

DRAFT ENVIRONMENTAL IMPACT ASSESSMENT
&
ENVIRONMENTAL MANAGEMENT PLAN

For

Draft EIA for the Development of 4/6 lane (Greenfield) access control expressway from Varanasi to Kolkata (Package-5) from Km 387+200 (near Kamalpur village, Jharkhand/West Bengal Border) to Km 622+500, NH-16, near Uluberia, Howrah District, West Bengal under Bharatmala Pariyojana Phase-II (Lot-9 Package-3)

(Total length- 235.300 km) by

M/s National Highways Authority of India

(Baseline monitoring period- March to May 2024)

PROJECT PROPONENT:

National Highways Authority of India
(NHAI)



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CHAPTER 1 – INTRODUCTION

1.1 INTRODUCTION

The Ministry of Road Transport and Highways (MORTH), Government of India has proposed “Bharatmala Pariyojana” an Umbrella scheme of road development project through National Highways Authority of India (NHAI), National Highway, Industrial Development Corporation Ltd (NHIDCL) and State Public Works Departments (PWD) at an estimated cost of INR 9250 crores. This is the second largest highways construction project in the country after NHDP, where in almost 50,000 km of roads are targeted across the country. This project aims to improve connectivity particularly on economic corridors, border areas and to remote areas with an aim of rapid and safe movement of cargo to boost exports. International trade considered as a key aspect in this scheme and North-eastern states have been given special focus.

M/s SA infrastructure Consultant Pvt. Ltd. 1101A, 11th Floor, Tower A-II, Corporate Park, Plot no. 7A/1, Sector 142, Noida, U.P has been appointed as consultant to carry out consultancy services for the for preparation of DPR and M/s P & M Solution, C-88, Sector 65, Noida, U.P has been appointed as Environment consultant to carry out consultancy service for Environment Impact Assessment (EIA) report.

This proposed highway starts from Km 387.200 (near Kamalpur village, Jharkhand/WB Border) in Purulia District to Km 622.500 NH-16, near Uluberia, Howrah District, in the state of West Bengal. The length of the proposed alignment is 235.300 km approx.

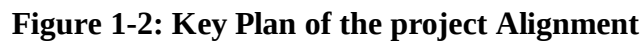
Project Highway Alignment (Greenfield) of 234.800 km and the Proposed Right of Way is 70 m in non-forest Area and 60 m in Forest areas as per the requirement keeping in view the fully access controlled Highway with 4/6-lane dual carriage way configuration.

The road passes through the important talukas like Jhalda-II, Jaipur, Purulia-I, Purulia-II, Hura, Pancha in District of Purulia , talukas like Indpur, Taldangra, and Simlpal in District of Bankura, talukas like Garbeta-I, Chandrakona-II, Chandrakona-I, Ghatal in District of Pashchim Mednipur, talukas like Khanakul-I, Khanakul-II, in District of Hoogli and talukas like Amta-II, Amta-II in District of Howrah in the state of West Bengal.



Figure 1-1: Project Location Map

Proposed Alignment



The purpose of this Environmental Impact Assessment (EIA) is to incorporate environmental concerns at the project planning level. The EIA has been carried out at the project planning and design stage as part of preliminary report to ensure that the project is environmentally feasible. The general objectives of EIA study are as follows:

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- v. To provide basic information for formulating management and monitoring plan.
- vi. To provide an estimate for the budget proposed for environmental impact mitigation and management.

This EIA is structured in accordance with the requirements of the MoEF&CC.

