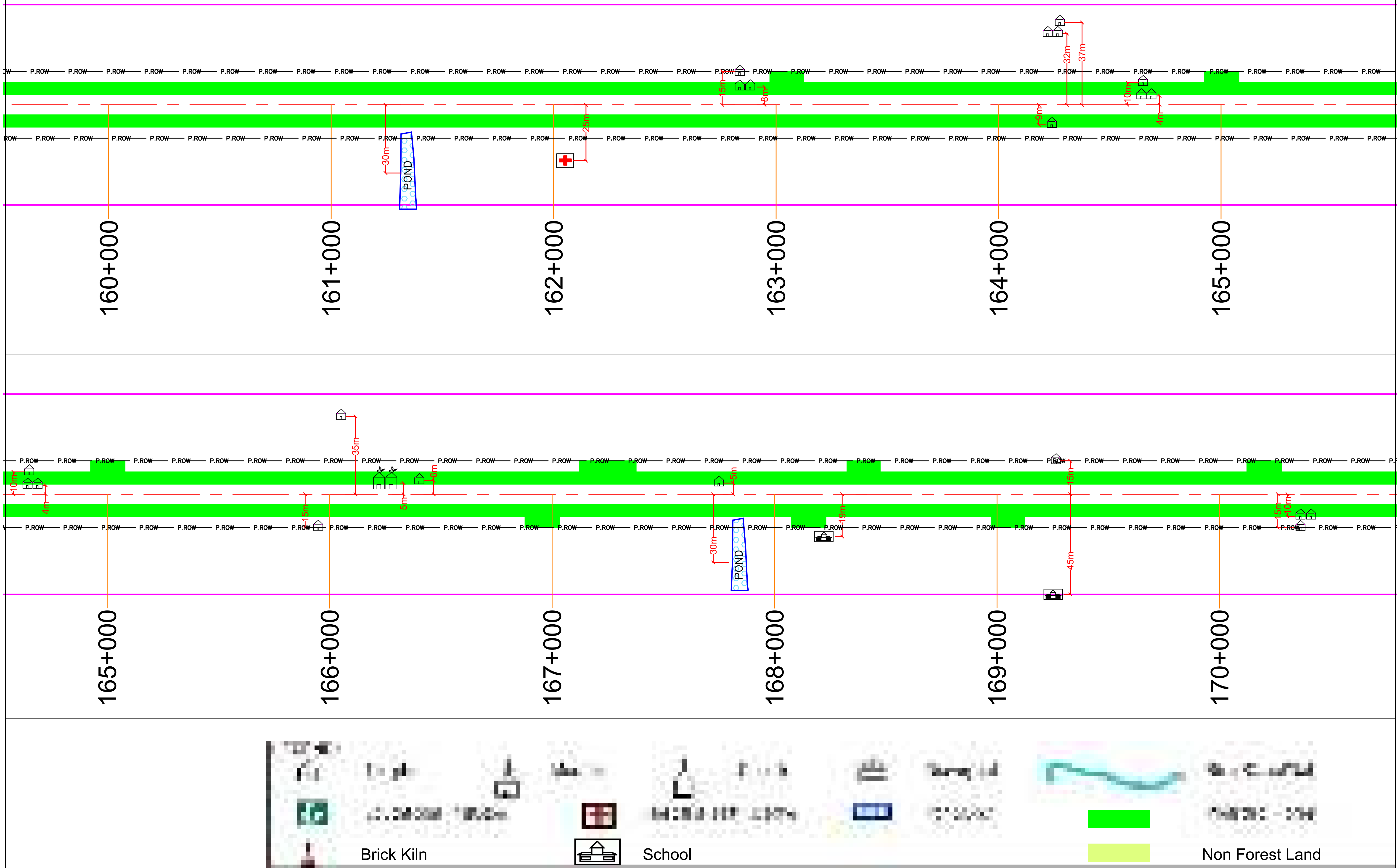

CLIENT:

MINISTRY OF ROAD TRANSPORT AND HIGHWAYS
GOVERNMENT OF INDIA.

CONSULTANT:

CHAITANYA PROJECTS CONSULTANCY PVT LTD
C-5, 2ND FLR, RK TOWER P NO- 21-22,
VAISHALI SECTOR-4,
DELHI-201010

PROJECT :

Consultancy services for feasibility study and preparation of DPR for improvement and up- gradation of in principle declared National Highways in the state of Uttar Pradesh.
Section : Bewar - Farrukhabad - Miranpur Katra - Bisalpur - Pilibhit

SCALE : 1:1500

DRAWING TITLE :
STRIP PLAN
(BEWAR PILIBHIT)
CH. (160+000 TO 170+000)

DRAWING NO. : CPC/B/P/STRIP/PLAN/17

DATE: SEPTEMBER 2020		Revision : R0	
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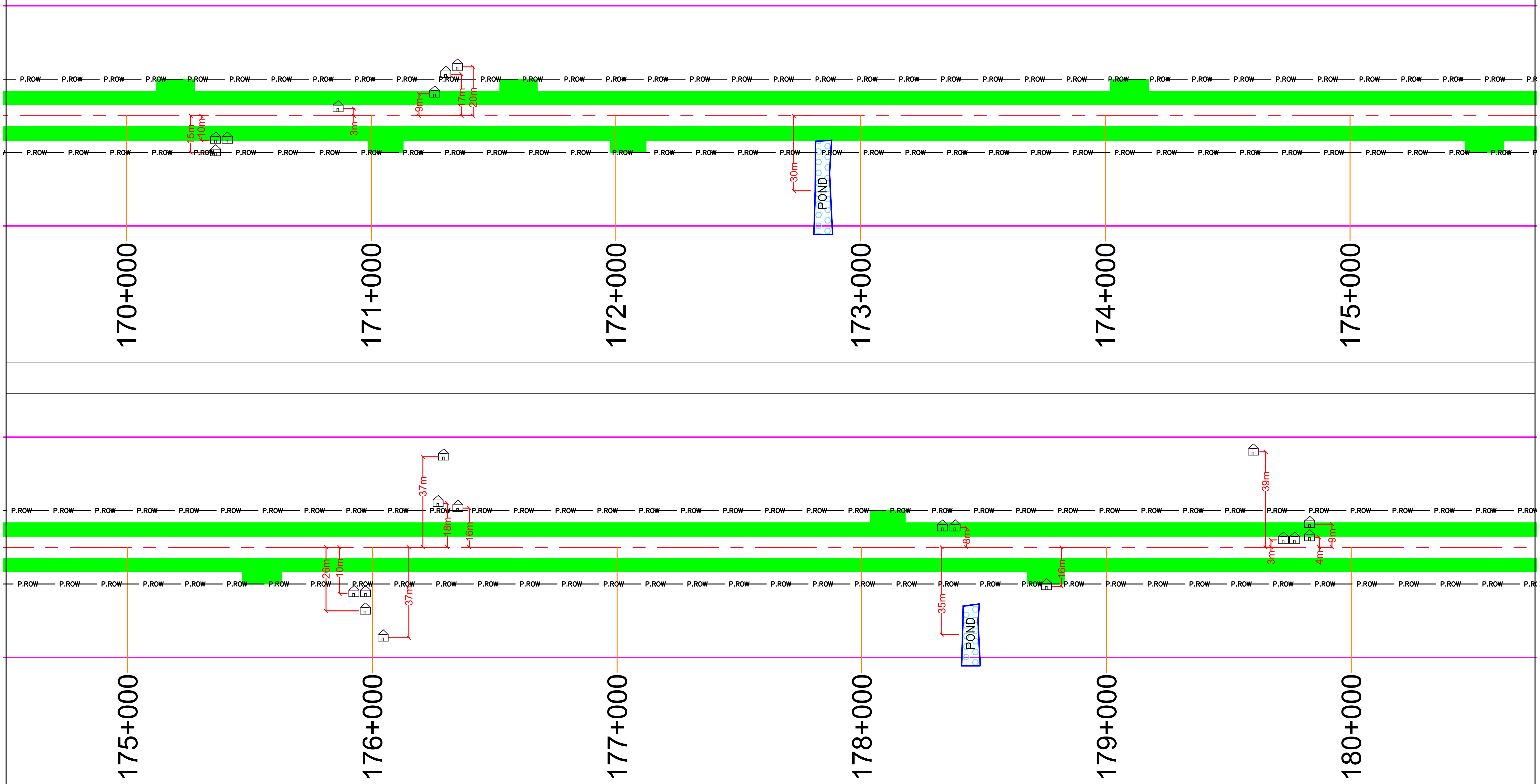
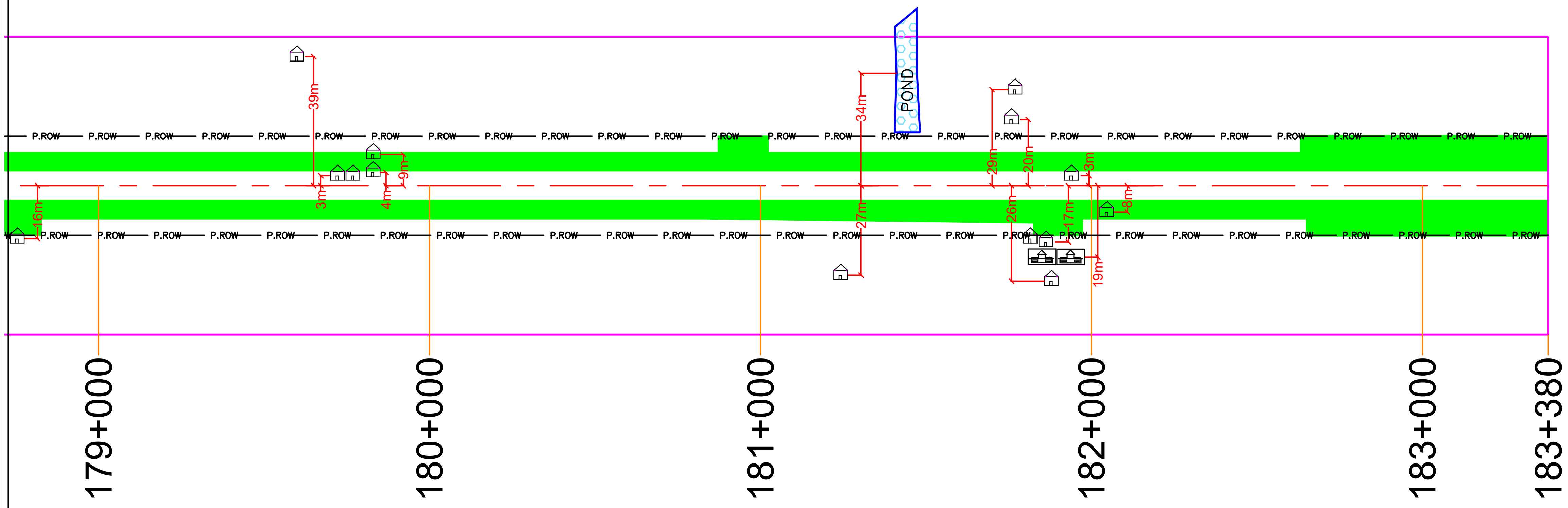


Brick Kiln
School
Non Forest Land

CLIENT: MINISTRY OF ROAD TRANSPORT AND HIGHWAYS GOVERNMENT OF INDIA.	CONSULTANT: CHAITANYA PROJECTS CONSULTANCY PVT LTD C-5, 2ND FLR, RK TOWER P NO- 21-22, VAISHALI SECTOR-4, DELHI-201010	PROJECT : Consultancy services for feasibility study and preparation of DPR for improvement and up- gradation of in principle declared National Highways in the state of Uttar Pradesh. Section : Bewar - Farrukhabad - Miranpur Katra - Bisalpur - Pilibhit	SCALE : 1:1500	DRAWING TITLE : STRIP PLAN (BEWAR PILIBHIT) CH. (170+000 TO 180+000)	DRAWING NO. : CPC/B/P/STRIP/PLAN/18

DATE:	Revision :	DRAWN BY	DESIGNED BY	CHECKED BY	APPROVED BY
SEPTEMBER 2020	R0	SANJAY	JAYA	S.VERMA	NS



Brick Kiln
School
Non Forest Land

CLIENT: MINISTRY OF ROAD TRANSPORT AND HIGHWAYS GOVERNMENT OF INDIA.	CONSULTANT: **CHAITANYA PROJECTS CONSULTANCY PVT LTD** C-5, 2ND FLR, RK TOWER P NO- 21-22, VAISHALI SECTOR-4, DELHI-201010	PROJECT : Consultancy services for feasibility study and preparation of DPR for improvement and up- gradation of in principle declared National Highways in the state of Uttar Pradesh. Section : Bewar - Farrukhabad - Miranpur Katra - Bisalpur - Pilibhit	SCALE : 1:1500	DRAWING TITLE : STRIP PLAN (BEWAR PILIBHIT) CH. (180+000 TO 183+380)	DRAWING NO. : CPC/B/P/STRIP/PLAN/19

DATE:	Revision :
SEPTEMBER 2020	R0

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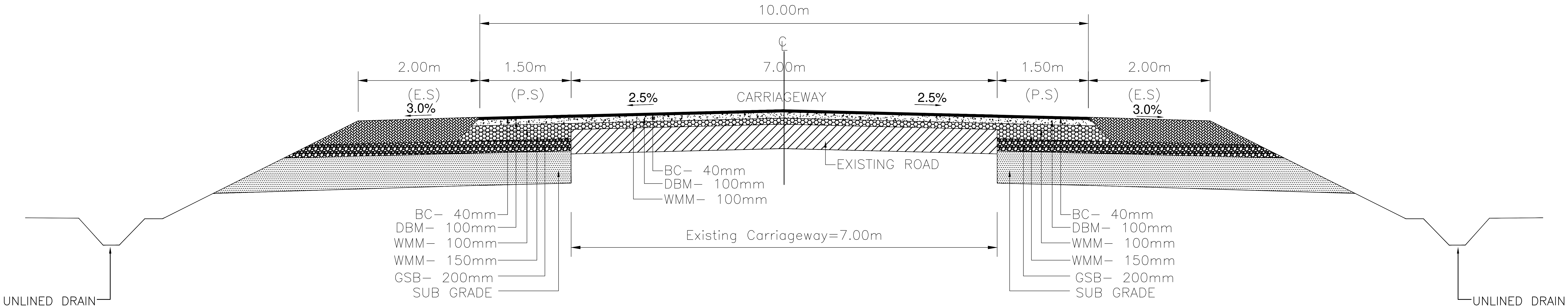


Concentric Widening and strengthning in open area

TWO LANE WITH PAVED SHOULDER IN OPEN AREAS (TCS- 2) FOR PLAIN TERRAIN

S.NO	DESIGN CHAINAGE		LENGTH	TCS TYPE
	FROM	TO		
1	40+440	52+770	12330	TCS−2

Project Title :

Consultancy services for feasibility study and preparation of DPR for improvement and up- gradation of in principle declared National Highways in the state of Uttar Pradesh.

Section : Bewar - Farrukhabad - Miranpur Katra - Bisalpur - Pilibhit

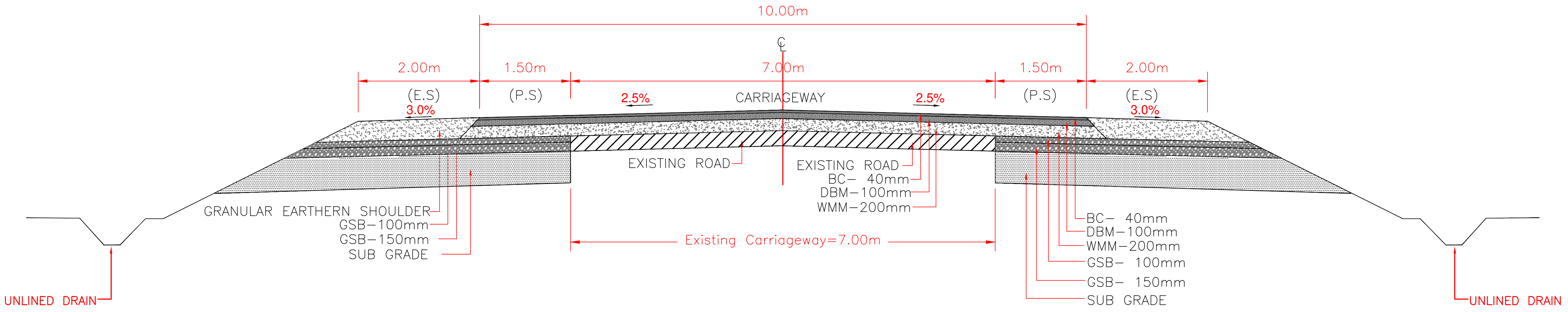
CLIENT

MINISTRY OF ROAD TRANSPORT & HIGHWAYS

Drawing Title:	TYPICAL CROSS SECTION		
Drawing No. :-			Sheet : 01 OF 07
Scale :-	NTS		
Drn	Dgn.	Appd	Date
PRADEEP RAWAT	LOVISH	M.P.S	SEP - 2018

CONSULTANT:

Chaitanya Projects Consultancy Pvt. Ltd.
in association with
Agnitio Infrastructure Projects Pvt. Ltd.
RN-73, Sector-62, Noida, Gautam Budh Nagar, Uttar Pradesh-201309



Concentric Widening and strengthning in existing open area

TWO LANE WITH PAVED SHOULDER IN OPEN AREAS (TCS- 2A) FOR PLAIN TERRAIN

S.NO	DESIGN CHAINAGE		LENGTH	TCS TYPE
	FROM	TO		
1	12+480	15+680	3200	TCS–2A
2	17+980	21+000	3020	TCS–2A
3	21+500	23+475	1975	TCS–2A
4	23+700	24+350	650	TCS–2A
5	24+900	26+950	2050	TCS–2A
6	28+050	32+650	4600	TCS–2A
	TOTAL LENGTH		15495	

Project Title :

Consultancy services for feasibility study and preparation of DPR for improvement and up- gradation of in principle declared National Highways in the state of Uttar Pradesh.

Section : Bewar - Farrukhabad - Miranpur Katra - Bisalpur - Pilibhit

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MINISTRY OF ROAD TRANSPORT & HIGHWAYS

Drawing Title:	TYPICAL CROSS SECTION		
Drawing No. :-			Sheet : 02 OF 07
Scale :-	NTS		
Drn	Dgn.	Appd	Date
PRADEEP RAWAT	LOVISH	M.P.S	SEP - 2018

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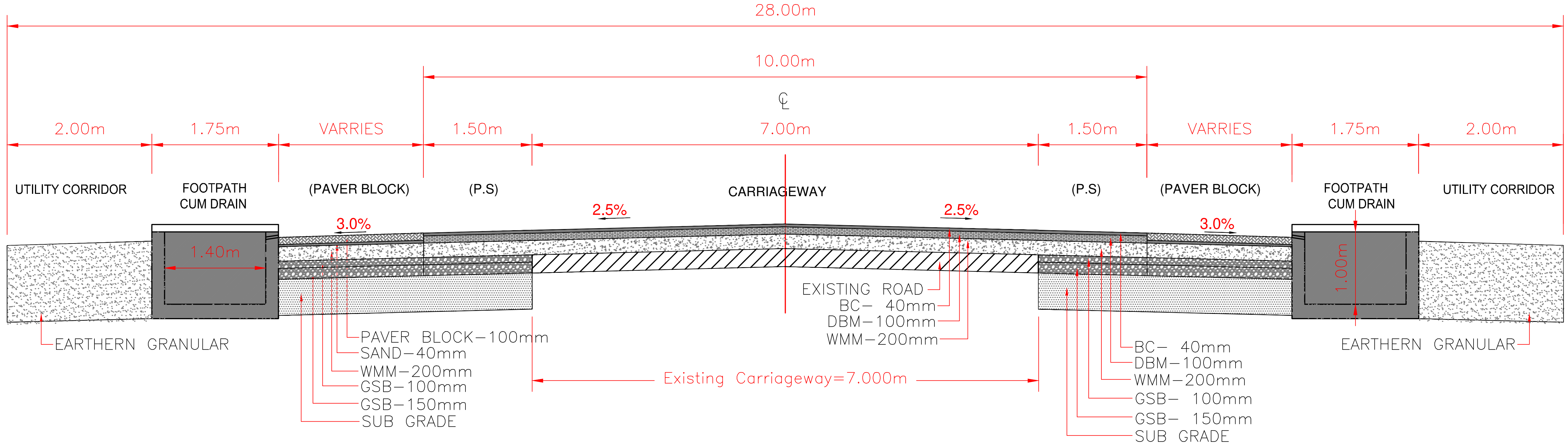

(BELOW PAVER BLOCK)

Concentric Widening and strengthning in built up area

TWO LANE WITH PAVED SHOULDER WITH PAVER BLOCK AND RCC DRAIN IN SEMI BUILT UP AREAS (TCS- 6C)

S.NO	DESIGN CHAINAGE		LENGTH	TCS TYPE
	FROM	TO		
1	12+000	12+480	480	TCS-6C
2	21+000	21+500	500	TCS-6C
3	23+475	23+700	225	TCS-6C
4	24+350	24+900	550	TCS-6C
5	26+950	28+050	1100	TCS-6C
	TOTAL LENGTH		2855	

Project Title :

Consultancy services for feasibility study and preparation of DPR for improvement and up- gradation of in principle declared National Highways in the state of Uttar Pradesh.

Section : Bewar - Farrukhabad - Miranpur Katra - Bisalpur - Pilibhit

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MINISTRY OF ROAD TRANSPORT & HIGHWAYS

Drawing Title:	TYPICAL CROSS SECTION		
Drawing No. :-			Sheet : 03 OF 07
Scale :-	NTS		
Drn	Dgn.	Appd	Date SEP - 2018
PRADEEP RAWAT	LOVISH	M.P.S	

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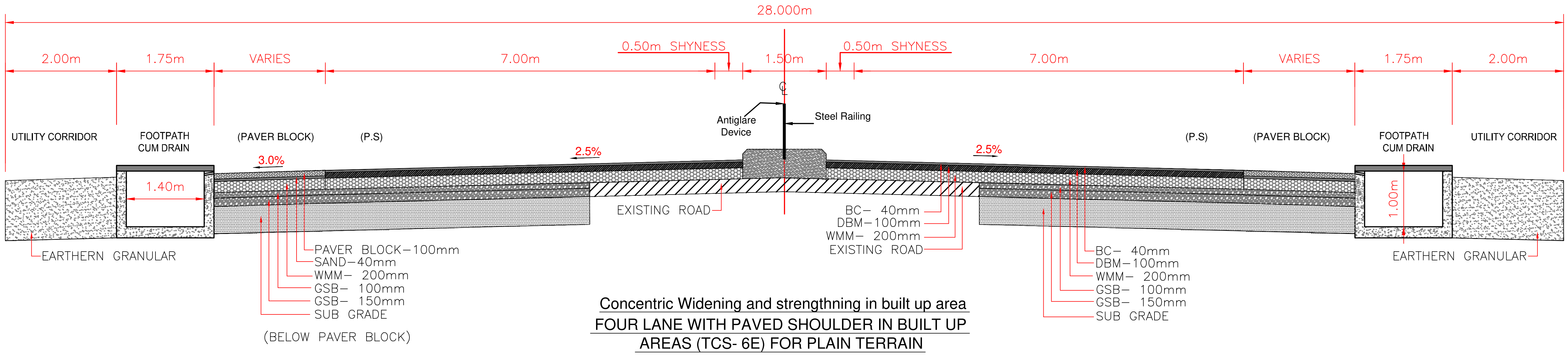

Concentric Widening and strengthning in built up area

FOUR LANE WITH PAVED SHOULDER IN BUILT UP AREAS (TCS- 6E) FOR PLAIN TERRAIN

S.NO	DESIGN CHAINAGE		LENGTH	TCS TYPE
	FROM	TO		
1	15+680	17+980	2300	TCS-6E
2	32+650	36+390	3740	TCS-6E
3	36+930	39+800	2870	TCS-6E
	TOTAL LENGTH		8910	

Project Title :

Consultancy services for feasibility study and preparation of DPR for improvement and up- gradation of in principle declared National Highways in the state of Uttar Pradesh.

Section : Bewar - Farrukhabad - Miranpur Katra - Bisalpur - Pilibhit

CLIENT

MINISTRY OF ROAD TRANSPORT & HIGHWAYS

Drawing Title:	TYPICAL CROSS SECTION		
Drawing No. :-			Sheet : 04 OF 07
Scale :-	NTS		
Drn	Dgn.	Appd	Date
PRADEEP RAWAT	LOVISH	M.P.S	SEP - 2018

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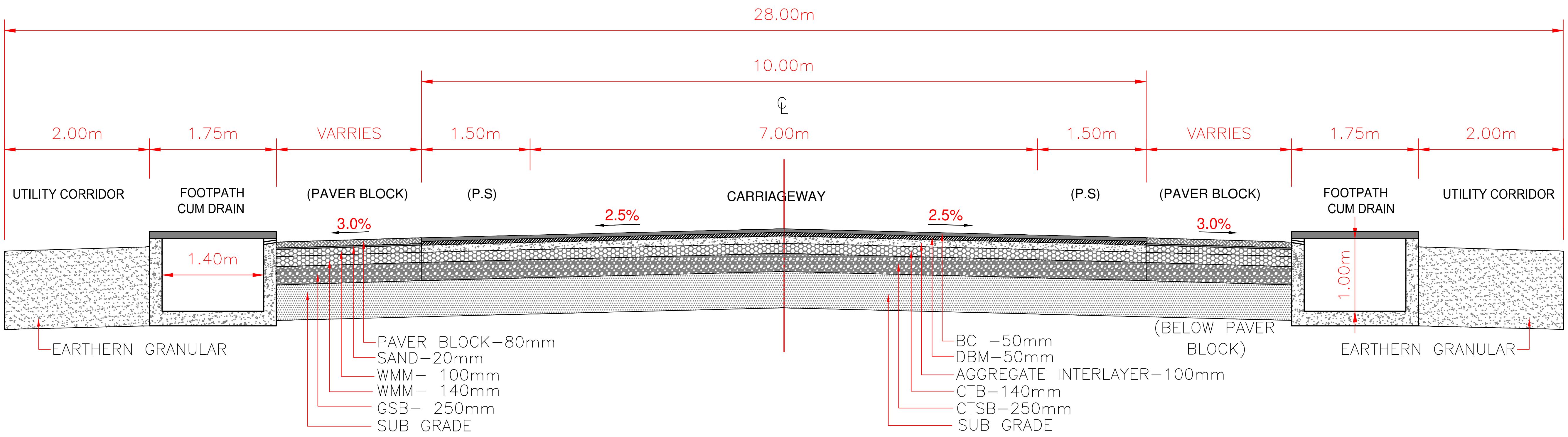
RN-73, Sector-62, Noida, Gautam Budh Nagar, Uttar Pradesh-201309



Concentric Widening and reconstruction in semi built up area

TWO LANE WITH PAVED SHOULDER WITH PAVER BLOCK AND RCC DRAIN IN SEMI BUILT UP AREAS (TCS- 6D)

S.NO	DESIGN CHAINAGE		LENGTH	TCS TYPE
	FROM	TO		
1	06+300	07+100	800	TCS−6D
2	08+300	09+300	1000	TCS−6D
3	10+400	11+150	750	TCS−6D
TOTAL LENGTH			2550	

Project Title :

Consultancy services for feasibility study and preparation of DPR for improvement and up- gradation of in principle declared National Highways in the state of Uttar Pradesh.

Section : Bewar - Farrukhabad - Miranpur Katra - Bisalpur - Pilibhit

CLIENT

MINISTRY OF ROAD TRANSPORT & HIGHWAYS

Drawing Title:	TYPICAL CROSS SECTION		Sheet : 05 OF 07
Drawing No. :-			
Scale :-	NTS		
Drn	Dgn.	Appd	Date
PRADEEP RAWAT	LOVISH	M.P.S	SEP - 2018

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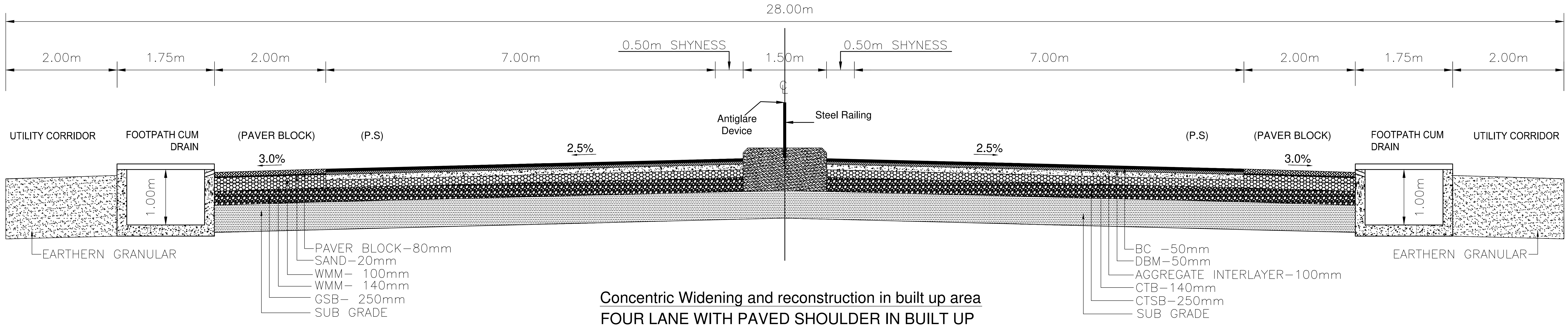
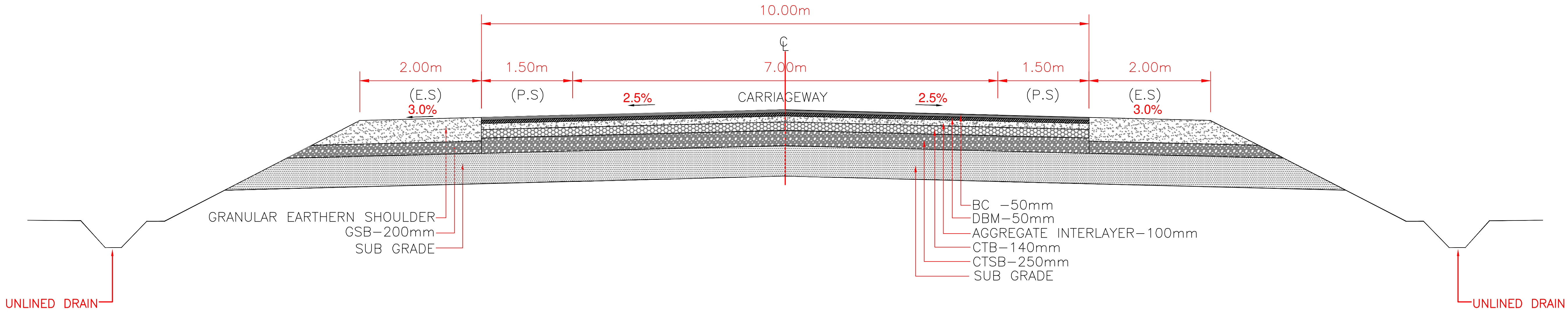


Concentric Widening and reconstruction in built up area

FOUR LANE WITH PAVED SHOULDER IN BUILT UP AREAS (TCS- 6F) FOR PLAIN TERRAIN

S.NO	DESIGN CHAINAGE		LENGTH	TCS TYPE
	FROM	TO		
1	0+000	1+500	1500	TCS-6F

Project Title :	CLIENT	Drawing Title: TYPICAL CROSS SECTION	CONSULTANT:
Consultancy services for feasibility study and preparation of DPR for improvement and up- gradation of in principle declared National Highways in the state of Uttar Pradesh. Section : Bewar - Farrukhabad - Miranpur Katra - Bisalpur - Pilibhit	MINISTRY OF ROAD TRANSPORT & HIGHWAYS	Drawing No. :- ; Scale :- NTS ; Sheet : 06 OF 07 ; Drn: PRADEEP RAWAT ; Dgn.: LOVISH ; Appd: M.P.S ; Date: SEP - 2018	Chaitanya Projects Consultancy Pvt. Ltd. in association with Agnitio Infrastructure Projects Pvt. Ltd. RN-73, Sector-62, Noida, Gautam Budh Nagar, Uttar Pradesh-201309



Concentric Widening and reconstruction in existing open area
TWO LANE WITH PAVED SHOULDER IN OPEN AREAS (TCS- 2B) FOR PLAIN TERRAIN

S.NO	DESIGN CHAINAGE		LENGTH	TCS TYPE
	FROM	TO		
1	01+500	03+600	2100	TCS–2B
2	03+600	03+940	340	TCS–2B
3	03+940	06+300	2360	TCS–2B
4	07+100	08+300	1200	TCS–2B
5	09+300	10+400	1100	TCS–2B
6	11+150	12+000	850	TCS–2B
TOTAL LENGTH			7950	

Project Title :

Consultancy services for feasibility study and preparation of DPR for improvement and up- gradation of in principle declared National Highways in the state of Uttar Pradesh.

Section : Bewar - Farrukhabad - Miranpur Katra - Bisalpur - Pilibhit

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MINISTRY OF ROAD TRANSPORT & HIGHWAYS

Drawing Title: TYPICAL CROSS SECTION

Drawing No. :-

Sheet : 07 OF 07

Scale :- NTS

Drn	Dgn.	Appd	Date
PRADEEP RAWAT	LOVISH	M.P.S	SEP - 2018

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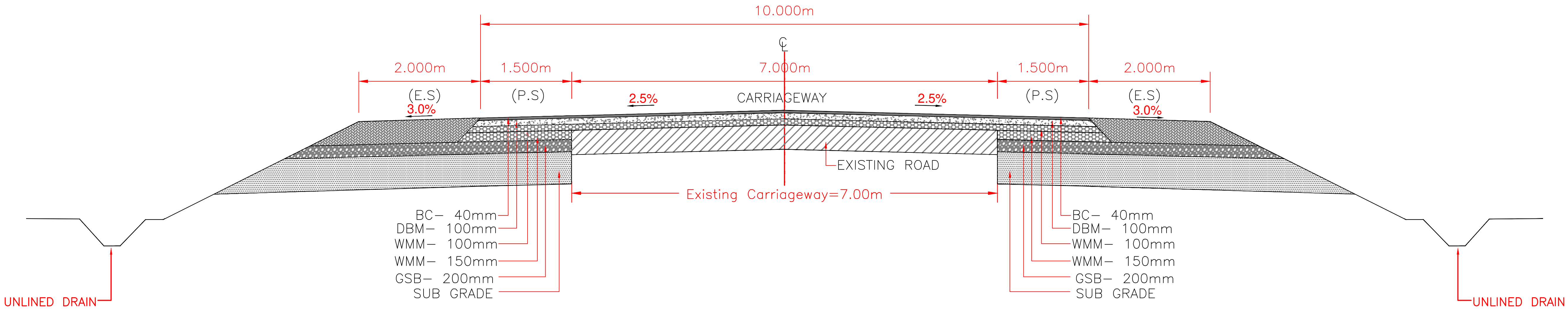

Concentric Widening and strengthning in open area

TWO LANE WITH PAVED SHOULDER IN OPEN AREAS (TCS- 2) FOR PLAIN TERRAIN

S.NO	DESIGN CHAINAGE		LENGTH	TCS TYPE
	FROM	TO		
1	52+770	59+250	6480	TCS–2
2	60+000	63+680	3680	TCS–2
3	64+630	66+280	1650	TCS–2
4	67+380	69+630	2250	TCS–2
5	69+970	70+620	650	TCS–2
6	71+900	76+350	4450	TCS–2
7	76+650	77+900	1250	TCS–2
8	81+750	86+280	4530	TCS–2
9	86+680	91+600	4920	TCS–2
10	91+850	95+900	4050	TCS–2
11	97+200	102+800	5600	TCS–2
12	103+080	108+800	5720	TCS–2
13	109+130	112+880	3750	TCS–2
	TOTAL LENGTH		48980	

Project Title :

Consultancy services for feasibility study and preparation of DPR for improvement and up- gradation of in principle declared National Highways in the state of Uttar Pradesh.

Section : Bewar - Farrukhabad - Miranpur Katra - Bisalpur - Pilibhit

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MINISTRY OF ROAD TRANSPORT & HIGHWAYS

Drawing Title:	TYPICAL CROSS SECTION (TCS-2)		
Drawing No. :-			Sheet : 01 OF 07
Scale :-	NTS		
Drn	Dgn.	Appd	Date
PRADEEP RAWAT	LOVISH	M.P.S	SEP - 2018

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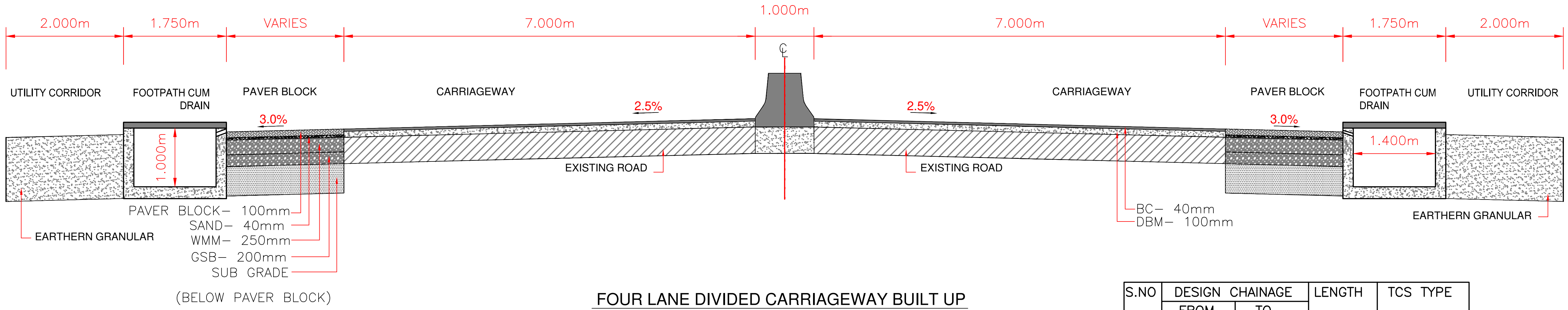

FOUR LANE DIVIDED CARRIAGEWAY BUILT UP AREAS (TCS- 6B) JALALABAD

S.NO	DESIGN CHAINAGE		LENGTH	TCS TYPE
	FROM	TO		
1	79+800	81+750	1950	TCS–6B

Project Title :

Consultancy services for feasibility study and preparation of DPR for improvement and up- gradation of in principle declared National Highways in the state of Uttar Pradesh.

Section : Bewar - Farrukhabad - Miranpur Katra - Bisalpur - Pilibhit

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MINISTRY OF ROAD TRANSPORT & HIGHWAYS

Drawing Title:	TYPICAL CROSS SECTION (TCS-6B)			
Drawing No. :-				Sheet : 04 OF 07
Scale :-	NTS			
Drn	Dgn.	Appd		Date
PRADEEP RAWAT	LOVISH	M.P.S		SEP - 2018

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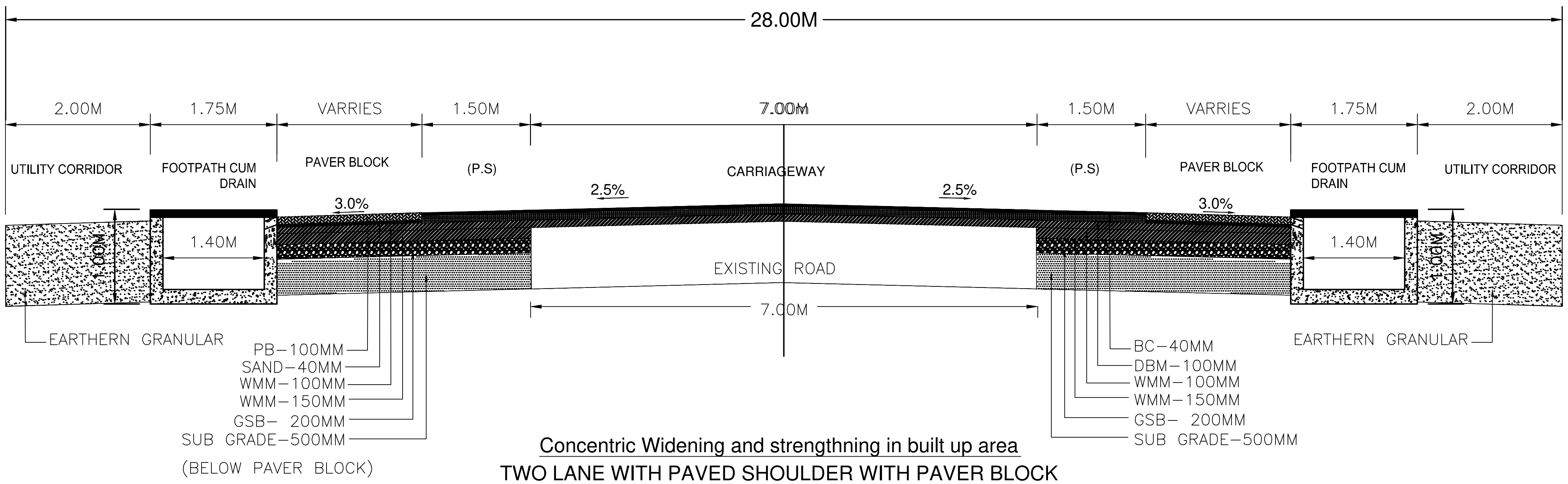
RN-73, Sector-62, Noida, Gautam Budh Nagar, Uttar Pradesh-201309



Concentric Widening and strengthning in built up area

TWO LANE WITH PAVED SHOULDER WITH PAVER BLOCK AND DRAIN IN SEMI BUILT UP AREAS (TCS- 6A)

DESIGN CHAINAGE		
FROM	TO	LENGTH
63+680	64+630	950
66+280	67+380	1100
69+630	69+970	340
70+620	71+900	1280
76+350	76+650	300
86+280	86+680	400
91+600	91+850	250
95+900	97+200	1300
102+800	103+080	280
108+800	109+130	330
TOTAL LENGTH		6530

Project Title :

Consultancy services for feasibility study and preparation of DPR for improvement and up- gradation of in principle declared National Highways in the state of Uttar Pradesh.

Section : Bewar - Farrukhabad - Miranpur Katra - Bisalpur - Pilibhit

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MINISTRY OF ROAD TRANSPORT & HIGHWAYS

Drawing Title:	TYPICAL CROSS SECTION		
Drawing No. :-			Sheet : 03 OF 07
Scale :-	NTS		
Drn	Dgn.	Appd	Date
PRADEEP RAWAT	LOVISH	M.P.S	SEP - 2018

CONSULTANT:

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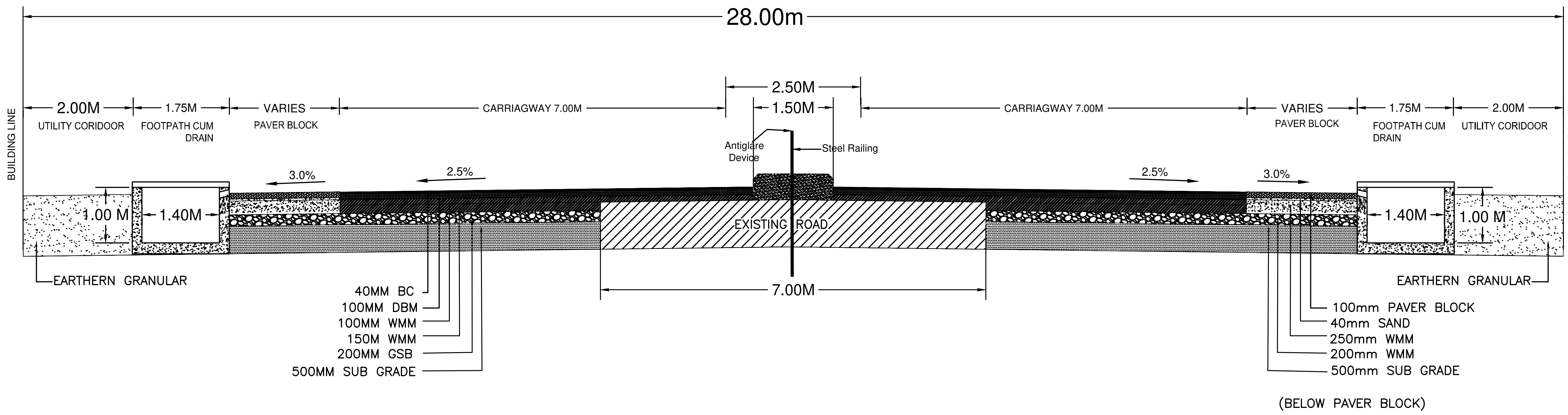

Concentric Widening and strengthening in existing 2 lane sections

FOUR LANE WITH PAVED SHOULDER IN BUILT-UP AREAS (TCS- 6) FOR PLAIN

DESIGN CHAINAGE		
FROM	TO	LENGTH
59+250	60+000	750
77+900	79+800	1900
112+880	114+000	1120
TOTAL LENGTH		3770

Project Title :

Consultancy services for feasibility study and preparation of DPR for improvement and up- gradation of in principle declared National Highways in the state of Uttar Pradesh.