1.3 SCOPE OF EIA STUDY

The scope of the EIA includes the following:

- i. To carry out Environment Impact Study including Environmental Impact Assessment (EIA) in accordance with MoEF&CC & State Government of West Bengal guidelines;
- ii. To carry out the preliminary environmental screening to assess the direct and induced impacts due to the project works;
- iii. To assess and document the baseline environmental conditions relevant to the project;
- iv. To assess the potential positive and negative significant impacts due to the project and identify the cost effective mitigation measures to address these impacts adequately in the Environmental Monitoring and Management Plan (EMMP);
- v. To do the analysis of alternatives incorporating environmental concerns and the associated costs in the economic analysis.
- vi. To give special attention to the environmental enhancement measures in the projects for the following:
 - Tree plantation along the project road;
 - Cultural property enhancement along the project roads;
 - Bus bays including a review of their location;
- vii. Traffic safety provisions like Guard post, Road Delineators, Metal Beam Crash Barrier along the Project roads, depending upon the site requirements, and
- viii. Re-development of the borrow, quarry areas located on public land.
- ix. To prepare EIA report adequate public consultation and the recommendations arising thereon.
- x. To identify all mitigation measures in the EIA and EMMP.
- xi. To provide additional inputs in the areas of performance indicators and monitoring mechanisms for environmental components during construction and operational phase of the project.
- xii. To provide the cost of mitigation measures and to ensure that environmental related staffing, training and institutional requirements are budgeted in project cost.

xiii. The objective of this EIA study is to identify potential environmental impacts of the proposed highway and formulate strategies to avoid / mitigate the same.

1.4 METHODOLOGY

The methodology used for this study is based on the procedures described in MoEF&CC Environmental Impact Assessment Notification dated 14th September 2006 and amendments thereon.

The Environmental Impact Assessment has been carried out using current Government of India guidelines, specifically:

- Project Terms of Reference (TOR) granted by MoEF&CC through 273rd meeting of Expert Appraisal Committee held on 16th - 17th September, 2021 Environmental Impact Assessment Notification dated **14th September 2006**, Ministry of Environment and Forest (MoEF&CC) and amendment, Government of India;
- The Environmental (Protection) Act, 1986 of Government of India;
- Environmental guidelines for Road/Rail/Highway Projects, 1989, MoRTH, Government of India;
- Handbook of environmental procedures and guidelines, 1994, MoRTH, Government of India; and Guidelines for Environmental Impact Assessment of Highway Projects (IRC: 104-1988).

1.5 LITIGATION STATUS

According to the NHAI, no litigation (s) pending against the proposed project and there are no directions from any court of law/any-statutory authority against the project.

1.6 ENVIRONMENTAL LEGISLATIONS

Ministry of Environment, Forest and Climate Change (MoEF&CC): The primary responsibility for administration and implementation of the GoI policy with respect to environmental management, conservation, ecologically sustainable development and pollution control rests with the MoEF&CC Established in 1985; the MoEF&CC is the agency primarily responsible for review and approval of EIA's pursuant to GoI legislation. The MoEF&CC has set up regional offices responsible for collecting and furnishing information relating to EIA projects, pollution control measures, enforcement of legislations and environmental protection in special conservation areas such as wetlands, mangroves and biological reserves.

State Pollution Control Board (SPCB): The objective of SPCB is to control, prevent and abate pollution in the state to protect the environment from degradation by effective monitoring and implementation of state pollution control legislations and are also involved in implementation, supervision and monitoring activities pertaining to Central Pollution Control Acts and Rules vests with the Central Pollution Control Board (CPCB), Government of India.

The Government of India has formulated various policy guidelines; acts and regulations aimed at protection and enhancement of environmental resources. The following **Table 1.3** summarizes the existing legislations pertaining to the project, the various clearances required for the project and the status as on date.

Table 1-1: Summary of Relevant Environmental Laws & Regulations

S.no	Law/ Regulation/ Guidelines	Objectives	Implementing/ Responsible Agency
1.	The Environmental (Protection) Act. 1986, and its rules	The Umbrella Act for protection and improvement of the environment. Establishes the standards for emission of noise in the atmosphere.	MoEF&CC; GoI; Department of Forest, GoB; CPCB; SPCB,
2.	Environmental Impact Assessment Notification (2006) and amendments made there after	To provide environmental clearance to new developmental activities following environmental impact assessment	MoEF&CC; GoI; CPCB; SPCB,
3.	Notification for use of Fly ash, 2016	Promoting the utilization of fly ash in the manufacture of building materials and in construction activity within a specified radius of 300 kilometers from coal or lignite based thermal power plants	MoEF&CC, SPCB
4.	The Water (Prevention	To control water pollution by	CPCB;SPCB