Section : Bewar - Farrukhabad - Miranpur Katra - Bisalpur - Pilibhit

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MINISTRY OF ROAD TRANSPORT & HIGHWAYS

Drawing Title:	TYPICAL CROSS SECTION		
Drawing No. :-			Sheet : 02 OF 07
Scale :-	NTS		
Drn	Dgn.	Appd	Date
PRADEEP RAWAT	LOVISH	M.P.S	SEP - 2018

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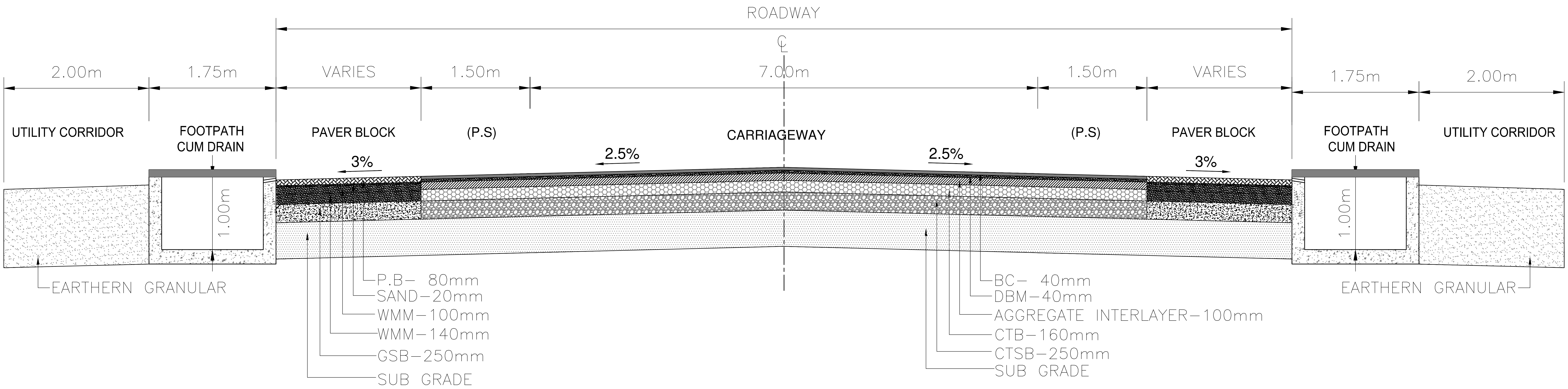
(TCS- 6D)



Reconstruction in semi built up area in existing single lane section

TWO LANE WITH PAVED SHOULDER WITH RCC DRAIN IN SEMI BUILT UP AREAS (TCS- 6D)

S.NO	DESIGN CHAINAGE		LENGTH (m)	TCS TYPE
	FROM	TO		
1	114+000	115+550	1550	TCS-6D
2	117+850	118+650	800	TCS-6D
3	122+850	123+450	600	TCS-6D
4	128+100	131+450	3350	TCS-6D
TOTAL LENGTH			6300	

Project Title :

Consultancy services for feasibility study and preparation of DPR for improvement and up- gradation of in principle declared National Highways in the state of Uttar Pradesh.

Section : Bewar - Farrukhabad - Miranpur Katra - Bisalpur - Pilibhit

CLIENT

MINISTRY OF ROAD TRANSPORT & HIGHWAYS

Drawing Title:	TYPICAL CROSS SECTION		
Drawing No. :-			Sheet : 02 OF 02
Scale :-	NTS		
Drn	Dgn.	Appd	Date
PRADEEP RAWAT	LOVISH	M.P.S	OCT - 2018

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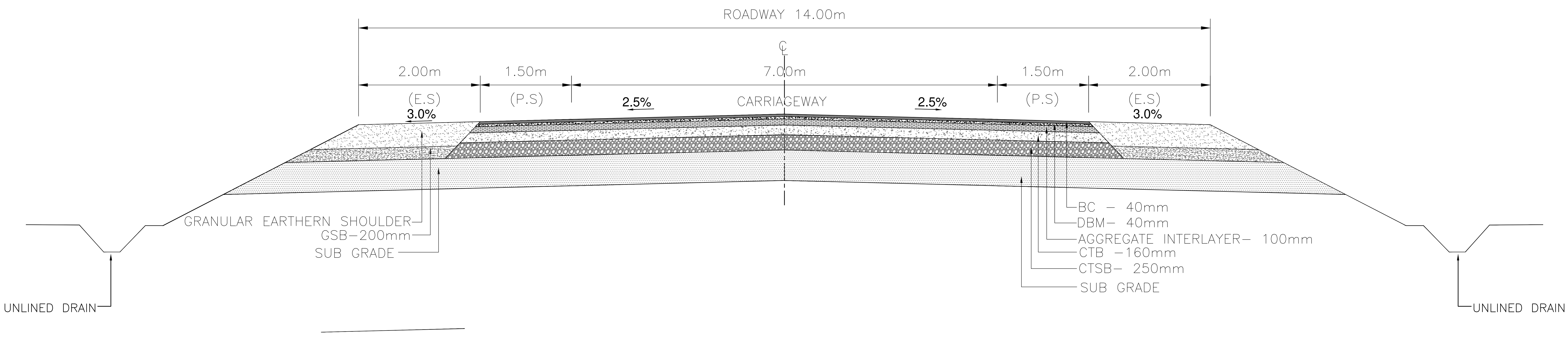
RN-73, Sector-62, Noida, Gautam Budh Nagar, Uttar Pradesh-201309

(TCS- 1)



Concentric Widening and Reconstruction in Existing Earthen Road Section
TWO LANE WITH PAVED SHOULDER IN OPEN AREAS (TCS- 1) FOR PLAIN TERRAIN

S.NO	DESIGN CHAINAGE		LENGTH (m)	TCS TYPE
	FROM	TO		
1	115+550	116+596	1046	TCS–1
2	117+360	117+850	490	TCS–1
3	118+650	122+850	4200	TCS–1
4	123+450	128+100	1700	TCS–1
5	131+450	132+600	1150	TCS–1
6	133+850	136+740	2890	TCS–1
TOTAL LENGTH			14426	

Project Title :

Consultancy services for feasibility study and preparation of DPR for improvement and up- gradation of in principle declared National Highways in the state of Uttar Pradesh.

Section : Bewar - Farrukhabad - Miranpur Katra - Bisalpur - Pilibhit

CLIENT

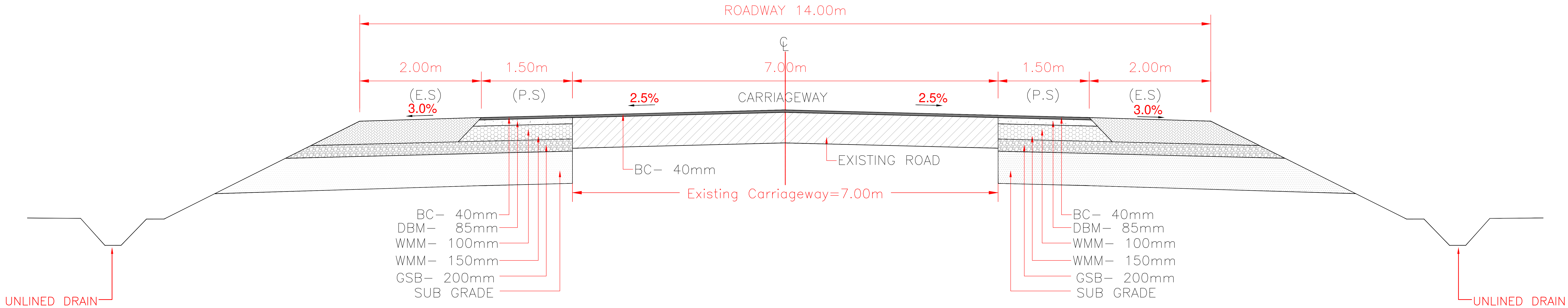
MINISTRY OF ROAD TRANSPORT & HIGHWAYS

Drawing Title:	TYPICAL CROSS SECTION		
Drawing No. :-			Sheet : 01 OF 02
Scale :-	NTS		
Drn	Dgn.	Appd	Date
PRADEEP RAWAT	LOVISH	M.P.S	OCT - 2018

CONSULTANT:

Chaitanya Projects Consultancy Pvt. Ltd.
in association with
Agnitio Infrastructure Projects Pvt. Ltd.
RN-73, Sector-62, Noida, Gautam Budh Nagar, Uttar Pradesh-201309

(TCS- 2)



CONCENTRIC WIDENING AND OVERLAYING FOR TWO LANE WITH PAVED SHOULDER IN OPEN AREAS (TCS- 2) FOR PLAIN TERRAIN

S.NO	DESIGN CHAINAGE		LENGTH (m)	TCS TYPE
	FROM	TO		
1	149+650	153+140	3490	TCS–2
2	153+950	154+850	900	TCS–2
3	155+300	158+150	2850	TCS–2
4	159+350	165+050	5700	TCS–2
5	166+900	167+350	450	TCS–2
6	168+100	168+450	350	TCS–2
7	169+000	170+250	1250	TCS–2
8	171+000	171+650	650	TCS–2
9	172+000	174+150	2150	TCS–2
10	175+500	178+150	2650	TCS–2
11	178+700	181+000	2300	TCS–2
12	181+850	182+750	900	TCS–2
TOTAL LENGTH			23640	

Project Title :

Consultancy services for feasibility study and preparation of DPR for improvement and up- gradation of in principle declared National Highways in the state of Uttar Pradesh.

Section : Bewar - Farrukhabad - Miranpur Katra - Bisalpur - Pilibhit

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MINISTRY OF ROAD TRANSPORT & HIGHWAYS

Drawing Title:	TYPICAL CROSS SECTION		
Drawing No. :-			Sheet : 01 OF 06
Scale :-	NTS		
Drn	Dgn.	Appd	Date
PRADEEP RAWAT	LOVISH	M.P.S	NOV - 2018

CONSULTANT:

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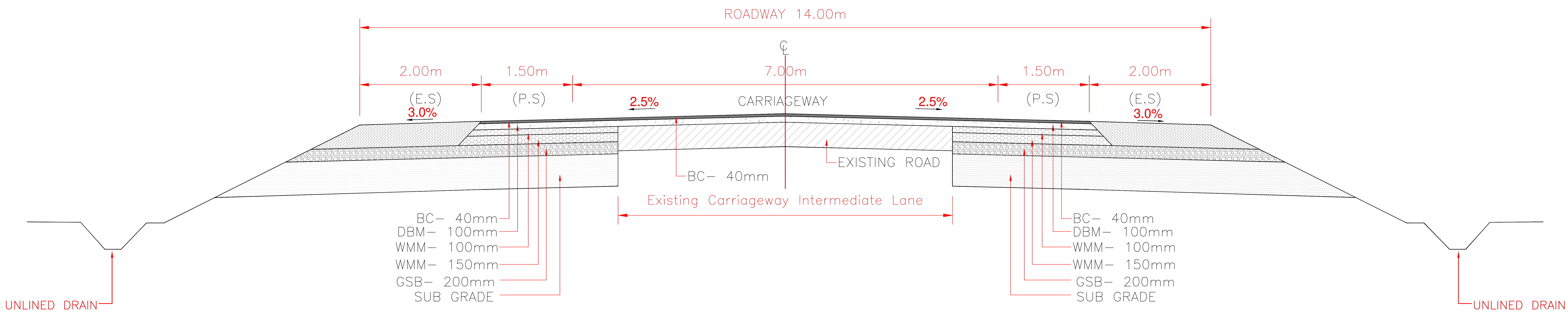
RN-73, Sector-62, Noida, Gautam Budh Nagar, Uttar Pradesh-201309

(TCS- 2C)



CONCENTRIC WIDENING AND OVERLAYING FOR TWO LANE WITH PAVED SHOULDER IN OPEN AREAS (TCS- 2C) FOR PLAIN TERRAIN (EXISTING INTERMEDIATE LANE)

S.NO	DESIGN CHAINAGE		LENGTH (m)	TCS TYPE
	FROM	TO		
1	136+740	145+550	8810	TCS–2C
2	146+200	146+900	700	TCS–2C
TOTAL LENGTH			9510	

Project Title :

Consultancy services for feasibility study and preparation of DPR for improvement and up- gradation of in principle declared National Highways in the state of Uttar Pradesh.

Section : Bewar - Farrukhabad - Miranpur Katra - Bisalpur - Pilibhit

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MINISTRY OF ROAD TRANSPORT & HIGHWAYS

Drawing Title:	TYPICAL CROSS SECTION		
Drawing No. :-			Sheet : 02 OF 06
Scale :-	NTS		
Drn	Dgn.	Appd	Date
PRADEEP RAWAT	LOVISH	M.P.S	NOV - 2018

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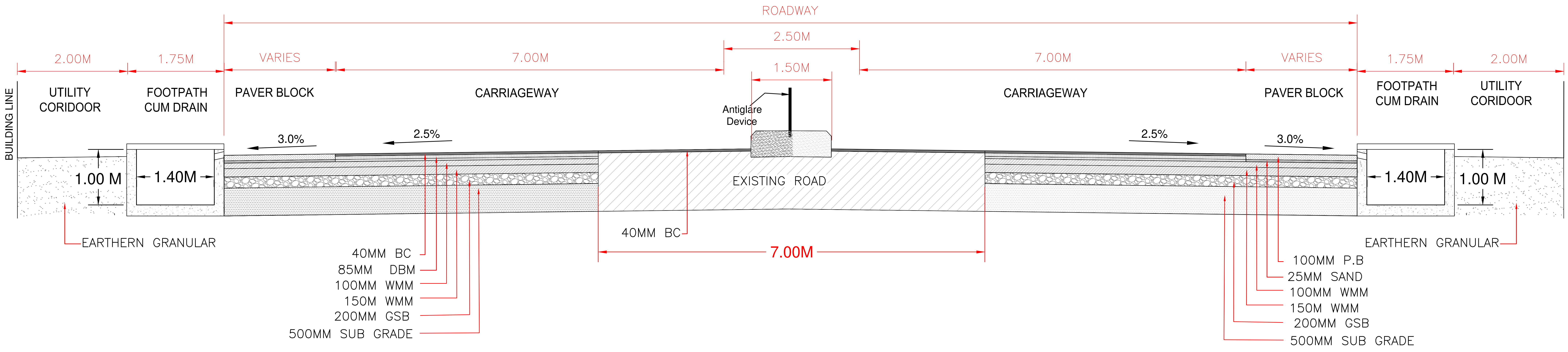
(TCS- 6)



CONCENTRIC WIDENING AND OVERLAYING FOR 4 LANE BUILT UP AREA (TCS-6)

S.NO	DESIGN CHAINAGE		LENGTH (m)	TCS TYPE
	FROM	TO		
1	165+050	166+900	1850	TCS–6
2	182+750	183+380	630	TCS–6
	TOTAL LENGTH		2480	

Project Title :

Consultancy services for feasibility study and preparation of DPR for improvement and up- gradation of in principle declared National Highways in the state of Uttar Pradesh.

Section : Bewar - Farrukhabad - Miranpur Katra - Bisalpur - Pilibhit

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Drawing Title: TYPICAL CROSS SECTION			
Drawing No. :-			Sheet : 03 OF 06
Scale :- NTS			
Drn	Dgn.	Appd	Date
PRADEEP RAWAT	LOVISH	M.P.S	NOV - 2018

CONSULTANT:

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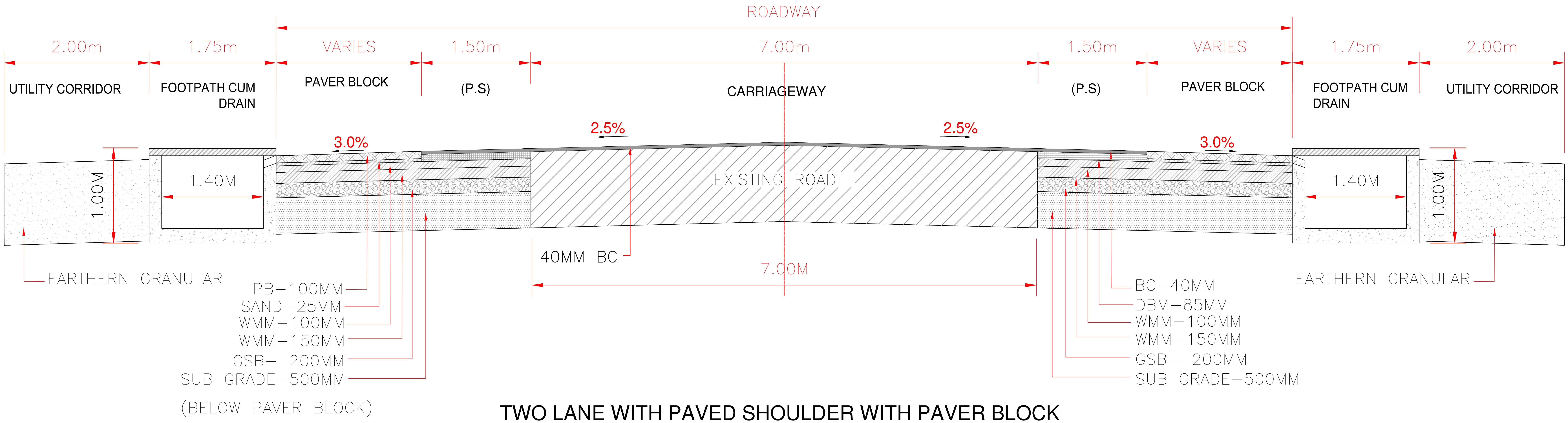
(TCS- 6B)



TWO LANE WITH PAVED SHOULDER WITH PAVER BLOCK IN SEMI BUILT UP AREAS (TCS- 6B)

S.NO	DESIGN CHAINAGE		LENGTH (m)	TCS TYPE
	FROM	TO		
1	147+650	149+650	2000	TCS-6B
2	153+140	153+950	810	TCS-6B
3	154+850	155+300	450	TCS-6B
4	158+150	159+350	1200	TCS-6B
5	170+250	171+000	750	TCS-6B
6	174+150	175+500	1350	TCS-6B
7	167+350	168+100	750	TCS-6B
8	168+450	169+000	550	TCS-6B
9	171+650	172+000	350	TCS-6B
10	178+150	178+700	550	TCS-6B
11	181+000	181+850	850	TCS-6B
TOTAL LENGTH			9610	

Project Title :

Consultancy services for feasibility study and preparation of DPR for improvement and up- gradation of in principle declared National Highways in the state of Uttar Pradesh.

Section : Bewar - Farrukhabad - Miranpur Katra - Bisalpur - Pilibhit

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Drawing Title:	TYPICAL CROSS SECTION		
Drawing No. :-			Sheet : 05 OF 06
Scale :-	NTS		
Drn	Dgn.	Appd	Date
PRADEEP RAWAT	LOVISH	M.P.S	NOV - 2018

CONSULTANT:

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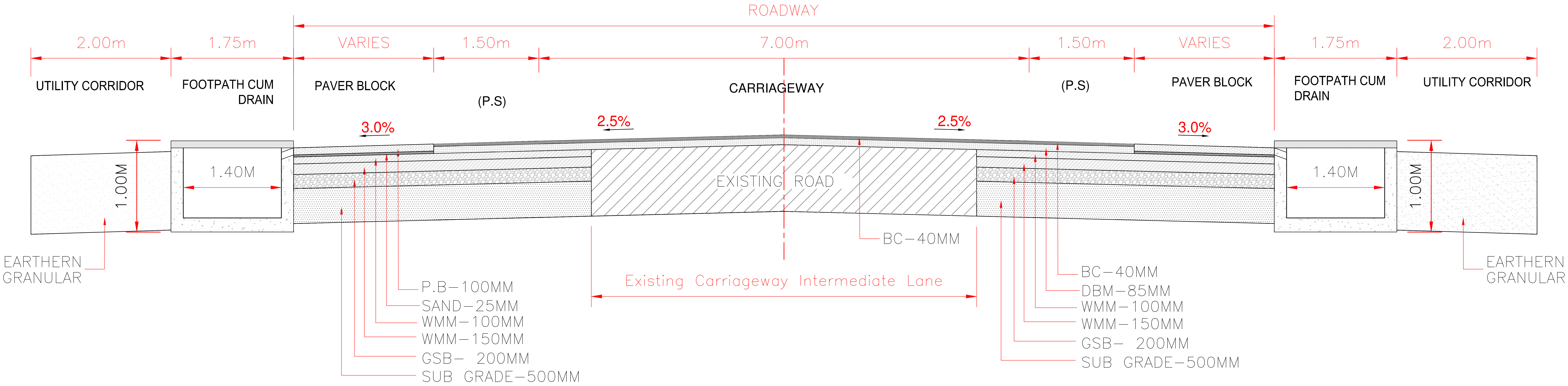
(TCS- 6H)



TWO LANE WITH PAVED SHOULDER WITH PAVER BLOCK IN SEMI BUILT UP AREAS (TCS- 6H) (EXISTING INTERMEDIATE LANE)

S.NO	DESIGN CHAINAGE		LENGTH (m)	TCS TYPE
	FROM	TO		
1	145+550	146+200	650	TCS-6H
2	146+900	147+650	750	TCS-6H
TOTAL LENGTH			1400	

Project Title :

Consultancy services for feasibility study and preparation of DPR for improvement and up- gradation of in principle declared National Highways in the state of Uttar Pradesh.