S.no	Law/ Regulation/ Guidelines	Objectives	Implementing/ Responsible Agency
	and Control of Pollution) Act, 1974	controlling discharge of pollutants as per prescribed standards	
5.	The Air (Prevention and Control of Pollution) Act. 1981	Empowers to control air pollution by controlling emission of air pollutants as per prescribed standards, SPCB to set and monitor air quality standards and to prosecute offenders, excluding vehicular air and noise emission.	CPCB; SPCB & Transport Department; State Govt.
6.	Noise Pollution (Regulation and Control) Act, 1990. Noise Pollution (Regulation And Control) Rules (2000) The Noise Pollution (Regulation and Control) Amendment Rules(2006)	To regulate and control noise producing and generating sources with the objective of maintaining the ambient air quality standards with respect to noise.	CPCB; SPCB, & Transport Department of State Government
7.	Indian Forest Act 1927, The Forest (Conservation) Act. 1980, Forest (conversion) Rules 1981, Forest Conservation Rules (Notification)2003	To consolidate the laws related to forest, the transit of forest produces and the duty livable on timber and other forest produce. Conservation of Forests, Judicious use of forest land for non-forestry purposes; and to replenish the loss of forest cover by Compensatory Afforestation on degraded forest	MoEF&CC; Department of Forest, State Government

S.no	Law/ Regulation/ Guidelines	Objectives	Implementing/ Responsible Agency
		land and non-forestland. Procedure for submission of the proposals seeking approval for Central Government for diversion of forest land to non-forest purposes.	
8.	National Forest Policy 1952, National Forest Policy (Revised) 1988	To maintain ecological stability through preservation and restoration of biological diversity.	Forest Department, GoI and State Government of West Bengal
9.	National Environment Appellate Authority Act (NEAA) 1997	Address Grievances regarding the process of environmental clearance.	National Environment Appellate Authority
10.	The National Highway Act (1956)	For Land Acquisition	NHAI; Revenue Department, GoB
11.	The Land Acquisition Act 1894	Set out rule for acquisition. Of land by government	Revenue Department State Government.
12.	The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 (also Land Acquisition Act, 2013)	For payment of compensation and assistance, different entitlements payment of compensation and Assistance, resettlement, and rehabilitation of project affected population due to acquisition of lands and structures.	NHAI, Competent Authority (Revenue Department)
13.	WildLifeProtectionAct ,1972The Wildlife (Protection) Amendment Act	To protect wildlife in general and National Parks and Sanctuaries in particular. To protect wild animals, birds and plants with a view to	Chief Conservator of Wildlife, Wildlife Wing, Forest Department, State

S.no	Law/ Regulation/ Guidelines	Objectives	Implementing/ Responsible Agency
	(2002)	ensure the ecological and environmental security of the country.	Government National/ State Board for Wildlife
14.	Ancient Monuments and Archaeological Sites and Remains (Amendment and Validation) Act, 2010)	To provide for the preservation of Ancient and historical monuments and archaeological sites and remains of national importance and protection sculptures, carvings and other like objects.	Archaeological Department, GoI; Indian Heritage Society and Indian National Trust for Art and Culture Heritage (INTACH)
15.	Central Motor Vehicle Act 1988 and Central Motor Vehicle Rules 1989	To consolidate and amend the laws related to motor vehicles. Licensing of driving of motor vehicles, registration of motor vehicles, with emphasis on road safety standards and pollution control measures, standards for transportation of hazardous and explosive materials To check vehicular air and noise pollution.	RTO Office, GoB
16.	The Explosives Act (& Rules)1884 (1983)	Sets out the regulations as to regards the use of explosives and precautionary measures while blasting & quarrying.	Chief Controller of Explosives
17.	Public Liability and Insurance Act, 1991	Protection to the general public from accidents due to hazardous material	SPCB
18.	Hazardous and Other	Protection to the general public	SPCB