Section : Bewar - Farrukhabad - Miranpur Katra - Bisalpur - Pilibhit

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Drawing Title:	TYPICAL CROSS SECTION		
Drawing No. :-			Sheet : 06 OF 06
Scale :-	NTS		
Drn	Dgn.	Appd	Date
PRADEEP RAWAT	LOVISH	M.P.S	NOV - 2018

CONSULTANT:

Chaitanya Projects Consultancy Pvt. Ltd.
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RN-73, Sector-62, Noida, Gautam Budh Nagar, Uttar Pradesh-201309

Annexure 2.3

Details Of Culverts

Table 1: Details Of Existing Culvert And Their Proposals (Package-1)

S.No	Ext. Chainage (Km)	Design Chainage (Km)	Existing Detail			Proposal Details					Width Of Culverts
			Type Existing	No. Of Vents	Vent Width	Proposal	No. Of Vents	B Or Dia	Height	Type Of Structure	
1.	0+180	0+180	Slab	1	2.1	Retain	1			Slab	21.5 m
2.	1+285	01+280	Arch	1	1.5	Reconstruction	1	2	2	Box	21.5 m
3.	1+585	01+560	Pipe	1	0.6	Reconstruction	1	1.2	NA	Pipe	15.0 m
4.	4+200	04+180	Arch	1	2.1	Reconstruction	1	2	2	Box	15.0 m
5.	4+760	04+740	Pipe	1	0.3	Reconstruction	1	1.2	NA	Pipe	15.0 m
6.	4+960	04+940	Pipe	1	0.2	Reconstruction	1	1.2	NA	Pipe	15.0 m
7.	5+360	05+340	Pipe	1	-	Reconstruction	1	1.2	NA	Pipe	15.0 m
8.	6+160	06+140	Slab	1	4.1	Widened	1	4.1		Slab	15.0 m
9.	8+770	08+760	Pipe	-	-	Reconstruction	1	1.2	NA	Pipe	21.5 m
10.	9+350	09+330	Pipe	-	-	Reconstruction	1	1.2	NA	Pipe	15.0 m
11.	9+950	09+935	Pipe	-	-	Reconstruction	1	1.2	NA	Pipe	15.0 m
12.	10+260	10+240	Pipe	1	-	Reconstruction	1	1.2	NA	Pipe	15.0 m
13.	11+160	11+140	Pipe	1	-	Reconstruction	1	1.2	NA	Pipe	21.5 m
14.	11+350	11+330	Pipe	1	0.3	Reconstruction	1	1.2	NA	Pipe	15.0 m
15.	11+950	11+920	Arch	1	2.3	Reconstruction	1	2	2	Box	15.0 m
16.	13+450	13+420	Pipe	1	-	Reconstruction	1	1.2	NA	Pipe	15.0 m
17.	13+635	13+620	Pipe	1	0.3	Reconstruction	1	1.2	NA	Pipe	15.0 m
18.	13+735	13+720	Arch	1	1.8	Reconstruction	1	2	2	Box	15.0 m
19.	15+400	15+360	Pipe	2	1.0	Widened	2	1	NA	Pipe	15.0 m
20.	16+370	16+350	Arch	1	1.4	Reconstruction	1	2	2	Box	21.5 m
21.	16+520	16+500	Slab	1	1.8	Reconstruction	1	2	2	Box	21.5 m
22.	18+800	18+790	Arch	1	2.5	Reconstruction	1	2	2	Box	15.0 m
23.	18+870	18+850	Arch	1	2.2	Reconstruction	1	2	2	Box	15.0 m
24.	18+950	18+930	Arch	1	2.1	Reconstruction	1	2	2	Box	15.0 m

S.No	Ext. Chainage (Km)	Design Chainage (Km)	Existing Detail			Proposal Details					Width Of Culverts
			Type Existing	No. Of Vents	Vent Width	Proposal	No. Of Vents	B Or Dia	Height	Type Of Structure	
25.	19+000	18+980	Arch	1	2.3	Reconstruction	1	2	2	Box	15.0 m
26.	19+110	19+090	Arch	1	2.3	Reconstruction	1	2	2	Box	15.0 m
27.	20+110	20+090	Slab	1	4.4	Widened	1	4.4		Slab	15.0 m
28.	20+290	20+260	Pipe	2	1.0	Widened	2	1	NA	Pipe	15.0 m
29.	21+450	21+420	Pipe	1	0.3	Reconstruction	1	1.2	NA	Pipe	21.5 m
30.	22+650	22+620	Slab	1	5.0	Widened	1	5		Slab	15.0 m
31.	22+780	22+760	Slab	1	4.3	Widened	1	4.3		Slab	15.0 m
32.	23+300	23+280	Arch	1	2.2	Reconstruction	1	2	2	Box	15.0 m
33.	24+570	24+510	Pipe	-	-	Reconstruction	1	1.2	NA	Pipe	21.5 m
34.	25+040	24+985	Slab	1	3.2	Widened	1	3.2		Slab	15.0 m
35.	26+560	26+510	Slab	1	2.0	Widened	1	2		Slab	15.0 m
36.	26+700	26+650	Slab	1	6.0	Widened	1	6	NA	Slab	15.0 m
37.	27+070	27+010	Pipe	1	0.3	Reconstruction	1	1.2	NA	Pipe	21.5 m
38.	27+800	27+740	Pipe	1	0.3	Reconstruction	1	1.2	NA	Pipe	21.5 m
39.	28+800	28+740	Pipe	1	0.3	Reconstruction	1	1.2	NA	Pipe	15.0 m
40.	29+130	29+075	Pipe	1	0.3	Reconstruction	1	1.2	NA	Pipe	15.0 m
41.	29+750	29+690	Pipe	1	0.3	Reconstruction	1	1.2	NA	Pipe	15.0 m
42.	30+125	30+070	Arch	1	1.8	Reconstruction	1	2	2	Box	15.0 m
43.	30+210	30+160	Arch	1	1.8	Reconstruction	1	2	2	Box	15.0 m
44.	30+750	30+690	Pipe	2	1.0	Widened	2	1	NA	Pipe	15.0 m
45.	31+600	31+540	Pipe	1	0.3	Reconstruction	1	1.2	NA	Pipe	15.0 m
46.	31+860	32+400	Arch	1	2.2	Reconstruction	1	2	2	Box	15.0 m
47.	32+470	32+410	Pipe	1	-	Reconstruction	1	1.2	NA	Pipe	15.0 m
48.	32+845	32+780	Pipe	2	1.0	Widened	2	1	NA	Pipe	21.5 m
49.	33+560	33+510	Pipe	1	0.3	Reconstruction	1	1.2	NA	Pipe	21.5 m
50.	34+100	34+050	Slab	1	1.5	Widened	1	1.5	NA	Slab	21.5 m
51.	35+600	35+550	Slab	1	2.2	Widened	2	2.2	NA	Slab	21.5 m
52.	35+860	35+800	Pipe	1	0.3	Reconstruction	1	1.2	NA	Pipe	21.5 m
53.	35+935	35+870	Pipe	1	-	Reconstruction	1	1.2	NA	Pipe	21.5 m
54.	37+440	37+380	Pipe	-	-	Reconstruction	1	1.2	NA	Pipe	21.5 m

S.No	Ext. Chainage (Km)	Design Chainage (Km)	Existing Detail			Proposal Details					Width Of Culverts
			Type Existing	No. Of Vents	Vent Width	Proposal	No. Of Vents	B Or Dia	Height	Type Of Structure	
55.	37+870	37+820	Pipe	-	-	Reconstruction	1	1.2	NA	Pipe	21.5 m
56.	38+020	37+960	Slab	1	1.0	Reconstruction	1	2	2	Box	21.5 m
57.	38+900	38+840	Pipe	-	-	Reconstruction	1	1.2	NA	Pipe	21.5 m
58.	38+950	38+890	Pipe	-	-	Dismantle					-
59.	39+100	39+040	Slab	1	1.8	Reconstruction	1	2	2	Box	21.5 m
60.	39+150	39+090	Pipe	1	-	Dismantle					-
61.	39+250	39+190	Pipe	1	-	Dismantle					-
62.	39+300	39+230	Slab	1	2.2	Reconstruction	1	2	2	Box	21.5 m

Source: Detailed Project Report

Table 2: Details of Additional New Culverts and Their Proposals (Package-1)

S.No	Ext. Chainage (Km)	Design Chainage (Km)	Proposal Details					
			Proposal	No. Of Vents	B Or Dia	Height	Type Of Structure	Width Of Culvert
1.	1+810	1+800	New Construction	1	1.20		Hume Pipe	15.0 m
2.	2+110	2+100	New Construction	1	1.20		Hume Pipe	15.0 m
3.	5+510	5+500	New Construction	1	1.20		Hume Pipe	15.0 m
4.	5+810	5+800	New Construction	1	1.20		Hume Pipe	15.0 m
5.	12+020	12+000	New Construction	1	1.20		Hume Pipe	15.0 m
6.	14+020	14+000	New Construction	1	1.20		Hume Pipe	15.0 m
7.	14+320	14+300	New Construction	1	1.20		Hume Pipe	15.0 m
8.	14+620	14+600	New Construction	1	1.20		Hume Pipe	15.0 m
9.	15+020	15+000	New Construction	1	1.20		Hume Pipe	15.0 m
10.	19+320	19+300	New Construction	1	1.20		Hume Pipe	15.0 m
11.	19+620	19+600	New Construction	1	1.20		Hume Pipe	15.0 m
12.	20+820	20+800	New Construction	1	1.20		Hume Pipe	15.0 m
13.	21+820	21+800	New Construction	1	1.20		Hume Pipe	15.0 m
14.	22+020	22+000	New Construction	1	1.20		Hume Pipe	15.0 m

S.No	Ext. Chainage (Km)	Design Chainage (Km)	Proposal Details					
			Proposal	No. Of Vents	B Or Dia	Height	Type Of Structure	Width Of Culvert
15.	23+320	22+300	New Construction	1	1.20		Hume Pipe	15.0 m
16.	25+060	25+000	New Construction	1	1.20		Hume Pipe	15.0 m
17.	25+360	25+300	New Construction	1	1.20		Hume Pipe	15.0 m
18.	25+660	25+600	New Construction	1	1.20		Hume Pipe	15.0 m
19.	26+060	26+000	New Construction	1	1.20		Hume Pipe	15.0 m
20.	28+060	28+000	New Construction	1	1.20		Hume Pipe	15.0 m
21.	28+360	28+300	New Construction	1	1.20		Hume Pipe	15.0 m
22.	29+560	29+500	New Construction	1	1.20		Hume Pipe	15.0 m

Source: Detailed Project Report

Table 3: Detail Of Existing Culvert And Their Proposals (Package-2)

S.No	Ext. Chainage (Km)	Design Chainage (Km)	Existing Detail			Proposal Details					
			Type	No. Of Vent	Vent Width	Proposal	No.Of Vents	B Or Dia	Height	Type Of Structure	Width Of Culvert
1.	59+970	59+900	Slab	1	3.1	Widened	1	3.1	1.8	Slab	21.5 m
2.	61+130	61+060	Slab	1	6.1	Widened	1	6.1	2	Slab	15.0 m
3.	61+540	61+470	Slab	1	6.0	Widened	1	6	2	Slzab	15.0 m
4.	62+240	62+165	Slab/Arch	1	3.0	Reconstruction	1	3	3	Box	15.0 m
5.	62+430	62+355	Slab	1	3.1	Widened	1	3.1	1.9	Slab	15.0 m
6.	62+695	62+610	Slab	2	3	Widened	2	3	2	Slab	15.0 m
7.	62+755	62+685	Pipe	3	1.0	Retain	3	1	Na	Pipe	15.0 m
8.	63+090	63+010	Slab	2	2.4	Reconstruction	1	3	3	Box	15.0 m
9.	63+410	63+350	Slab	2	3.0	Widened	2	3	1.8	Slab	15.0 m
10.	63+670	63+600	Slab	1	3.0	Widened	1	3	1.5	Slab	15.0 m
11.	63+990	63+910	Slab	1	3.0	Reconstruction	1	3	3	Box	21.5 m
12.	64+755	64+690	Pipe	3	1.2	Widened	3	1.2	Na	Pipe	15.0 m
13.	65+350	65+285	Pipe	1	1.0	Widened	1	1	Na	Pipe	15.0 m
14.	65+980	65+900	Pipe	1	1.0	Widened	1	1	Na	Pipe	15.0 m

S.No	Ext. Chainage (Km)	Design Chainage (Km)	Existing Detail			Proposal Details					
			Type	No. Of Vent	Vent Width	Proposal	No.Of Vents	B Or Dia	Height	Type Of Structure	Width Of Culvert
15.	66+550	66+470	Slab	2	3.0	Reconstruction	1	3	3	Box	21.5 m
16.	66+900	66+835	Pipe	6	0.8	Reconstruction	4	1.2	Na	Pipe	21.5 m
17.	67+455	67+390	Pipe	1	1.0	Retain	1	1	Na	Pipe	15.0 m
18.	67+730	67+660	Pipe	4	1.0	Widened	4	1	Na	Pipe	15.0 m
19.	68+200	68+125	Pipe	4	1	Widened	4	1	Na	Pipe	15.0 m
20.	68+450	68+375	Pipe	6	1.0	Retain	6	1	Na	Pipe	15.0 m
21.	69+600	69+525	Pipe	12	1.0	Retain	12	1	Na	Pipe	15.0 m
22.	69+935	69+860	Pipe	4	1.0	Widened	4	1	Na	Pipe	21.5 m
23.	70+610	70+550	Pipe	3	1.0	Retain	3	1	Na	Pipe	15.0 m
24.	72+200	72+100	Pipe	3	1.0	Retain	3	1	Na	Pipe	15.0 m
25.	72+800	72+700	Pipe	6	1.0	Retain	1	1	Na	Pipe	15.0 m
26.	73+100	73+000	Pipe	1	1.0	Retain	1	1	Na	Pipe	15.0 m
27.	73+700	73+600	Pipe	2	1.0	Retain	2	1	Na	Pipe	15.0 m
28.	74+250	74+150	Pipe	1	1.0	Retain	1	1	Na	Pipe	15.0 m
29.	78+050	77+950	Slab	1	3.0	Widened	1	3	1.7	Slab	15.0 m
30.	79+250	79+150	Pipe	2	1.0	Widened	2	1	Na	Pipe	21.5 m
31.	82+850	82+750	Pipe	6	1.0	Retain	6	1	Na	Pipe	15.0 m
32.	83+550	83+450	Pipe	1	1.0	Retain	1	1	Na	Pipe	15.0 m
33.	84+400	84+310	Pipe	6	0.8	Reconstruction	4	1.2	Na	Pipe	15.0 m
34.	87+450	87+350	Pipe	10	1.0	Retain	10	5	Na	Pipe	15.0 m
35.	88+250	88+150	Pipe	3	1.0	Retain	3	1	Na	Pipe	15.0 m
36.	88+700	88+600	Slab	1	2.7	Widened	1	2.7	2	Slab	15.0 m
37.	90+400	90+300	Box	1	2	Widened	1	2	2	Box	15.0 m
38.	91+000	90+900	Box	1	2.0	Widened	1	2	2	Box	15.0 m
39.	91+300	91+200	Pipe	2	0.6	Reconstruction	1	1.2	Na	Pipe	15.0 m
40.	91+750	91+650	Pipe	2	1.2	Widened	2	1.2	Na	Pipe	21.5 m
41.	92+750	92+660	Box	2	3.0	Widened	1	3	3	Box	15.0 m
42.	93+700	93+600	Pipe	2	1.0	Retain	2	1	Na	Pipe	15.0 m
43.	95+150	95+040	Slab	1	1.5	Widened	1	1.5	2	Slab	15.0 m
44.	95+800	95+710	Slab	1	2.0	Widened	1	2	2	Slab	15.0 m

S.No	Ext. Chainage (Km)	Design Chainage (Km)	Existing Detail			Proposal Details					
			Type	No. Of Vent	Vent Width	Proposal	No.Of Vents	B Or Dia	Height	Type Of Structure	Width Of Culvert
45.	96+100	96+000	Pipe	3	1.0	Widened	3	1	Na	Pipe	21.5 m
46.	97+300	97+200	Slab	1	2.0	Widened	1	2	2	Slab	21.5 m
47.	99+720	99+615	Slab	1	3.0	Widened	1	3	2	Slab	15.0 m
48.	101+250	101+140	Pipe	2	1.0	Widened	2	1	Na	Pipe	15.0 m
49.	101+500	101+400	Slab	1	5.0	Widened	1	5	2	Slab	15.0 m
50.	102+270	102+170	Slab	1	2.0	Widened	1	2	2	Slab	15.0 m
51.	103+200	103+100	Pipe	6	1.0	Retain	6	1	Na	Pipe	21.5 m
52.	103+920	103+830	Slab	1	5.8	Widened	1	5.8	1.9	Slab	15.0 m
53.	104+320	104+225	Pipe	6	1.0	Retain	6	1	Na	Pipe	15.0 m
54.	104+850	104+765	Slab	1	2.7	Widened	1	2.7	2	Slab	15.0 m
55.	106+050	105+950	Pipe	1	1.0	Widened	1	1	Na	Pipe	15.0 m
56.	106+470	106+360	Slab	1	3.0	Widened	1	3	2	Slab	15.0 m
57.	107+500	107+410	Slab	1	5.6	Widened	1	5.6	2	Slab	15.0 m
58.	109+470	109+380	Slab	1	5.5	Widened	1	5.5	2	Slab	15.0 m
59.	110+220	110+120	Pipe	1	1.0	Retain	1	1	Na	Pipe	15.0 m
60.	110+850	110+745	Pipe	1	1	Retain	1	1	Na	Pipe	15.0 m

Source: Detailed Project Report

Table 4: Details Of Additional New Culverts And Their Proposals (Package-2)

S.No	Design Chainage (Km)	Proposal Details					
		Proposal	No. Of Vents	B Or Dia	H	Type Of Structure	Width
1.	64+900	New Construction	1	1.20		Hume Pipe	15.0 M
2.	65+750	New Construction	1	1.20		Hume Pipe	15.0 M
3.	68+950	New Construction	1	1.20		Hume Pipe	15.0 M
4.	70+780	New Construction	1	1.20		Hume Pipe	15.0 M
5.	71+300	New Construction	1	1.20		Hume Pipe	15.0 M
6.	71+800	New Construction	1	1.20		Hume Pipe	15.0 M

S.No	**Design Chainage (Km)**	**Proposal Details**					
		Proposal	**No. Of Vents**	**B Or Dia**	**H**	**Type Of Structure**	**Width**
7.	74+500	New Construction	1	1.20		Hume Pipe	15.0 M
8.	75+300	New Construction	1	1.20		Hume Pipe	15.0 M
9.	75+850	New Construction	1	1.20		Hume Pipe	15.0 M
10.	76+100	New Construction	1	1.20		Hume Pipe	15.0 M
11.	77+350	New Construction	1	1.20		Hume Pipe	15.0 M
12.	77+680	New Construction	1	1.20		Hume Pipe	15.0 M
13.	83+000	New Construction	1	1.20		Hume Pipe	15.0 M
14.	83+950	New Construction	1	1.20		Hume Pipe	15.0 M
15.	84+750	New Construction	1	1.20		Hume Pipe	15.0 M
16.	85+050	New Construction	1	1.20		Hume Pipe	15.0 M
17.	86+950	New Construction	1	1.20		Hume Pipe	15.0 M
18.	87+800	New Construction	1	1.20		Hume Pipe	15.0 M
19.	89+000	New Construction	1	1.20		Hume Pipe	15.0 M
20.	89+400	New Construction	1	1.20		Hume Pipe	15.0 M
21.	89+850	New Construction	1	1.20		Hume Pipe	15.0 M
22.	92+100	New Construction	1	1.20		Hume Pipe	15.0 M
23.	93+100	New Construction	1	1.20		Hume Pipe	15.0 M
24.	94+000	New Construction	1	1.20		Hume Pipe	15.0 M
25.	94+450	New Construction	1	1.20		Hume Pipe	15.0 M
26.	97+700	New Construction	1	1.20		Hume Pipe	15.0 M
27.	98+100	New Construction	1	1.20		Hume Pipe	15.0 M
28.	98+600	New Construction	1	1.20		Hume Pipe	15.0 M
29.	99+050	New Construction	1	1.20		Hume Pipe	15.0 M
30.	100+050	New Construction	1	1.20		Hume Pipe	15.0 M
31.	100+600	New Construction	1	1.20		Hume Pipe	15.0 M
32.	101+850	New Construction	1	1.20		Hume Pipe	15.0 M
33.	102+500	New Construction	1	1.20		Hume Pipe	15.0 M
34.	102+750	New Construction	1	1.20		Hume Pipe	15.0 M
35.	105+100	New Construction	1	1.20		Hume Pipe	15.0 M
36.	105+600	New Construction	1	1.20		Hume Pipe	15.0 M

S.No	Design Chainage (Km)	Proposal Details					
		Proposal	No. Of Vents	B Or Dia	H	Type Of Structure	Width
37.	106+850	New Construction	1	1.20		Hume Pipe	15.0 M
38.	107+900	New Construction	1	1.20		Hume Pipe	15.0 M
39.	108+300	New Construction	1	1.20		Hume Pipe	15.0 M
40.	109+950	New Construction	1	1.20		Hume Pipe	15.0 M
41.	111+100	New Construction	1	1.20		Hume Pipe	15.0 M
42.	111+700	New Construction	1	1.20		Hume Pipe	15.0 M
43.	112+200	New Construction	1	1.20		Hume Pipe	15.0 M
44.	112+750	New Construction	1	1.20		Hume Pipe	15.0 M

Source: Detailed Project Report

Table 5: Detail Of Existing Culverts And Their Proposals (Package-3)

S.No	Ext. Chainage (Km)	Design Chainage (Km)	Existing Detail			Proposal Details					
			Type	No. Of Vent	Vent Width	Proposal	No.Of Vents	B Or Dia	Height	Type Of Structure	TCS Type
1.	114+320	114+235	Arch	1	2.5	Reconstruction	1	2	2	Rcc Box	TCS 6D
2.	114+650	114+550	Arch	1	2.1	Reconstruction	1	2	2	Rcc Box	TCS 6D
3.	115+100	115+000	Arch	1	1.8	Reconstruction	1	2	2	Rcc Box	TCS 6D
4.	115+300	115+200	Hume Pipe	1	0.6	Reconstruction	1	1.2	NA	Hume Pipe	TCS 6D
5.	115+750	115+620	Slab	1	4.2	Widened	1	4.2	2.1	Slab	TCS 1
6.	115+850	115+710	Slab	1	1.5	Widened	1	1.5	1.4	Slab	TCS 1
7.	116+400	116+300	Hume Pipe	1	0.6	Reconstruction	1	1.2	NA	Hume Pipe	TCS 1
8.	116+550	116+420	Hume Pipe	1	0.45	Reconstruction	1	1.2	NA	Hume Pipe	TCS 1
9.	118+920	118+790	Slab	1	3.0	Widened	1	3	1.7	Slab	TCS 1
10.	119+500	119+380	Hume Pipe	1	0.6	Reconstruction	2	1.2	NA	Hume Pipe	TCS 1
11.	120+400	120+270	Hume Pipe	1	0.6	Reconstruction	1	1.2	NA	Hume Pipe	TCS 1
12.	121+120	120+680	Hume Pipe	2	0.45	Reconstruction	1	1.2	NA	Hume Pipe	TCS 1
13.	121+300	121+160	Hume Pipe	1	0.45	Reconstruction	1	1.2	NA	Hume Pipe	TCS 1

S.No	Ext. Chainage (Km)	Design Chainage (Km)	Existing Detail			Proposal Details					
			Type	No. Of Vent	Vent Width	Proposal	No.Of Vents	B Or Dia	Height	Type Of Structure	TCS Type
14.	121+800	121+660	Hume Pipe	2	0.45	Reconstruction	1	1.2	NA	Hume Pipe	TCS 1
15.	122+000	121+860	Arch	1	2.2	Reconstruction	1	2	2	RCC Box	TCS 1
16.	122+180	122+050	Arch	1	1.2	Reconstruction	1	2	2	RCC Box	TCS 1
17.	122+420	122+290	Arch	1	1.2	Reconstruction	1	2	2	RCC Box	TCS 1
18.	122+650	122+500	Hume Pipe	1	0.45	Reconstruction	1	1.2	NA	Hume Pipe	TCS 1
19.	123+500	123+350	Slab	1	3.0	Widened	1	3.0	1.8	Slab	TCS 6D
20.	124+750	124+610	Arch	1	2.5	Reconstruction	1	2	2	RCC Box	TCS 1
21.	125+000	124+850	Slab	1	5.0	Widened	1	5	2.1	Slab	TCS 1
22.	125+200	125+070	Slab	1	6.0	Widened	1	6	1.6	Slab	TCS 1
23.	126+000	125+850	Slab	1	2.0	Widened	1	2	1.3	Slab	TCS 1
24.	127+620	127+480	Arch	2	2.8	Reconstruction	1	3	3	RCC Box	TCS 1
25.	129+800	129+660	Hume Pipe	2	0.3	Reconstruction	1	1.2	NA	Hume Pipe	TCS 6D
26.	130+125	129+980	Hume Pipe	2	0.45	Reconstruction	1	1.2	NA	Hume Pipe	TCS 6D
27.	130+150	130+010	Hume Pipe	1	1.0	Widened	1	1	NA	Hume Pipe	TCS 6D
28.	130+300	130+160	Hume Pipe	1	0.3	Reconstruction	1	1.2	NA	Hume Pipe	TCS 6D
29.	130+450	130+310	Hume Pipe	2	1.2	Widened	2	1.2	Na	Hume Pipe	TCS 6D
30.	130+650	130+510	Hume Pipe	1	0.6	Reconstruction	1	1.2	NA	Hume Pipe	TCS 6D
31.	130+700	130+560	Hume Pipe	1	1.0	Widened	1	1	NA	Hume Pipe	TCS 6D
32.	131+150	131+010	Hume Pipe	1	1.0	Widened	1	1	NA	Hume Pipe	TCS 6D
33.	131+650	131+510	Hume Pipe	1	1.2	Widened	1	1.2	NA	Hume Pipe	TCS 1
34.	132+450	132+310	Arch	1	1.6	Reconstruction	1	2	2	RCC Box	TCS 1

Source: Detailed Project Report

Table 6: Details of Additional Of New Culverts And Their Proposals (Package-3)

S.No	Ext. Chainage (Km)	Design Chainage (Km)	Proposal Details					
			Proposal	No. Of Vents	B Or Dia	H	Type Of Structure	TCS Type

S.No	Ext. Chainage (Km)	Design Chainage (Km)	Proposal Details					
			Proposal	No. Of Vents	B Or Dia	H	Type Of Structure	TCS Type
1.	114+830	114+740	New Construction	1	2	2	RCC Box	TCS-6D
2.	116+110	116+000	New Construction	1	2	2	RCC Box	TCS-1
3.	117+600	117+460	New Construction	1	2	2	RCC Box	TCS-1
4.	117+940	117+800	New Construction	1	2	2	RCC Box	TCS-1
5.	118+240	118+100	New Construction	1	2	2	RCC Box	TCS-6D
6.	118+640	118+500	New Construction	1	2	2	RCC Box	TCS-6D
7.	119+190	119+050	New Construction	1	2	2	RCC Box	TCS-1
8.	119+940	119+800	New Construction	1	2	2	RCC Box	TCS-1
9.	120+060	120+920	New Construction	1	2	2	RCC Box	TCS-1
10.	122+990	122+850	New Construction	1	2	2	RCC Box	TCS-1
11.	123+740	123+600	New Construction	1	2	2	RCC Box	TCS-1
12.	124+060	123+920	New Construction	1	2	2	RCC Box	TCS-1
13.	124+390	124+250	New Construction	1	2	2	RCC Box	TCS-1
14.	125+590	125+450	New Construction	1	2	2	RCC Box	TCS-1
15.	126+240	126+100	New Construction	1	2	2	RCC Box	TCS-1
16.	126+590	126+450	New Construction	1	2	2	RCC Box	TCS-1
17.	127+090	126+950	New Construction	1	2	2	RCC Box	TCS-1
18.	127+990	127+850	New Construction	1	2	2	RCC Box	TCS-1
19.	128+340	128+200	New Construction	1	2	2	RCC Box	TCS-6D
20.	128+740	128+600	New Construction	1	2	2	RCC Box	TCS-6D
21.	129+240	129+100	New Construction	1	2	2	RCC BOX	TCS-6D
22.	132+040	131+900	New Construction	1	2	2	RCC BOX	TCS-1
23.		134+000	New Construction	1	1.2	NA	Hume Pipe	TCS 1
24.		134+500	New Construction	1	1.2	NA	Hume Pipe	TCS 1
25.		135+000	New Construction	1	1.2	NA	Hume Pipe	TCS 1
26.		135+500	New Construction	1	1.2	NA	Hume Pipe	TCS 1
27.		136+000	New Construction	1	1.2	NA	Hume Pipe	TCS 1
28.		136+400	New Construction	1	1.2	NA	Hume Pipe	TCS 1
29.		136+700	New Construction	1	1.2	NA	Hume Pipe	TCS 1

Source: Detailed Project Report

Table 7: Detail Of Existing Culvert And Their Proposals (Package-4)

S. No	Existing Chainage (Km)	Design Chainage (Km)	Existing Detail			Proposal Details						
			Type	No. Of Vent	Vent Width	Proposal	No. Of Vents	B Or Dia	Height	Type Of Structure	Width	TCS Type
1.	137+340	137+100	Slab	1	0.9	Reconstruction	1	2	2	RCC Box	15.00	TCS 2C
2.	137+810	137+570	Slab	1	0.9	Reconstruction	1	2	2	RCC Box	15.00	TCS 2C
3.	138+210	137+980	Hume Pipe	2	0.6	Reconstruction	1	1.2	NA	Hume Pipe	15.00	TCS 2C
4.	138+690	138+450	Hume Pipe	2	1.2	Widened	2	1.2	NA	Hume Pipe	15.00	TCS 2C
5.	138+750	138+510	Slab	1	3.6	Widened	1	3.6	2.1	Slab	15.00	TCS 2C
6.	138+890	138+650	Hume Pipe	1	0.9	Widened	1	0.9	NA	Hume Pipe	15.00	TCS 2C
7.	139+500	139+260	Hume Pipe	2	0.9	Widened	2	0.9	NA	Hume Pipe	15.00	TCS 2C
8.	139+710	139+470	Slab	1	2.1	Widened	1	2.1	2	Slab	15.00	TCS 2C
9.	140+560	140+315	Hume Pipe	1	1	Widened	1	1	NA	Hume Pipe	15.00	TCS 2C
10.	140+620	140+380	Hume Pipe	2	0.8	Reconstruction	1	1.2	NA	Hume Pipe	15.00	TCS 2C
11.	140+720	140+480	Slab	1	0.9	Reconstruction	1	2	2	RCC Box	15.00	TCS 2C
12.	141+060	140+820	Hume Pipe	2	0.8	Reconstruction	1	1.2	NA	Hume Pipe	15.00	TCS 2C
13.	141+850	141+610	Slab	1	1.4	Widened	1	1.4	1.1	Slab	15.00	TCS 2C
14.	142+950	142+700	Slab	1	1.4	Widened	1	1.4	2	Slab	15.00	TCS 2C
15.	143+510	143+260	Slab	1	1.4	Widened	1	1.4	1.3	Slab	15.00	TCS 2C
16.	146+020	145+780	Slab	1	1.8	Widened	1	1.8	1.2	Slab	11.00	TCS 6H
17.	146+610	146+380	Arch	1	1.1	Reconstruction	1	2	2	RCC BOX	15.00	TCS 2C
18.	147+100	146+860	Hume Pipe	1	0.6	Reconstruction	1	1.2	NA	Hume Pipe	15.00	TCS 2C
19.	148+020	147+780	Hume Pipe	1	1	Widened	1	1	NA	Hume Pipe	11.00	TCS 6B
20.	148+150	147+900	Slab	1	4.2	Widened	1	4.2	1	Slab	11.00	TCS 6B
21.	148+340	148+090	Hume Pipe	1	1	Widened	1	1	NA	Hume Pipe	11.00	TCS 6B
22.	148+560	148+320	Hume Pipe	1	0.6	Reconstruction	1	1.2	NA	Hume Pipe	11.00	TCS 6B
23.	149+270	149+030	Slab	1	4.2	Widened	1	4.2	2.1	Slab	11.00	TCS 6B
24.	149+510	149+260	Hume Pipe	1	1.2	Widened	1	1.2	NA	Hume Pipe	11.00	TCS 6B
25.	149+640	149+400	Arch	1	1.9	Reconstruction	1	2	2	RCC BOX	11.00	TCS 6B
26.	149+680	149+430	Hume Pipe	3	1.2	Widened	3	1.2	NA	Hume Pipe	11.00	TCS 6B
27.	149+940	149+680	Hume Pipe	1	0.6	Reconstruction	1	1.2	NA	Hume Pipe	15.00	TCS 2
28.	149+970	149+730	Hume Pipe	1	0.45	Reconstruction	1	1.2	NA	Hume Pipe	15.00	TCS 2

S. No	Existing Chainage (Km)	Design Chainage (Km)	Existing Detail			Proposal Details						
			Type	No. Of Vent	Vent Width	Proposal	No. Of Vents	B Or Dia	Height	Type Of Structure	Width	TCS Type
29.	150+090	149+840	Hume Pipe	1	0.9	Widened	1	0.9	NA	Hume Pipe	15.00	TCS 2
30.	150+230	149+980	Hume Pipe	3	1	Widened	3	1	NA	Hume Pipe	15.00	TCS2
31.	150+570	150+320	Hume Pipe	3	1	Widened	3	1	NA	Hume Pipe	15.00	TCS2
32.	150+800	150+540	Hume Pipe	3	1	Widened	3	1	NA	Hume Pipe	15.00	TCS2
33.	150+900	150+650	Hume Pipe	1	1.2	Widened	1	1.2	NA	Hume Pipe	15.00	TCS2
34.	151+100	150+850	Hume Pipe	1	0.6	Reconstruction	1	1.2	NA	Hume Pipe	15.00	TCS 2
35.	151+190	150+940	Hume Pipe	1	0.6	Reconstruction	1	1.2	NA	Hume Pipe	15.00	TCS 2
36.	151+400	151+150	Arch	1	0.9	Reconstruction	1	2	2	RCC Box	15.00	TCS 2
37.	151+670	151+425	Arch	1	1.6	Reconstruction	1	2	2	RCC Box	15.00	TCS 2
38.	151+685	151+440	Hume Pipe	3	1	Widened	3	1	NA	Hume Pipe	15.00	TCS2
39.	151+770	151+520	Hume Pipe	3	1	Widened	3	1	NA	Hume Pipe	15.00	TCS2
40.	151+870	151+620	Hume Pipe	3	1.2	Widened	3	1.2	NA	Hume Pipe	15.00	TCS2
41.	151+970	151+720	Hume Pipe	1	0.6	Reconstruction	1	1.2	NA	Hume Pipe	15.00	TCS 2
42.	152+040	151+780	Hume Pipe	3	1	Widened	3	1	NA	Hume Pipe	15.00	TCS2
43.	152+230	151+980	Hume Pipe	1	0.6	Reconstruction	1	1.2	NA	Hume Pipe	15.00	TCS 2
44.	152+490	152+240	Hume Pipe	3	1.2	Widened	3	1.2	NA	Hume Pipe	15.00	TCS2
45.	152+700	152+450	Hume Pipe	1	0.6	Reconstruction	1	1.2	NA	Hume Pipe	15.00	TCS 2
46.	153+040	152+790	Hume Pipe	3	0.9	Widened	3	0.9	NA	Hume Pipe	15.00	TCS 2
47.	153+200	152+950	Arch	1	1.0	Reconstruction	1	2	2	RCC Box	15.00	TCS 2
48.	153+300	153+050	Hume Pipe	3	1	Widened	3	1	NA	Hume Pipe	15.00	TCS2
49.	153+430	153+180	Hume Pipe	1	0.6	Reconstruction	1	1.2	NA	Hume Pipe	11.00	TCS 6B
50.	153+600	153+350	Slab	1	1.5	Widened	1	1.5	0.9	Slab	11.00	TCS 6B
51.	153+700	153+450	Hume Pipe	1	0.6	Reconstruction	1	1.2	NA	Hume Pipe	11.00	TCS 6B
52.	154+050	153+800	Hume Pipe	3	0.9	Widened	3	0.9	NA	Hume Pipe	11.00	TCS 6B
53.	154+140	153+890	Arch	1	2.8	Reconstruction	1	3	3	RCC Box	11.00	TCS 6B
54.	154+180	153+930	Slab	1	4.1	Widened	1	4.1	1.2	Slab	11.00	TCS 6B
55.	154+225	153+975	Hume Pipe	3	1	Widened	3	1	NA	Hume Pipe	15.00	TCS2
56.	154+260	154+010	Hume Pipe	1	0.6	Reconstruction	1	1.2	NA	Hume Pipe	15.00	TCS 2
57.	154+310	154+060	Hume Pipe	1	0.6	Reconstruction	1	1.2	NA	Hume Pipe	15.00	TCS 2
58.	155+805	155+550	Hume Pipe	2	1	Widened	2	1	NA	Hume Pipe	15.00	TCS2

S. No	Existing Chainage (Km)	Design Chainage (Km)	Existing Detail			Proposal Details						
			Type	No. Of Vent	Vent Width	Proposal	No. Of Vents	B Or Dia	Height	Type Of Structure	Width	TCS Type
59.	155+900	155+650	Hume Pipe	1	0.6	Reconstruction	1	1.2	NA	Hume Pipe	15.00	TCS 2
60.	157+020	156+770	Hume Pipe	1	0.5	Reconstruction	1	1.2	NA	Hume Pipe	15.00	TCS 2
61.	157+320	157+080	Hume Pipe	1	0.9	Widened	1	0.9	NA	Hume Pipe	15.00	TCS 2
62.	157+590	157+340	Hume Pipe	1	1	Widened	1	1	NA	Hume Pipe	15.00	TCS2
63.	158+380	158+130	Hume Pipe	1	0.9	Widened	1	0.9	NA	Hume Pipe	15.00	TCS 2
64.	158+440	158+190	Hume Pipe	4	1	Widened	4	1	NA	Hume Pipe	11.00	TCS 6B
65.	158+630	158+380	Hume Pipe	3	1	Widened	3	1	NA	Hume Pipe	11.00	TCS 6B
66.	158+860	158+610	Hume Pipe	1	0.9	Widened	1	0.9	NA	Hume Pipe	11.00	TCS 6B
67.	159+060	158+820	Slab	1	2.5	Widened	1	2.5	1.6	Slab	11.00	TCS 6B
68.	159+410	159+150	Hume Pipe	1	0.9	Widened	1	0.9	NA	Hume Pipe	11.00	TCS 6B
69.	160+260	160+010	Slab	1	1.5	Widened	1	1.5	0.6	Slab	15.00	TCS 2
70.	161+840	161+580	Arch	1	1.2	Reconstruction	1	2	2	RCC Box	15.00	TCS 2
71.	162+180	161+930	Arch	1	1.0	Reconstruction	1	2	2	RCC Box	15.00	TCS 2
72.	162+780	162+530	Hume Pipe	3	0.9	Widened	3	0.9	NA	Hume Pipe	15.00	TCS 2
73.	164+180	163+930	Slab	1	2.3	Widened	1	2.3	1.5	Slab	15.00	TCS2
74.	164+570	164+320	Slab	1	3	Widened	1	3	1.8	Slab	15.00	TCS2
75.	164+715	164+460	Hume Pipe	1	0.6	Reconstruction	1	1.2	NA	Hume Pipe	15.00	TCS 2
76.	165+390	165+130	Hume Pipe	3	0.9	Widened	3	0.9	NA	Hume Pipe	17.50	TCS 6
77.	166+230	165+970	Slab	1	0.9	Reconstruction	1	2	2	RCC Box	17.50	TCS 6
78.	166+340	166+090	Slab	1	1.2	Widened	1	1.2	2.1	Slab	17.50	TCS 6
79.	166+910	166+650	Hume Pipe	2	0.9	Widened	2	0.9	NA	Hume Pipe	17.50	TCS 6
80.	167+610	167+350	Arch	1	0.9	Reconstruction	1	2	2	RCC Box	15.00	TCS 2
81.	169+370	169+110	Hume Pipe	1	0.6	Reconstruction	1	1.2	NA	Hume Pipe	15.00	TCS 2
82.	169+410	169+160	Hume Pipe	1	0.9	Widened	1	0.9	NA	Hume Pipe	15.00	TCS 2
83.	169+450	169+190	Slab	1	3	Widened	1	3	1.8	Slab	15.00	TCS 2
84.	170+500	170+250	Hume Pipe	1	0.6	Reconstruction	1	1.2	NA	Hume Pipe	15.00	TCS 2
85.	170+620	170+360	Slab	1	3	Widened	1	3	1.6	Slab	11.00	TCS 6B
86.	170+700	170+440	Slab	1	0.6	Reconstruction	1	2	2	RCC Box	11.00	TCS 6B
87.	170+800	170+550	Hume Pipe	1	0.6	Reconstruction	1	1.2	NA	Hume Pipe	11.00	TCS 6B
88.	171+040	170+780	Hume Pipe	1	0.6	Reconstruction	1	1.2	NA	Hume Pipe	11.00	TCS 6B

S. No	Existing Chainage (Km)	Design Chainage (Km)	Existing Detail			Proposal Details						
			Type	No. Of Vent	Vent Width	Proposal	No. Of Vents	B Or Dia	Height	Type Of Structure	Width	TCS Type
89.	172+510	172+260	Arch	1	0.5	Reconstruction	1	2	2	RCC Box	15.00	TCS 2
90.	172+810	172+550	Arch	1	1.5	Reconstruction	1	2	2	RCC Box	15.00	TCS 2
91.	173+190	172+940	Slab	1	2	Widened	1	2	1.9	Slab	15.00	TCS 2
92.	173+360	173+110	Hume Pipe	3	0.9	Widened	3	0.9	NA	Hume Pipe	15.00	TCS 2
93.	173+760	173+510	Hume Pipe	1	0.3	Reconstruction	1	1.2	NA	Hume Pipe	15.00	TCS 2
94.	174+070	173+820	Hume Pipe	2	1.2	Widened	2	1.2	NA	Hume Pipe	15.00	TCS 2
95.	174+540	174+290	Hume Pipe	1	0.6	Reconstruction	1	1.2	NA	Hume Pipe	11.00	TCS 6B
96.	174+750	174+500	Arch	1	1	Reconstruction	1	2	2	RCC Box	11.00	TCS 6B
97.	175+900	175+640	Slab	1	1.3	Widened	1	1	1	Slab	15.00	TCS 2
98.	176+790	176+530	Slab	1	3.8	Widened	1	3.8	2.0	Slab	15.00	TCS 2
99.	177+340	177+090	Hume Pipe	2	1.2	Widened	2	1.2	NA	Hume Pipe	15.00	TCS 2
100.	177+740	177+475	Hume Pipe	3	0.9	Widened	3	0.9	NA	Hume Pipe	15.00	TCS 2
101.	178+760	178+510	Slab	1	1.5	Widened	1	1	1	Slab	15.00	TCS 6B
102.	181+240	180+985	Hume Pipe	1	0.6	Reconstruction	1	1.2	NA	Hume Pipe	15.00	TCS 2
103.	181+330	181+075	Arch	1	2	Reconstruction	1	2	2	RCC Box	15.00	TCS 6B
104.	181+950	181+790	Slab	1	3	Widened	1	3	2	Slab	15.00	TCS 6B
105.	182+600	182+350	Hume Pipe	3	0.9	Widened	3	0.9	NA	Hume Pipe	15.00	TCS 2

Source: Detailed Project Report

Table 8: Details of Additional of New Culverts And Their Proposals (Package-4)

S.No	Design Chainage (Km)	Proposal Details				
		Proposal	No. Of Vents	B Or Dia	Type Of Structure	Width Of Culvert
1.	141+000	New Construction	1	1.20	Hume Pipe	15.0 M
2.	141+300	New Construction	1	1.20	Hume Pipe	15.0 M
3.	143+000	New Construction	1	1.20	Hume Pipe	15.0 M
4.	143+500	New Construction	1	1.20	Hume Pipe	15.0 M
5.	143+800	New Construction	1	1.20	Hume Pipe	15.0 M

S.No	Design Chainage (Km)	Proposal Details				
		Proposal	No. Of Vents	B Or Dia	Type Of Structure	Width Of Culvert
6.	144+300	New Construction	1	1.20	Hume Pipe	15.0 M
7.	144+600	New Construction	1	1.20	Hume Pipe	15.0 M
8.	144+800	New Construction	1	1.20	Hume Pipe	15.0 M
9.	145+000	New Construction	1	1.20	Hume Pipe	15.0 M
10.	146+000	New Construction	1	1.20	Hume Pipe	15.0 M
11.	146+200	New Construction	1	1.20	Hume Pipe	15.0 M
12.	156+000	New Construction	1	1.20	Hume Pipe	15.0 M
13.	159+500	New Construction	1	1.20	Hume Pipe	15.0 M
14.	159+800	New Construction	1	1.20	Hume Pipe	15.0 M
15.	160+300	New Construction	1	1.20	Hume Pipe	15.0 M
16.	160+600	New Construction	1	1.20	Hume Pipe	15.0 M
17.	160+600	New Construction	1	1.20	Hume Pipe	15.0 M
18.	160+900	New Construction	1	1.20	Hume Pipe	15.0 M
19.	162+300	New Construction	1	1.20	Hume Pipe	15.0 M
20.	162+830	New Construction	1	1.20	Hume Pipe	15.0 M
21.	163+000	New Construction	1	1.20	Hume Pipe	15.0 M
22.	164+000	New Construction	1	1.20	Hume Pipe	15.0 M
23.	167+000	New Construction	1	1.20	Hume Pipe	15.0 M
24.	168+300	New Construction	1	1.20	Hume Pipe	15.0 M
25.	171+000	New Construction	1	1.20	Hume Pipe	15.0 M
26.	171+300	New Construction	1	1.20	Hume Pipe	15.0 M
27.	179+600	New Construction	1	1.20	Hume Pipe	15.0 M
28.	180+000	New Construction	1	1.20	Hume Pipe	15.0 M
29.	180+300	New Construction	1	1.20	Hume Pipe	15.0 M
30.	182+000	New Construction	1	1.20	Hume Pipe	15.0 M

Source: Detailed Project Report

Annexure 2.4

Details of improvement proposal at the intersections (Package-1)

Major Junctions:

S.N.	Existing Ch.	Design Ch.	Type of Junction	Category of cross road	Side	To Village*
1	0+000	0+000	3-Arm ("T")	NH-92	LHS RHS	Aligarh (BT) Kanpur (BT)
2	17+260	17+235	4-Arm	ODR	LHS RHS	Sankisha Bodh Dham (BT) Chibramau (CC)
3	31+450	31+390	3-Arm ("T")	ODR	RHS	Chibramau (BT)

Minor Junctions:

S.N.	Survey Ch.	Design Ch.	Type of Junction	Side	To Village
1	1+100	1+100	3-Arm ("T")	LHS	Village Road (BT)
2	1+550	1+545	3-Arm ("T")	RHS	Barahar Road (BT)
3	2+130	2+125	3-Arm ("T")	RHS	Sakat Bewar Road (BT)
4	2+350	2+395	3-Arm ("T")	LHS	Ghaziapur Road (BT)
5	3+850	3+840	3-Arm ("T")	LHS	Manikpur (BT)
6	4+000	4+985	3-Arm ("T")	RHS	Saminagra (BT)
7	5+250	5+235	3-Arm ("T")	RHS	Santoshpur (BT)
8	6+325	6+335	3-Arm ("T")	RHS	Nagla Khan Singh (BT)
9	7+125	7+110	3-Arm ("T")	LHS	Ugarpur (BT)
10	7+500	7+480	3-Arm ("T")	LHS	Ugarpur (BT)
11	7+750	7+730	3-Arm ("T")	RHS	Village Road(BT)
12	8+900	8+880	4-Arm	LHS RHS	Pakhana (BT) Dhirpur (BT)
13	10+600	10+580	3-Arm ("T")	RHS	Ganeshpur (CC)
14	11+590	11+570	3-Arm ("T")	RHS	Nadasha (BT)
15	11+700	11+680	3-Arm ("T")	LHS	Nagla Bagh (BT)
16	13+400	13+380	3-Arm ("T")	LHS	Ghaziapur Road (BT)
17	13+650	13+580	3-Arm ("T")	LHS	Ghurva Nagla (BT)
18	13+800	13+780	3-Arm ("T")	LHS	Chandan Nagla(BT)
19	14+900	14+877	3-Arm ("T")	RHS	Kusajpur (BT)
20	15+760	15+740	3-Arm ("T")	RHS	Harkampur (CC)
21	15+840	15+820	3-Arm ("T")	LHS	Bharatpur/ Rasoolpur (BT)
22	16+050	16+230	3-Arm ("T")	RHS	Under Construction Road
23	17+080	17+060	3-Arm ("T")	LHS	Village Road

S.N.	Survey Ch.	Design Ch.	Type of Junction	Side	To Village
24	17+950	17+925	4-Arm	LHS RHS	Nwabganj (BT) Chibramau (BT)
25	20+470	20+450	3-Arm	LHS	Terra (BT)
26	20+750	20+725	3-Arm ("T")	LHS	Village Road (BR)
27	22+010	21+990	3-Arm ("T")	RHS	Gosaipur (BT)
28	23+150	23+125	3-Arm ("T")	LHS	Bheerpur (BT)
29	23+700	23+675	3-Arm ("T")	RHS	Iocl Gas Plant (BT)
30	24+350	23+290	3-Arm ("T")	LHS	Nisai (BT)
31	24+500	24+440	3-Arm ("T")	RHS	Village Road (BT)
32	24+560	24+490	3-Arm ("T")	LHS	Laguna Bari (BT)
33	24+740	24+685	3-Arm ("T")	RHS	Village Road (BT)
34	24+860	24+790	3-Arm ("T")	LHS	Village Road (BT)
35	25+750	25+690	3-Arm ("T")	RHS	Basantnagar (BT)
36	26+350	26+290	4-Arm	LHS RHS	Pipra Gaon (BT) Kamlaganj (BT)
37	27+110	27+050	3-Arm ("T")	RHS	Pattikhurd (BT)
38	27+850	27+795	3-Arm ("T")	RHS	Village Road (BT)
39	28+000	28+845	3-Arm ("Y")	LHS	Manikpur (BT)
40	28+440	28+385	3-Arm ("T")	RHS	Murhas (BT)
41	29+200	29+145	3-Arm ("T")	RHS	Village (BT)
42	29+600	29+535	4-Arm	LHS RHS	Daheliya (BT) Jaidpur(BT)
43	30+200	30+145	3-Arm ("T")	LHS	Wahidpur (BT)
44	31+040	30+975	3-Arm ("Y")	RHS	Village Road
45	31+650	31+590	3-Arm ("T")	LHS	Kayamganj (BT)
46	33+070	33+010	3-Arm ("Y")	LHS	Village Road (BT)
47	33+700	33+640	3-Arm ("T")	RHS	Arjun Nagla (BT)
48	34+050	33+990	3-Arm ("T")	RHS	Village Road (BT)
49	34+770	34+720	4-Arm	LHS RHS	Farrukhabd (BT) Kamalganj BT
50	35+100	35+040	3-Arm ("T")	RHS	Village Road (Paved Block)
51	35+400	35+440	3-Arm ("T")	RHS	Village Road (BT)
52	35+450	35+340	3-Arm ("Y")	RHS	Fatehgarh (BT)
53	36+090	36+040	3-Arm ("T")	LHS	Village Road (BT)
54	36+400	36+340	3-Arm ("T")	LHS	Village Road
55	36+700	36+640	4-ARM	LHS RHS	Farukhabad(BT) Fatehgarh(BT)
56	37+400	37+340	4-Arm	LHS RHS	Farrukhabad (BT) Fatehgarh (CC)

S.N.	Survey Ch.	Design Ch.	Type of Junction	Side	To Village
57	37+800	37+740	3-Arm ("T")	RHS	Village Road (CC)
58	39+600	39+540	4-Arm	LHS RHS	Farrukhabad (BT) Fatehgarh (CC)
59	40+500	40+440	4-Arm	LHS RHS	To Temple (BT) To Temple (BT)
60	41+850	41+790	3-Arm ("T")	RHS	Village Road (CC)
61	43+250	43+190	3-Arm ("T")	RHS	Chachupur (BT)
62	43+300	43+240	4-Arm	LHS RHS	Badaun (BT) Khandauli (BT)
63	43+500	43+440	3-Arm ("T")	RHS	Temple Road
64	44+500	44+440	3-Arm ("T")	LHS	Gotiya (BT)
65	45+600	45+540	3-Arm ("T")	RHS	Mohamadpur (BT)
66	46+050	45+990	3-Arm ("T")	RHS	Village Road
67	46+330	46+240	3-Arm ("T")	RHS	Village Road
68	46+380	46+320	3-Arm ("T")	RHS	Village Road
69	46+500	46+440	3-Arm ("T")	RHS LHS	Village Road (CC)
70	46+960	46+910	3-Arm ("T")	LHS	Village Road (BT)
71	47+490	47+440	3-Arm ("T")	RHS	Nibiya(BT)
72	47+510	47+450	3-Arm ("T")	LHS	Village Road(BT)
73	47+950	47+840	3-Arm ("T")	LHS	Village Road (CC)
74	48+250	48+190	4-Arm	LHSRHS	Village Road(CC)Village Road (BT)
75	48+530	48+470	3-Arm ("T")	LHS	Village Road (BT)
76	48+850	48+790	3-Arm ("T")	RHS	Village Road (BT)
77	49+200	49+140	4-Arm	LHS RHS	Village Road (BT) Village Road (CC)
78	49+770	49+710	3-Arm ("T")	RHS	Nya Gaon (BT)
79	50+500	50+440	4-Arm	LHS RHS	Bakaspur (BT) Naugma (BT)
80	51+200	51+140	3-Arm ("T")	LHS	Village Road (CC)

Source: Detailed Project Report

Details of improvement proposal at the intersections (Package-2)

Major junctions:

S.N.	Existing Chainage	Design Chainage	At grade	Category of Cross Road			
				NH	SH	MDR	Others
1.	54+950	54+890	4 arm	NH	-	-	-

2.	77+650	77+540	3 arm "T"	-	-	-	ODR
3.	79+000	78+900	3 arm "T	-	-	MDR	-
4.	114+100	114+100	4 arm	NH	-	-	-

(NH: National Highway, SH: State Highway, MDR: Major District Road)

Minor junctions:

S.N.	Survey Ch.	Design Ch.	Type of Junction	Side	To Village
1	58+500	58+440	4-Arm	LHS RHS	Road Under Construction Devipur (BT)
2	59+500	59+440	3-Arm ("Y")	LHS	Hullapur Market(BT)
3	58+870	58+790	3-Arm ("T")	RHS	Islamganj (BT)
4	59+800	59+730	3-Arm ("T")	LHS	Veerganj (CC)
5	62+190	62+120	3-Arm ("T")	RHS	Amiliya Gaon (BT)
6	64+500	64+430	3-Arm ("Y")	RHS	Chiloua (BT)
7	66+050	65+980	3-Arm ("T")	RHS	Chilaulli (BT)
8	70+210	70+125	3-Arm ("T")	RHS	Gokulnagar (ER)
9	70+250	70+175	4-Arm	LHS RHS	Saipur (BR) Dehna (BT)
10	71+820	71+720	3-Arm ("T")	RHS	Gora Mahua (BT)
11	73+130	73+030	3-Arm ("T")	RHS	Kuwarpur (BT)
12	73+200	73+100	3-Arm ("T")	LHS	Kuwarpur (BT)
13	73+430	73+330	3-Arm ("T")	RHS	Kuwarpur (CC)
14	76+650	75+550	4-Arm	LHS RHS	Koli (BT) Gurgaon (BT)
15	77+910	77+820	3-Arm ("T")	RHS	Rolli Bauli (BT)
16	80+450	80+355	3-Arm ("T")	LHS	To Gunara (BT)
17	80+800	80+700	4-Arm	LHS RHS	Badaun (BT) Shahjhanpur (BT)
18	81+450	81+330	3-Arm ("T")	LHS	Budhwana (BT)
19	85+470	85+380	3-Arm ("T")	RHS	Kalyanpur (BT)
20	86+500	86+405	4-Arm	LHS RHS	Budhwana (BT) Chandura (BT)

S.N.	Survey Ch.	Design Ch.	Type of Junction	Side	To Village
21	87+600	87+500	3-Arm ("T")	LHS	Village Road (BT)
22	88+200	88+110	3-Arm ("Y")	LHS	Ativara (BT)
23	89+820	89+720	3-Arm ("T")	RHS	Heera Nagar (BT)
24	91+930	91+830	3-Arm ("T")	LHS	Pratappur (CC)
25	92+600	92+510	3-Arm ("T")	LHS	Pratappur (BT)
26	93+100	92+980	3-Arm ("T")	RHS	Behta Pathak (BT)
27	93+900	93+800	3-Arm ("T")	RHS	Jhapka (BT)
28	94+150	94+040	3-Arm ("T")	LHS	Baruwa Gaon (BT)
29	96+430	96+335	3-Arm ("T")	RHS	Ismilepur (BT)
30	96+600	96+460	3-Arm ("T")	LHS	Madnapur Village (BT)
31	96+800	96+700	3-Arm ("T")	RHS	SHAHJHANPUR (BT)
32	96+680	96+580	3-Arm ("T")	LHS	Madnapur Village (BT)
33	96+740	96+635	3-Arm ("T")	LHS	Madnapur Village (BT)
34	97+150	97+030	3-Arm ("T")	LHS	Madnapur Village (BT)
35	98+540	98+430	3-Arm ("Y")	LHS	Chandaukha (BT)
36	98+560	98+465	3-Arm ("T")	RHS	Tilhar (BT)
37	100+910	100+830	3-Arm ("T")	LHS	Dhirpur (BT)
38	102+720	102+625	3-Arm ("T")	RHS	Kabilpur (BT)
39	102+950	102+830	4-Arm	LHS RHS	Joura (BT) Tilhar (CC)
40	103+900	103+810	3-Arm ("T")	LHS	Karaunda (BT)
41	104+020	103+925	3-Arm ("T")	RHS	Haizalpur (BT)
42	104+500	104+405	3-Arm ("T")	LHS	Rajpuri (BT)
43	105+500	105+360	4-Arm	LHS RHS	Rajpuri (BT) Tilhar (BT)
44	107+290	107+190	3-Arm ("T")	LHS	To Silampur (BR)

S.N.	Survey Ch.	Design Ch.	Type of Junction	Side	To Village
45	107+290	107+190	3-Arm ("T")	RHS	Village Road (BT)
46	108+750	108+640	4-Arm	LHS RHS	Chigrapur (BT) Khairpur (ER)
47	109+120	109+015	4-Arm	LHS RHS	Katra (BT) Tilhar(BT)
48	113+610	113+525	3-Arm ("T")	RHS	Village Road

Source: Detailed Project Report

Details of improvement proposal at the intersections (Package-3)

Minor Junctions:

S.N.	Survey Ch.	Design Ch.	Type of Junction	Side	To Village
1	114+250	114+160	3-Arm ("Y")	LHS	Katra Market (BT)
2	114+550	114+435	4-Arm	LHS RHS	Market(Paved Block) Market(Paved Block)
3	114+700	114+600	3-Arm ("Y")	RHS	Katra Railway Station (BT)
4	114+910	114+800	3-Arm ("T")	RHS	Katra Railway Station (Paved Block)
5	115+100	114+990	3-Arm ("Y")	LHS	Katra Market (BT)
6	115+300	115+210	3-Arm ("T")	LHS	Katra Village (Paved Block)
7	116+800	116+700	3-Arm ("T")	LHS	Shalpur Gaon (BT)
8	117+120	117+060	3-Arm ("T")	RHS	Village Road
9	118+500	118+470	3-Arm ("T")	RHS	Village Road
10	118+700	118+650	3-Arm ("T")	RHS	Parshurampur (BT)
11	118+760	118+720	3-Arm ("T")	LHS	Kushak (BT)
12	121+500	121+450	3-Arm ("T")	LHS	Kapoornagra (BT)
13	121+790	121+750	3-Arm ("T")	RHS	Bhuriya Gaon (BT)
14	122+450	122+400	3-Arm ("T")	LHS	Navadiya (BT)
15	123+500	123+475	3-Arm ("T")	LHS	Village Road

S.N.	Survey Ch.	Design Ch.	Type of Junction	Side	To Village
16	124+000	123+960	4-Arm	RHS	Poolwaiya (BT) Parmanandapur (BT)
17	124+050	123+980	4-Arm	LHS	Poolwaiya (BT) Parmanandapur (BT)
18	124+600	124+580	3-Arm ("T")	RHS	Akbariya Village (CC)
19	124+870	124+820	3-Arm ("T")	LHS	Village Road
20	125+500	125+450	3-Arm ("T")	LHS	Fatehpur Village (Paved Block)
21	126+200	126+140	3-Arm ("T")	LHS	Village Road
22	126+350	126+310	3-Arm ("T")	RHS	Village Road
23	126+500	126+480	4-Arm	LHS RHS	Phoolwaiya (BT) Akbarpur (CC)
24	126+530	126+480	3-Arm ("T")	RHS	Village Road
25	126+500	126+480	3-Arm ("T")	LHS	Village Road
26	126+750	126+710	3-Arm ("T")	RHS	Village Road
27	127+140	127+100	3-Arm ("T")	RHS	Village Road
28	127+630	127+590	3-Arm ("T")	RHS	Village Road (BT)
29	128+500	BYPASS	3-Arm ("T")	LHS	Village Road (BT)
30	128+900	BYPASS	3-Arm ("T")	RHS	Munya (BT)
31	128+900	BYPASS	4-Arm	LHS RHS	Village Road (BT) Village Road (Paved Block)
32	129+200	BYPASS	3-Arm ("T")	LHS	Haridpur (BT)
33	129+500	BYPASS	3-Arm ("T")	RHS	Nigoi (BT)
34	129+600	BYPASS	3-Arm ("T")	LHS	Village Road
35	129+650	BYPASS	3-Arm ("T")	RHS	Thana Khudaganj (BR)
36	130+000	BYPASS	3-Arm ("T")	RHS	Village Road (Paved Block)
37	130+500	BYPASS	3-Arm ("T")	LHS	Village Road (BT)
38	130+560	BYPASS	3-Arm ("T")	RHS	Village Road (Paved Block)

S.N.	Survey Ch.	Design Ch.	Type of Junction	Side	To Village
39	131+100	BYPASS	3-Arm ("T")	RHS	Village Road
40	131+500	BYPASS	3-Arm ("T")	LHS	Village Road (ER)
41	132+300	BYPASS	3-Arm ("T")	LHS	Baniyanpur (BT)
42	132+560	BYPASS	3-Arm ("T")	RHS	Village Road
43	132+700	BYPASS	3-Arm ("T")	RHS	Bhundi Village (BR)
44	132+800	BYPASS	3-Arm ("T")	RHS	Bhundi Village (Paved Block)
45	132+850	BYPASS	3-Arm ("T")	LHS	Bhundi Village (BT)

Source: Detailed Project Report

<u>Details of improvement proposal at the intersections (Package-4)</u>

Major Junctions:

S.N.	Existing Chainage	Design Chainage	At grade	Category of Cross Road			
				NH	SH	MDR	Others
1.	147+900	148+090	3-Arm (“T”)	-	SH	-	-
2.	166+950	167+120	3-Arm (“T”)	-	-	-	ODR
3.	183+682	183+380	4-Arm (“+”)	NH	-	-	-

(NH: National Highway, SH: State Highway, MDR: Major District Road)

Minor Junctions:

S.N.	Survey Ch.	Design Ch.	Type of Junction	Side	To Village
1.	138+000	138+220	3-Arm ("T")	LHS	Khandepur (BT)
2.	138+220	138+425	3-Arm ("T")	LHS	Barchiya (BT)
3.	139+200	139+425	3-Arm ("T")	RHS	Basara (BT)
4.	140+950	141+135	3-Arm ("T")	LHS	Rakhola (BT)
5.	141+000	141+210	3-Arm ("T")	RHS	Waira (BT)
6.	144+350	144+540	3-Arm ("T")	LHS	Bareily (BT)
7.	145+950	146+140	3-Arm ("T")	RHS	Village Road
8.	146+300	146+500	3-Arm ("T")	RHS	Shahjanpur (BT)
9.	147+350	147+550	3-Arm ("T")	LHS	Bisalpur Village (BR)
10.	147+895	148+090	3-Arm ("T")	RHS	Bisalpur Village (Paved Block)
11.	148+350	148+320	4-Arm	LHS	Nawadiya (BT)

S.N.	Survey Ch.	Design Ch.	Type of Junction	Side	To Village
				RHS	Bisalpur Market (BT)
12.	148+780	148+940	4-Arm	LHS RHS	Ghatgava (Paved Block) Bhisanda (Paved Block)
13.	148+950	149+130	4-Arm	LHS RHS	Rampura (CC) Ramleela (BT)
14.	148+310	148+520	3-Arm ("T")	RHS	Bisalpur Village (BT)
15.	148+580	148+750	3-Arm ("T")	LHS	Bisalpur Village
16.	148+660	148+840	3-Arm ("T")	LHS	Bisalpur Village
17.	151+720	151+900	3-Arm ("T")	RHS	Kashimpur (BT)
18.	152+000	152+190	3-Arm ("T")	LHS	Arjunpur (BT)
19.	153+270	153+440	3-Arm ("Y")	RHS	Jasauli (ER)
20.	154+160	154+330	3-Arm ("T")	LHS	Diwari Village(Paved Block)
21.	155+300	155+460	3-Arm ("T")	LHS	Veerampur (BT)
22.	155+320	155+530	3-Arm ("Y")	RHS	Parsiya Village (CC)
23.	155+950	156+140	3-Arm ("T")	RHS	Pakariya (BT)
24.	157+100	157+285	3-Arm ("T")	RHS	Shimra (BT)
25.	157+700	157+920	3-Arm ("T")	RHS	Sherganj Station (BT)
26.	158+470	158+650	3-Arm ("T")	LHS	Jogi Ther (BT)
27.	158+700	158+890	3-Arm ("T")	LHS	Village Road (Paved Block)
28.	159+520.	159+660	3-Arm ("T")	RHS	Umariya (BT)
29.	159+220	159+400	3-Arm ("T")	LHS	Katwara (BT)
30.	159+800	149+980	3-Arm ("T")	LHS	Village Road
31.	161+710	161+900	3-Arm ("T")	RHS	Patrasiya (BT)
32.	161+920	162+100	3-Arm ("T")	RHS	Patrasiya (Paved Block)
33.	162+000	162+190	3-Arm ("T")	RHS	Patrasiya (ER)
34.	163+950	164+135	3-Arm ("T")	RHS	Patrasa (BT)
35.	164+800	164+990	3-Arm ("T")	RHS	Mushariya (BT)
36.	164+950	165+125	3-Arm ("T")	LHS	Bhaihra (ER)
37.	166+280	166+440	3-Arm ("T")	LHS	Barkhera Village (CC)
38.	166+520	166+730	3-Arm ("T")	RHS	Barkhera Village (CC)
39.	166+000	166+170	4-Arm	LHS RHS	Barkhera Village (CC) Pipra Village (BT)
40.	166+450	166+630	3-Arm ("T")	LHS	Barkhera Village (CC)
41.	166+710	166+900	3-Arm ("T")	RHS	Barkhera Station (CC)
42.	168+270	168+460	3-Arm ("T")	RHS	Barkhera Market (BT)
43.	168+025	168+210	3-Arm ("T")	LHS	Village Road (BT)
44.	169+000	169+200	3-Arm ("T")	RHS	Nakta (BT)
45.	169+080	169+240	3-Arm ("T")	LHS	Ghuruda(BT)

S.N.	Survey Ch.	Design Ch.	Type of Junction	Side	To Village
46.	169+080	169+240	3-Arm ("T")	LHS	Ghuruda(BT)
47.	170+500	170+680	3-Arm ("T")	RHS	Machwakheda (BT)
48.	171+100	171+230	4-Arm	LHS RHS	Shemariya (BT) Kalyanpur Village (BR)
49.	171+280	171+360	3-Arm ("Y")	RHS	Jora Kalyanpur (BT)
50.	172+000	172+200	3-Arm ("T")	RHS	Shemariya (BT)
51.	172+100	172+300	3-Arm ("T")	RHS	Shemariya Village
52.	172+520	172+650	3-Arm ("T")	RHS	Gazipur Mughal Village (CC)
53.	172+650	172+830	3-Arm ("T")	RHS	Gazipur Mughal Village (CC)
54.	173+850	174+030	3-Arm ("T")	RHS	Tikri (BT)
55.	174+150	174+330	3-Arm ("T")	LHS	Raipur (BT)
56.	175+100	175+280	3-Arm ("Y")	RHS	Pauta Kalan Market (BT)
57.	174+950	175+090	3-Arm ("T")	LHS	Pauta Kalan Village(BR)
58.	175+900	176+080	3-Arm ("T")	RHS	Karore Village (BT)
59.	177+200	177+360	4-Arm	LHS RHS	Nawdiya (BT) Jaliyapur (BT)
60.	178+500	178+680	3-Arm ("T")	RHS	Jangrauli Village (BT)
61.	178+750	178+940	4-Arm	LHS RHS	Madhurani (BT) Bambapuri (BT)
62.	179+300	179+480	3-Arm ("T")	RHS	Jangrauli Village (CC)
63.	179+660	179+830	3-Arm ("T")	LHS	Sariya (BT)
64.	181+400	181580	3-Arm ("T")	RHS	Nawodiya (BT)
65.	181+660	181+850	3-Arm ("T")	LHS	Rooppur Kamalu (CC)
66.	181+750	181+930	3-Arm ("T")	LHS	Rooppur Kamalu (BT)
67.	181+750	181+940	3-Arm ("T")	RHS	Rooppur Kamalu (CC)
68.	182+350	182+540	3-Arm ("T")	RHS	Rooppur Kripa (CC)
69.	182+600	182+780	3-Arm ("T")	RHS	Rooppur Kripa Village (CC)

Source: Detailed Project Report

Environmental, Health, and Safety Guidelines for Toll Roads

Introduction

The Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP)[1]. When one or more members of the World Bank Group are involved in a project, these EHS Guidelines are applied as required by their respective policies and standards. These industry sector EHS guidelines are designed to be used together with the **General EHS Guidelines** document, which provides guidance to users on common EHS issues potentially applicable to all industry sectors. For complex projects, use of multiple industry-sector guidelines may be necessary. A complete list of industry-sector guidelines can be found at: www.ifc.org/ifcext/enviro.nsf/Content/EnvironmentalGuidelines

The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new projects / facilities by existing technology at reasonable costs. Application of the EHS Guidelines to existing facilities may involve the establishment of site-specific targets, with an appropriate timetable for achieving them. The applicability of the EHS Guidelines should be tailored to the hazards and risks established for each project on the basis of the results of an environmental assessment in which site-specific variables, such as host country context, assimilative capacity of the environment, and other project factors, are taken into account. The applicability of specific technical recommendations should be based on the professional opinion of qualified and experienced persons. When host country regulations differ from the levels and measures presented in the EHS Guidelines, projects are expected to achieve whichever is more stringent. If less stringent levels or measures than those provided in these EHS Guidelines are appropriate, in view of specific project circumstances, a full and detailed justification for any proposed alternatives is needed as part of the site-specific environmental assessment. This justification should demonstrate that the choice for any alternate performance levels is protective of human health and the environment.

[1] Defined as the exercise of professional skill, diligence, prudence and foresight that would be reasonably expected from skilled and experienced professionals engaged in the same type of undertaking under the same or similar circumstances globally. The circumstances that skilled and experienced professionals may find when evaluating the range of pollution prevention and control techniques available to a project may include, but are not limited to, varying levels of environmental degradation and environmental assimilative capacity as well as varying levels of financial and technical feasibility.

Applicability

The EHS Guidelines for Toll Roads include information relevant to construction, operation and maintenance of large, sealed road projects including associated bridges and overpasses.[2] Issues associated with the construction and operation of maintenance facilities are addressed in the **General EHS Guidelines**. Issues associated with sourcing of construction materials are presented in the EHS Guidelines for Construction Materials Extraction, while those related to vehicle service areas are included in the EHS Guidelines for Retail Petroleum. This document is organized according to the following sections:

Section 1.0 — Industry-Specific Impacts and Management
Section 2.0 — Performance Indicators and Monitoring
Section 3.0 — References and Additional Sources
Annex A — General Description of Industry Activities

[2] Elements of this Guideline document apply to smaller scale and / or unsealed road projects.

1.0 Industry-Specific Impacts and Management

The following section provides a summary of EHS issues associated with road projects, which occur during the construction and operation phase, along with recommendations for their management. Recommendations for the management of EHS issues during the decommissioning phase are provided in the **General EHS Guidelines**.

1.1 Environment

Environmental issues during the construction and operation of roads are similar to those of other large infrastructure projects involving significant earth moving and civil works and their prevention and control recommendations are presented in the **General EHS Guidelines**. These impacts include, among others, construction site waste generation; soil erosion and sediment control from materials sourcing areas and site preparation activities; fugitive dust and other emissions (e.g. from vehicle traffic, land clearing and movement, and materials stockpiles); noise from heavy equipment and truck traffic; and potential hazardous materials and oil spills associated with heavy equipment operation and fuelling activities.

Environmental issues specific to construction and operation of roads include the following:

- Habitat alteration and fragmentation
- Stormwater
- Waste
- Noise
- Air emissions
- Wastewater

Habitat Alteration and Fragmentation

Disruption of terrestrial and aquatic habitats can occur both during construction of a road and during maintenance of the right-of-way.

Road Construction

Construction activities along a road alignment may adversely affect wildlife habitats, depending on the characteristics of existing vegetation, topographic features, and waterways. Examples of habitat alteration from these activities include fragmentation of forested habitat; loss of nesting sites of listed rare, threatened, or endangered species and / or high biodiversity / sensitive habitat; disruption of watercourses; creation of barriers to wildlife movement; and visual and auditory disturbance due to the presence of machinery, construction workers, and associated equipment. In addition, sediment and erosion from construction activities and stormwater runoff may increase turbidity of surface waters.

Management practices to prevent and control impacts to terrestrial and aquatic habitats include:

- Siting roads and support facilities to avoid critical terrestrial and aquatic habitat (e.g. old-growth forests, wetlands, and fish spawning habitat) utilizing existing transport corridors whenever possible;
- Design and construction of wildlife access to avoid or minimize habitat fragmentation, taking into account motorist safety and the behavior and prevalence of existing species. Possible techniques for terrestrial species may include wildlife underpasses, overpasses, bridge extensions, viaducts, enlarged culverts, and fencing. Possible techniques for aquatic species include bridges, fords, open-bottom or arch culverts, box and pipe culverts;[3]

[3] Additional information on the design of wildlife crossing and passage structures is available in "Chapter 3: Designing for Environmental Stewardship in

- Avoidance or modification of construction activities during the breeding season and other sensitive seasons or times of day to account for potentially negative effects;
- Preventing short and long term impacts to the quality of aquatic habitats by minimizing clearing and disruption of riparian vegetation; providing adequate protection against scour and erosion; and giving consideration to the onset of the rainy season with respect to construction schedules;[4]
- Minimizing removal of native plant species, and replanting of native plant species in disturbed areas;
- Exploring opportunities for habitat enhancement through such practices as the placement of nesting boxes in rights-of-way, bat boxes underneath bridges, and reduced mowing to conserve or restore native species;[5]
- Management of construction site activities as described in relevant sections of the **General EHS Guidelines.**

Right-of-Way[6] Maintenance

Regular maintenance of vegetation within road rights-of-way is necessary to avoid interference with vehicle travel and road maintenance. Unchecked growth of trees and plants can cover signals and signs, restrict motorist visibility, and fall onto the road and overhead power lines.

Regular maintenance of rights-of-way to control vegetation may involve the use of mechanical methods (e.g. mowing), manual methods (e.g. hand pruning), and the use of herbicides. Vegetation maintenance beyond that which is necessary for safety may, by removing unnecessary amounts of vegetation, result in the continual replacement of successional species and an increased likelihood of the establishment of invasive species.

Management practices to prevent, minimize, and control impacts from rights-of-way maintenance include:

- Implementation of integrated vegetation management (IVM).
  - From the edge of the road area to the boundary of the right-of-way, vegetation is structured with smaller plants near the road and larger trees further away to provide habitats for a wide variety of plants and animals[7]
  - Planting of native species and removal of invasive plant species[8]
  - Use of biological, mechanical, and thermal vegetation control measures where practical, and avoiding use of chemical herbicides

An integrated approach to vegetation management may indicate that use of herbicides is the preferred approach to control fast-growing vegetation within road rights-of-way. In this case, users (e.g. road owners or contractors) should take the following precautions:

- Training of personnel to apply herbicides and ensure that personnel have received applicable certifications or

Construction and Maintenance" of Environmental Stewardship Practices, Procedures, and Policies for Highway Construction and Maintenance, National Cooperative Highway Research Program (NCHRP) Project 25-25 (04) and Evink, G. (2002)

[4] Additional information on techniques for the protection of riparian and wetland areas is provided in Chapter 3 and Chapter 4, NCHRP Project 25-25 (04) and Nova Scotia Department of Transportation and Public Works Environmental Protection Plan (http://www.gov.ns.ca/tran/enviroservices)

[5] Examples of additional habitat restoration strategies are presented in Chapter 3 and Chapter 10, NCHRP Project 25-25 (04)

[6] Also known as a "wayleave" or "easement" in some countries, but referred to as right-of-way for the purposes of these Guidelines.

[7] Mowing can be used to control growth of ground covers, minimize propagation of plants in the track area, and prevent the establishment of trees and shrubs in rights-of-way. Herbicides, in combination with mowing, can control fast-growing weedy species that have a potential to mature to heights over those permitted within the right-of-way. Trimming and pruning can be utilized at the boundaries of rights-of-way to maintain corridor breadth and prevent the encroachment of tree branches. Hand removal or removal of vegetation, while labor intensive, can be used in the vicinity of structures, streams, fences, and other obstructions that make the use of machinery difficult or dangerous.

[8] Dense, thorny native shrubs can be used to help deter trespassers. Native plants can also help to stabilize soils, reducing erosion. Waste from removal of invasive species should be disposed of (e.g. by incineration or at a landfill) to avoid accidental spreading of the weeds to new sites. Invasive species should be removed during flowering periods to avoid dispersal of seeds.

equivalent training where such certifications are not required;[9]

- Compliance with international restrictions on pesticide use;[10]
- Restriction of herbicide use to those that are manufactured under license, and registered / approved by the appropriate authority and in accordance with the Food and Agriculture Organization's (FAO) International Code of Conduct on the Distribution and Use of Pesticides;[11]
- Use only of herbicides that are labeled in accordance with international standards and norms, such as the FAO Revised Guidelines for Good Labeling Practice for Pesticides;[12]
- Review of manufacturer's directions on maximum recommended dosage or treatment, as well as published reports on reduced rate of herbicide application without loss of effect,[13] and application of the minimum effective dose;
- Application of herbicides based on criteria (e.g. field observations, weather data, time of treatment, and dosage) and maintenance of a pesticide logbook to record such information;
- Selection of application technologies and practices designed to reduce unintentional drift or runoff;
- Maintenance and calibration of herbicide application equipment in accordance with manufacturer's recommendations;
- Establishment of untreated buffer zones or strips along water sources, rivers, streams, ponds, lakes, and ditches to help protect water resources;
- Contamination of soils, groundwater, or surface water resources, due to accidental spills during transfer, mixing, and storage of herbicides, should be prevented by following the hazardous materials storage and handling management practices in the **General EHS Guidelines**.

Stormwater

Construction or widening of sealed roads increases the amount of impermeable surface area, which increases the rate of surface water runoff. High stormwater flow rates can lead to stream erosion and flooding. Stormwater may be contaminated with oil and grease, metals (e.g. lead, zinc, copper, cadmium, chromium, and nickel), particulate matter and other pollutants released by vehicles on the roadway, in addition to deicing salts (e.g. sodium chloride and magnesium chloride) and their substitutes (e.g. calcium magnesium acetate and potassium acetate) from road maintenance facilities in colder climates. Stormwater may also contain nutrients and herbicides used for management of vegetation in the rights-of-way.

In addition to the management practices for stormwater during construction and operations presented in the **General EHS Guidelines**, practices applicable to roadways include the following:[14]

General Stormwater Management

- Use of stormwater management practices that slow peak runoff flow, reduce sediment load, and increase infiltration, including vegetated swales (planted with salt-resistant vegetation); filter strips; terracing; check dams; detention ponds or basins; infiltration trenches; infiltration basins; and constructed wetlands;
- Where significant oil and grease is expected, using oil / water separators in the treatment activities;

[9] Examples of certification schemes are provided by the US EPA Certification of Pesticide Applicators (40 CFR 171), which categorizes pesticides as either "unclassified" or "restricted" and requires workers that apply unclassified pesticides to be trained according to the Worker Protection Standard (40 CFR Part 170) for Agricultural Pesticides. It further requires restricted pesticides to be applied by or in the presence of a certified pesticide applicator.
[10] Stockholm Convention on Persistent Organic Pollutants (2001).
[11] FAO (2002a)
[12] FAO (2002b)
[13] Danish Agricultural Advisory Service (DAAS) (2000)

- Regular inspection and maintenance of permanent erosion and runoff control features;

Road Paving[15]

- Paving in dry weather to prevent runoff of asphalt or cement materials;
- Use of proper staging techniques to reduce the spillage of paving materials during the repair of potholes and worn pavement. This may include covering storm drain inlets and manholes during paving operations; using erosion and sediment control measures to decrease runoff from repair sites; and utilizing pollution prevention materials (e.g. drip pans and absorbent material on paving machines) to limit leaks and spills of paving materials and fluids;
- Reducing the amount of water used to control dust, and using sweeping practices rather than washing. Collecting and returning swept material to aggregate base or disposing as solid waste, as described in the **General EHS Guidelines**;
- Avoiding the generation of contaminated runoff from cleaning of asphalt equipment by substituting diesel with vegetable oil as a release and cleaning agent; containing cleaning products and contaminated asphalt residues; scraping before cleaning; and conducting cleaning activities away from surface water features or drainage structures.

Road Deicing

Colder climates may require the clearing of snow and ice from road surfaces during winter months. Stormwater management recommendations in this context include:[16]

- Primary use of mechanical deicing methods (e.g. sweepers and plows) complemented by chemical means if necessary;
- Pre-treating of pavement surfaces with anti-icing methods prior to the onset of snow or ice to reduce the need for subsequent applications and allow for easy removal;
- Selectively applying anti-icing and deicing agents based on expected pavement temperatures and the use of road weather information systems;
- Training employees in the application of anti-icing and deicing agents at optimum rates and times, and routinely calibrating deicer application equipment;
- Selecting the type of anti-icing and deicing agents based on the location of environmentally sensitive areas and the potential impacts of the particular agent;[17]
- Designing roads and bridges to minimize the accumulation of drifting snow on the roadway;[18]
- Designing drainage and site reinstatement to minimize impacts of anti-icing and deicing agent runoff to surface water and vegetation.[19]

Waste

Solid waste may be generated during construction and maintenance of roads and associated structures. Significant quantities of rock and soil materials may be generated from earth moving during construction activities. Solid waste generation during operation and maintenance activities may include road resurfacing waste (e.g. removal of the old road surface material);

[14] The adoption of specific recommendations should be based on an identification of environmentally sensitive areas along the transport corridor.

[15] Additional recommendations on paving activities management are presented in "Chapter 5: Pavement Materials and Recycling" of NCHRP Project 25-25 (04)

[16] Additional recommendations on the management of road de-icing methods provided in "Source Water Protection Practices Bulletin: Managing Highway Deicing to Prevent Contamination of Drinking Water" USEPA 816-F-02-019 (2002) and Chapter 8: Winter Operations and Salt, Sand, and Chemical Management of NCHRP Project 25-25 (04)

[17] Salts and acetates can create potentially negative consequences to soil and aquatic environments and should be carefully selected based on site specific circumstances, such as distance to receiving water bodies and the type of local aquatic habitat.

[18] Specific design recommendations applicable to roadway and bridge structures, the use of structural or living fences, and other methods are provided in numerous sources including "Chapter 3: Designing for Environmental Stewardship in Construction and Maintenance" of NCHRP Project 25-25 (04)

[19] Specific stormwater management design recommendations for roads are available in numerous sources including Chapter 3 of NCHRP Project 25-25 (04)

road litter, illegally dumped waste, or general solid waste from rest areas; animal carcasses; vegetation waste from right-of-way maintenance; and sediment and sludge from stormwater drainage system maintenance (including sediment traps and oil / water separation systems). Paint waste may also be generated from road and bridge maintenance (e.g. due to removal of old paint from road stripping and bridges prior to re-painting). Waste management strategies include:

Construction Phase

- Management of construction site excavation materials according to the recommendations of the **EHS Guidelines for Construction Materials Extraction** and the **General EHS Guidelines**;

Road Resurfacing

- Maximizing the rate of recycling of road resurfacing waste either in the aggregate (e.g. reclaimed asphalt pavement or reclaimed concrete material) or as a base;
- Incorporating recyclable materials (e.g. glass, scrap tires, certain types of slag and ashes) to reduce the volume and cost of new asphalt and concrete mixes.[20]

Miscellaneous Wastes

- Collecting road litter or illegally dumped waste and managing it according to the recommendations in the **General EHS Guidelines**. Provision of bottle and can recycling and trash disposal receptacles at parking lots to avoid littering along the road;
- Manage herbicide and paint inventories to avoid having to dispose of large quantities of unused product. Obsolete product should be managed as a hazardous waste as described in the **General EHS Guidelines**;
- Collecting animal carcasses in a timely manner and disposing through prompt burial or other environmentally safe methods;
- Composting of vegetation waste for reuse as a landscaping fertilizer;
- Managing sediment and sludge removed from storm drainage systems maintenance activities as a hazardous or non-hazardous waste (see **General EHS Guidelines**) based on an assessment of its characteristics.

Painting Activities

- Management of all removed paint materials suspected or confirmed of containing lead as a hazardous waste;
- Use of a system to collect paint waste when removing old paint containing lead. For a simple scraping operation, ground-covering tarps may be sufficient. For a blasting operation, an enclosure with a negative pressure ventilation system may be necessary;
- Grinding of removed, old road surface material and re-use in paving, or stockpiling the reclaim for road bed or other uses. Old, removed asphalt may contain tar and polycyclic aromatic hydrocarbons and may require management as a hazardous waste.

Noise

Traffic noise is generated by vehicle engines, emission of exhaust, aerodynamic sources, and tire / pavement interaction. For vehicle speeds over 90 kilometers per hour (km/h), the noise from the tire / pavement interaction predominates.[21] Traffic noise can be a significant nuisance and may be loud enough to

[20] Additional information on the reuse of reclaimed concrete or asphalt and the use of recyclable materials in the aggregate is provided in numerous sources including "Chapter 5: Pavement, Materials, and Recycling" of NCHRP Project 25-25 (04)

[21] The noise level is influenced by the type, volume, and speed of traffic (e.g. one five-axel truck sounds about as loud as 28 cars when traveling at 90 km/hr). US Department of Transportation, Federal Highway Administration. Highway Traffic Noise. http://www.fhwa.dot.gov/environment/htnoise.htm .

interfere with normal conversation[22] and can cause stress in children and raise blood pressure, heart rates, and levels of stress hormones.[23] Traffic noise levels are reduced by distance, terrain, vegetation, and natural and manmade obstacles.

Management practices to prevent, minimize, and control noise include:

- Consideration of noise impacts during road design to prevent adverse impacts at nearby properties through the placement of the road right-of-way and / or through the design and implementation of noise control measures discussed below.[24, 25]
- Design and implementation of noise control measures may include the following:
  - Construction of the road below the level of the surrounding land
  - Noise barriers along the border of the right-of way (e.g. earthen mounds, walls, and vegetation)[26]
  - Insulation of nearby building structures (typically consisting of window replacements)
  - Use of road surfaces that generate less pavement / tire noise such as stone-matrix asphalt[27]

[22] At a distance of 50 ft, traffic noise ranges from about 70 dBA for cars to 90 dBA for heavy trucks.

[23] Evans, Gary W. et al. (2001)

[24] For example, the U.S. Federal Highway administration has established noise impact criteria, such as L_{10} (sound level exceeded 10 percent of the time) = 70 dBA for residential land use. A new road project should not cause a significant increase in existing noise levels at nearby properties.

[25] Traffic noise is generally not perceived as a nuisance for people who live more than 150 meters from heavily traveled highways or more than 30 to 60 meters from lightly traveled roads.

[26] The most effective noise abatement measures include noise barriers and mounds, which can reduce noise by 5 dBA or more. The cost of noise walls in the US has been estimated at $1.3 million per mile (NCHRP Project 25-25 (04))

[27] Stone-matrix asphalt (SMA) is one of several alternative surfaces that can be used in new roads or as surface treatment in existing roads to provide a quieter surface. A double-layered porous asphalt construction results in a further reduction of traffic noise, from 3 to 4 dBA at 50 km/h up to 5.5 dBA at 100 km/h compared with regular asphalt and 7 to 12 dBA quieter than concrete pavements (NSW Roads and Traffic Authority (RTA), 2005).

Air Emissions

Air emissions are typically related to dust during construction and exhaust from vehicles. Management practices for air emissions include:

- Prevention and control of dust emissions during construction and maintenance activities as described in the **General EHS Guidelines**;
- Operation and maintenance of maintenance vehicle fleets according to the recommendations in the **General EHS Guidelines**;
- Consideration of design options for the reduction of traffic congestion, including:
  - Automated toll charging systems
  - Availability of high-occupancy vehicle lanes
  - Minimizing grade changes, at-grade crossings, and sharp curves which can promote congestion
  - Design of roadway to shed water, and prompt removal of snow to minimize rolling resistance, as well as to enhance safety
  - Maintenance of the road surface to preserve surface characteristics (e.g. texture and roughness)

Wastewater

Wastewater discharges from maintenance facilities and from rest areas should be managed according to the recommendations provided in the **General EHS Guidelines**, and may include connection to centralized wastewater collection and treatment systems and / or use of properly designed and operated septic systems.

1.2 Occupational Health and Safety

Guidance on the prevention and control of physical, chemical, and biological hazards common to most projects and facilities is presented in the **General EHS Guidelines.**

Occupational health and safety issues associated with the construction and operation of roads primarily include the following:

- Physical hazards
- Chemical hazards
- Noise

Physical Hazards

Road construction and maintenance personnel, as well as landscaping workers maintaining vegetation in the rights-of-way, can be exposed to a variety of physical hazards, principally from operating machinery and moving vehicles but also working at elevation on bridges and overpasses. Other physical hazards (e.g. exposure to weather elements, noise, work in confined spaces, trenching, contact with overhead power lines, falls from machinery or structures, and risk of falling objects) are discussed in the **General EHS Guidelines**.

Management practices to prevent and control physical hazards include:

Moving Equipment and Traffic Safety

- Development of a transportation management plan for road repairs that includes measures to ensure work zone safety for construction workers and the traveling public;
- Establishment of work zones to separate workers on foot from traffic and equipment by:
    - Routing of traffic to alternative roads when possible
    - Closure of lanes and diversion of traffic to the remaining lanes if the road is wide enough (e.g. rerouting of all traffic to one side of a multi-lane highway)
    - Where worker exposure to traffic cannot be completely eliminated, use of protective barriers to shield workers from traffic vehicles, or installation of channeling devices(e.g. traffic cones and barrels) to delineate the work zone
    - Regulation of traffic flow by warning lights, avoiding the use of flaggers if possible
    - Design of the work space to eliminate or decrease blind spots
- Reduction of maximum vehicle speeds in work zones;
- Training of workers in safety issues related to their activities, such as the hazards of working on foot around equipment and vehicles; and safe practices for work at night and in other low-visibility conditions, including use of high-visibility safety apparel and proper illumination for the work space (while controlling glare so as not to blind workers and passing motorists).

Elevated and Overhead Work

- The area around which elevated work is taking place should be barricaded to prevent unauthorized access. Working under personnel on elevated structures should be avoided;
- Hoisting and lifting equipment should be rated and properly maintained, and operators trained in their use. Elevating platforms should be maintained and operated according to established safety procedures including use of fall protection measures (e.g. railings); equipment movement protocols (e.g. movement only when the lift is in a retracted position); repair by qualified individuals; and installation of locks to avoid unauthorized use by untrained individuals;
- Ladders should be used according to pre-established safety procedures for proper placement, climbing, standing, as well as the use of extensions.

Fall Protection

- Implementation of a fall protection program that includes training in climbing techniques and use of fall protection measures; inspection, maintenance, and replacement of fall protection equipment; and rescue of fall-arrested workers, among others;

- Establishment of criteria for use of 100 percent fall protection (typically when working over 2 meters above the working surface, but sometimes extended to 7 meters, depending on the activity). The fall protection system should be appropriate for the structure and necessary movements, including ascent, descent, and moving from point to point;
- Installation of fixtures on bridge components to facilitate the use of fall protection systems;
- Safety belts should be not less than 16 millimeters (mm) (5/8 inch) two-in-one nylon or material of equivalent strength. Rope safety belts should be replaced before signs of aging or fraying of fibers become evident;
- When operating power tools at height, workers should use a second (backup) safety strap.

Chemical Hazards

Chemical hazards in road construction, operations, and maintenance activities may be principally associated with exposures to dust during construction and paving activities; exhaust emissions from heavy equipment and motor vehicles during all construction and maintenance activities (including during work in tunnels or in toll collection booths); potentially hazardous dust generated during bridge paint removal; herbicide use during vegetation management; and diesel fuel used as a release and cleaning agent for paving equipment. General recommendations for hazardous materials management and chemicals hazard management are provided in the **General EHS Guidelines**.

Recommendations specific to road projects include:

- Use of millers and pavers with exhaust ventilation systems and proper maintenance of such systems to maintain worker exposure to crystalline silica (millers and grinders) and asphalt fumes (pavers) below applicable occupational exposure levels;
- Use of the correct asphalt product for each specific application, and ensuring application at the correct temperature to reduce the fuming of bitumen during normal handling;
- Maintenance of work vehicles and machinery to minimize air emissions;
- Reduction of engine idling time in construction sites;
- Use of extenders or other means to direct diesel exhaust away from the operator;
- Ventilation of indoor areas where vehicles or engines are operated, or use of exhaust extractor hose attachments to divert exhaust outside;
- Provision of adequate ventilation in tunnels or other areas with limited natural air circulation;
- Installation of tollbooth ventilation and air filtration systems;
- Use of protective clothing when working with cutbacks (a mixture of asphalt and solvents for the repair of pavement), diesel fuel, or other solvents;
- Use of dustless sanding and blasting equipment and special containment measures for paint removal activities[28]. Avoiding the use of lead-containing paint and using appropriate respiratory protection when removing paints (including those containing lead in older installations) or when cutting galvanized steel.

[28] Examples of enclosures used in paint removal activities include total enclosures with dust collector systems (for abrasive blasting), impermeable curtains (for wet abrasive blasting), or vacuum equipped power and blasting tools (Minnesota Pollution Control Agency http://www.pca.state.mn.us/air/lead-class.html)

Noise

Construction and maintenance personnel may be potentially exposed to extremely high levels of noise from heavy equipment operation and from working in proximity to vehicular traffic. As most of these noise sources cannot be prevented, control measures should include the use of personal hearing protection by exposed personnel and implementation of work rotation programs to reduce cumulative exposure. Additional recommendations on the management of occupational noise are provided in the **General EHS Guidelines.**

1.3 Community Health and Safety

Community health and safety issues during the construction of roads are common to those at most large construction sites, and are discussed in the **General EHS Guidelines**. These impacts include, among others, dust, noise, and vibration from construction vehicle transit, and communicable disease associated with the influx of temporary construction labor. Significant community health and safety issues associated with road projects may also include:

- Pedestrian safety
- Traffic safety
- Emergency preparedness

Pedestrian Safety

Pedestrians and bicyclists are at greatest risk of serious injury from collisions with moving vehicles. Children are generally the most vulnerable due to lack of experience and knowledge of traffic related hazards, their behavior while at play, and their small size making them less visible to motorists. Recommended pedestrian safety management strategies include the following:

- Provision of safe corridors along the road alignment and construction areas, including tunnels and bridges (e.g. paths separated from the roadway), and safe crossings (preferably over or under the roadway) for pedestrians and bicyclists during construction and operation. Crossing locations should take into account community preferences, including those related to convenience or personal safety (e.g. the prevalence of crime at potential crossing point locations).
- Installation of barriers (e.g. fencing, plantings) to deter pedestrian access to the roadway except at designated crossing points;
- Installation and maintenance of speed control and traffic calming devices at pedestrian crossing areas;
- Installation and maintenance of all signs, signals, markings, and other devices used to regulate traffic, specifically those related to pedestrian facilities or bikeways.[29]

Traffic Safety

Collisions and accidents can involve a single or multiple vehicles, pedestrians or bicyclists, and animals. Many factors contribute to traffic accidents. Some are associated with the behavior of the driver or the quality of the vehicle, while others are linked to the road design, or construction and maintenance issues. Recommendations to prevent, minimize, and control risks to the community from traffic accidents include:

- Installation and maintenance of all signs, signals, markings, and other devices used to regulate traffic, including posted speed limits, warnings of sharp turns, or other special road conditions;[30]
- Setting of speed limits appropriate to the road and traffic conditions;

[29] As required by public agencies with jurisdiction over the project site. In their absence, project developers and operators should refer to sources from well developed regulatory frameworks such as the US Code of Federal Regulations (CFR) Part 655, Subpart F and the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD, 2003)

[30] Based on local regulatory requirements or, in their absence, sources such as the US Code of Federal Regulations (CFR) Part 655, Subpart F and the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD, 2003)

- Design of roadways to accommodate anticipated traffic volume and flow;
- Maintenance of the road to prevent mechanical failure of vehicles due to road conditions;
- Construction of roadside rest areas at strategic locations to minimize driver fatigue;
- Installation of measures to reduce collisions between animals and vehicles (e.g. use of signs to alert drivers on road segments where animals frequently cross; construction of animal crossing structures; installation of fencing along the roadway to direct animals toward crossing structures; and use of reflectors along the roadside to deter animal crossings at night when vehicles are approaching);
- Targeting elimination of at-grade rail crossings;
- Targeting the use of a real-time warning system with signage to warn drivers of congestion, accidents, adverse weather or road conditions, and other potential hazards ahead.

Emergency Preparedness

Emergency situations most commonly associated with road operations include accidents involving single or multiple vehicles, pedestrians, and / or the release of oil or hazardous materials. Road operators should prepare an emergency preparedness and response plan in coordination with the local community and local emergency responders to provide timely first aid response in the event of accidents and hazardous materials response in the event of spills.

2.0 Performance Indicators and Monitoring

2.1 Environment

Emissions and Effluent Guidelines

Roads do not typically give rise to significant point source air emissions or effluents. Instead, operators should apply the principles and guidelines described above and in the **General EHS Guidelines,** especially with regard to emissions or effluents from road maintenance facilities.

Environmental Monitoring

Environmental monitoring programs for this sector should be implemented to address all activities that have been identified to have potentially significant impacts on the environment, during normal operations and upset conditions. Monitoring frequency should be sufficient to provide representative data for the parameter being monitored. Monitoring should be conducted by trained individuals following monitoring and record-keeping procedures and using properly calibrated and maintained equipment. Monitoring data should be analyzed and reviewed at regular intervals and compared with the operating standards so that any necessary corrective actions can be taken. Additional guidance on applicable sampling and analytical methods for emissions and effluents is provided in the **General EHS Guidelines**.

2.1 Occupational Health and Safety

Occupational Health and Safety Guidelines

Occupational health and safety performance should be evaluated against internationally published exposure guidelines, of which examples include the Threshold Limit Value (TLV®)

occupational exposure guidelines and Biological Exposure Indices (BEIs®) published by American Conference of Governmental Industrial Hygienists (ACGIH),[31] the Pocket Guide to Chemical Hazards published by the United States National Institute for Occupational Health and Safety (NIOSH),[32] Permissible Exposure Limits (PELs) published by the Occupational Safety and Health Administration of the United States (OSHA),[33] Indicative Occupational Exposure Limit Values published by European Union member states,[34] or other similar sources

Accident and Fatality Rates

Projects should try to reduce the number of accidents among project workers (whether directly employed or subcontracted) to a rate of zero, especially accidents that could result in lost work time, different levels of disability, or even fatalities. Facility rates may be benchmarked against the performance of facilities in this sector in developed countries through consultation with published sources (e.g. US Bureau of Labor Statistics and UK Health and Safety Executive)[35].

Occupational Health and Safety Monitoring

The working environment should be occupational hazards relevant to the specific project. Monitoring should be designed and implemented by accredited professionals[36] as part of an occupational health and safety monitoring program. Facilities should also maintain a record of occupational accidents and diseases and dangerous occurrences and accidents. Additional guidance on occupational health and safety monitoring programs is provided in the **General EHS Guidelines**.

[31] Available at: http://www.acgih.org/TLV/ and http://www.acgih.org/store/
[32] Available at: http://www.cdc.gov/niosh/npg/
[33] Available at: http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9992
[34] Available at: http://europe.osha.eu.int/good_practice/risks/ds/oel/
[35] Available at: http://www.bls.gov/iif/ and http://www.hse.gov.uk/statistics/index.htm
[36] Accredited professionals may include Certified Industrial Hygienists, Registered Occupational Hygienists, or Certified Safety Professionals or their equivalent.

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Annex A: General Description of Industry Activities

Road project infrastructure typically includes the rights-of-way, the roadway, junctions, tunnels, bridges, maintenance facilities, parking lots, and toll plazas in the case of toll roads. Road projects may include provisions for bicycles and pedestrians, such as designated bicycle lanes or shared-use paths separated from the roadway. Some road projects may also involve the construction and operation of vehicle service areas.

Direct land requirements for roads typically range from about 9 hectares (ha) per kilometer (km) for two lanes in each direction to 12 ha / km for four lanes in each direction.[37] The width of the rights-of-way may need to be sufficient to include traffic lanes, shoulders, grass strips, sidewalks and cycle lanes, public utility facilities, and outer slopes. In hilly terrain, the required right-of-way varies considerably as the roadway passes areas that require landscapes to be cut and filled, however tunnels are often preferred to avoid steep up and down sections on roads.

Design and Construction

Generally, modern roads are constructed as all-weather roads with a hard surface pavement, usually asphalt or concrete. A paved roadway typically consists of three layers above the sub-grade: the sub-base, base course, and wearing course. Each layer is compacted by a roller before proceeding with the next course.

Sub-grade, Sub-base, and Base layers

The sub-grade is earth that has been graded to the desired elevation. The soil may need to be amended with stabilizing additives (e.g. lime, portland cement, or fly ash) to provide adequate, uniform support to the overlying road structure.

The sub-base layer is designed to evenly spread the load of the pavement and the traffic to the ground below. Both bound and unbound materials are used for construction of sub-base. Unbound materials consist of aggregates which are loose and do not bind or adhere to neighboring particles when laid and compacted. The material is typically crushed stone, slag, or concrete. For bound materials, a binder, usually cement, is added to bind the aggregates together, thus allowing heavier loads but also reducing drainage. Crushed stone, slag, and building material can be used as components in bound materials.

The base course is the strengthening layer of the pavement. The material used is similar to that of the sub-base, but the size of particles is more uniform. Asphalt or concrete can be used as a binding medium.

Wearing layer

The wearing course is the top layer of asphalt or concrete. The top layer needs to be even to provide a smooth ride for cars and trucks. Asphalt is the most common material for the wearing course. The basic input materials used in asphalt preparation are hot liquid bitumen and aggregates (e.g. sand and crushed stone).

Asphalt

Hot mix asphalt is a highly technical mixture of strictly specified materials (e.g. the tolerance for the aggregates is often less than 5 percent for the shape, size, hardness, and wear index) The variety of mix types is practically limitless, depending on its position in the road structure (e.g. base or wearing course), on its particular function (e.g. intensity of traffic, anti-skid properties, noise reduction), on climatic conditions (e.g. from freezing to high temperatures), and on the nature of raw materials locally available (e.g. limestone or granite quarries, types of bitumen).

[37] EEA, 1998.

Other materials, such as broken asphalt (taken from a road that has been ripped up), sulphur, rubber, and foundry sands can be added to the basic mix without compromising the final asphalt quality.

Asphalts are grouped by their content and the size of stones (aggregates). Many types of asphalts have been developed to satisfy desired requirements depending on climate conditions, traffic loads, and other specific parameters. Two types of asphalt that are common in modern road work are stone mastic asphalt (SMA) and porous asphalt.

SMA consists of a coarse aggregate skeleton bound with mastic consisting of crushed rock fines, filler, and bitumen. The stone to stone contact of the coarse aggregate ensures a very durable matrix that is resistant to age hardening, and capable of high resistance to deformation. Consequently, it is resistant to cracking, ravelling, and damage by moisture.

Increasing traffic volumes, particularly in countries with wet climates, have led to the development of porous asphalt (PA). PA consists primarily of gap-graded aggregates bound together by a polymer modified binder to form a matrix with interconnecting voids through which water can pass.

The main difference between SMA and PA is in the percentage of voids in the mix. PA has a void content of at least 20 percent compared with 3 to 6 percent for SMA. This higher void content means that the PA greatly improves the rate of surface water drainage, thereby reducing spray and headlight glare in wet weather, improving skid resistance, and reducing the tendency for hydroplaning. PA typically also generates lower tire / pavement noise than other wearing course materials.

Asphalt is normally applied within 30-50 km of the mixing plant, however transport up to 100 km may be necessary in some cases.

Concrete

Concrete may be chosen for the wearing course, especially for roads carrying high traffic volume and heavy truck traffic, principally because of its durability, long life (usually 20 – 30 years), and generally lower maintenance needs compared to asphalt paving. Concrete typically generates higher levels of tire / pavement noise and is more expensive to install than asphalt.

The sub-grade, sub-base, and base layers supporting concrete paving are similar to those described above for asphalt paving. Because of the rigidity of concrete pavement, loads are spread over a large area and pressures on the subgrade are relatively low. A sub-base may be omitted when constructing concrete roads designed for light traffic. For large road projects, the concrete slab is usually laid down by slip-form paving equipment, which form and consolidate fresh concrete as they move along the right-of-way. The pavement surface is textured to enhance wet and dry weather traction. Contraction and expansion joints are included at regular intervals to relieve stresses and prevent cracking of the concrete slab.

Pavement Marking

Pavement striping is used for lane stripes and other pavement markings to guide motorists. Other pavement markers are used to supplement traffic signs. Markers may either be surface mounted (raised) or placed in recessed slots in the pavement. Markers are applied using bitumen / epoxy adhesives.

Toll stations

Toll stations may be manually or electronically operated or a mixture of both. To avoid prolonged stops at the tollgates, the roadway expands into a toll plaza with several lanes. The plaza design allows for traffic to safely separate and decelerate to the collection point and then accelerate and merge with the traffic flow again. Manual collection of tolls is relatively slow, and therefore requires more toll booths / lanes than are required for electronic systems to process the same number of vehicles.

Operation and Maintenance

Operation and maintenance activities are numerous but mainly include road repair, snow and ice removal, bridge maintenance, and vegetation maintenance.

Asphalt pavement is susceptible to cracking and other breakdowns that have to be repaired. Asphalt emulsions are usually used to fill up small cracks. Cutbacks, which are a mixture of asphalt and petroleum solvents, are not used as frequently because of potential environmental effects of the solvents. Repair tasks include equipment operation, sweeping, application of asphalt, and compaction rolling.

The most common location for repairs of concrete roadways is at the longitudinal joints, where moisture has the opportunity to enter the pavement system. Repairs are typically conducted by sawing through and removing the deteriorated concrete. The existing base material is compacted, and additional material added if necessary. Load transfer is re-established in the patched area by means of reinforcement (e.g. tiebars and dowels). The new concrete is textured to match the surface of the existing roadway. Diamond grinding is also used to restore surface properties (e.g. reducing bumps and dips and restoring surface roughness).

When the road surface deteriorates to the extent that spot repairs and surface treatments are not useful, resurfacing is necessary. For asphalt pavement, resurfacing is most often accomplished by use of milling machines, which remove the top layer of pavement. The removed pavement can be transported off site and crushed or otherwise processed to make it useable as sub-base or other material. Often, the removed pavement is ground at the job site, mixed with beneficiating additives (e.g. virgin aggregate, binder, and / or softening or rejuvenating agents to improve binder properties), and then used for re-paving the roadway. Milling and paving of asphalt roads is often completed in a single pass. Resurfacing of a concrete roadway entails breaking and removal of the concrete, compacting and amending the base material as necessary, and then re-paving. Removed concrete is usually crushed and recycled as sub-base material.

Snow / ice removal consists of plowing snow and ice from bridges, roadways, and shoulders. Wide ditches facilitate storage for plowed snow, which otherwise would be piled along the edge of the roadway or require removal. De-icing with chemicals (e.g. common salt [sodium chloride] or magnesium chloride) is used to facilitate safe driving. Alternatives to chloride salts include calcium magnesium acetate and potassium acetate. Spreading of sand or crushed stone is also used for increasing traffic safety. However, sanding is less effective on highways because the sand can be displaced by vehicles traveling at high speeds.[38]

Steel bridges are generally painted with a multi-coat paint system to resist corrosion. In order to keep a high-quality protection against deterioration, new paint has to be applied regularly. If the old paint is in good condition it can be overcoated, otherwise it has to be removed before the new paint can be applied. Old paints may contain lead.

Vegetation in the rights of way requires periodic maintenance to enhance aesthetics and to prevent potential safety hazards (e.g. reduced visibility, obstruction of signs, and debris in the roadway). Vegetation maintenance typically includes mechanical mowing, trimming, removal of brush, cleanup, and removal of trees when necessary.

[38] University of New Hampshire, 2001.

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