S.no	Law/ Regulation/ Guidelines	Objectives	Implementing/ Responsible Agency
	Wastes (Management & Transboundary Movement) Rules, 2016	against improper handling and disposal of hazardous wastes	
19.	Minor Mineral and concession Rules, 2004	For opening new quarries.	District Collector
20.	The Mining Act (1952)	The mining act has been notified for safe and sound mining activity.	Department of mining, GoB
21.	Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996	Protection against chemical accident while handling any hazardous chemicals resulting.	District & Local Crisis Group headed by the DM and SDM
22.	Construction and Demolition Waste Management Rules 2016	To promote an integrated approach, whereby environmental management of construction and demolition waste is given due consideration throughout the duration of the project	MoEF&CC, SPCB

1.6.1 THE ENVIRONMENT (PROTECTION) ACT, 1986

The Environment (Protection) Act, popularly known as EP Act, is an umbrella a legislation that supplements existing environmental regulations. Empowered by the EP Act, the Ministry of Environment, Forest and Climate Change (MoEF&CC), Government of India has issued the following notifications regulating siting of industry and operations, procuring clearance to establish industries and development of projects with appropriate EIA studies, coastal zone regulations and other aspects of environment are:

- Empowers the Government of India (section 6) to make rules to regulate environmental pollution by stipulating standards and maximum allowable limits to prevent air, water, noise, soil and other environmental pollutants.
- Prohibits operations that emit pollutants more than standards (section 7).
- Regulates handling of hazardous substances and identifies persons responsible for discharges and pollution prevention (section 9).
- Section 17 deals with offences committed by Government Departments.
- Formulated Environmental (Protection) Rules, 1986, Hazardous Wastes (Management and Handling) Rules, 1989 and Manufacture, Storage & Import of Hazardous Chemical Rules, 1989 in accordance with the sections 6, 8 and 25 of EP Act.
- The act has been supplemented with EIA notification 2006.

1.6.2 ENVIRONMENTAL IMPACT ASSESSMENT NOTIFICATION, 2006

The primary responsibility for administration and implementation of the GoI policy with respect to conservation, ecologically sustainable development and pollution control rests with the Ministry of Environment, Forests and Climate Change (MoEF&CC). The MoEF&CC is responsible to enforce the regulations established pursuant to the National Conservation Strategy, National Forest Policy, 1988, the Policy for Abatement of Pollution (1992) and the Indian Environmental Protection Act 1986, revised in 1994 and amendments thereafter.

The GoI EIA Notification on Environmental Clearances (September 14, 2006) replacing the EIA Notification of 1994, sets out the requirement for Environmental Assessment in India. This states that Environmental Clearance (EC) is required for specified activities/ projects, and this must be obtained before any construction work or land preparation (except land acquisition) may commence. Projects are categorized as A or B depending on the scale of the project and the nature of its impacts. The categorization for highways and roads projects is as given in **Table 1-2**.

Table 1-2: Categorization of Highway & Road Projects

Project or Activity		Category with threshold limit		Conditions if any
		A	B	
7(f)	Highways	New National Highway and Expansion of National	All New State Highway projects	General Condition shall apply.

		Highways greater than 100km involving additional right of way or land acquisition greater than 40m on existing alignments and 60m on realignments or by-passes.	ii) State expansion Highway projects in hilly terrain (above 1,000m AMSL) and or ecologically sensitive areas	Note: Highway include expressways

Source: MoEF & CC's EIA Notification 2006 and its amendments thereafter

Category A projects requires EC from the National's Ministry of Environment, Forest and Climate Change (MoEF&CC).

Category B projects require environmental clearance from the State Environment Impact Assessment Authority (SEIAA).

General Condition (GC): Any project or activity specified in Category 'B' will be treated as Category A, if located in whole or in part within 5km from the boundary of:

- Protected Areas notified under the Wildlife (Protection) Act, 1972,
- Critically Polluted areas as notified by the Central Pollution Control Board from time to time,
- Notified Eco-sensitive areas,
- Inter-State boundaries and international boundaries.

1.6.3 WATER (PREVENTION AND CONTROL OF POLLUTION) ACT, 1974

Water (Prevention and Control of Pollution) Act is the first environmental regulation that brought at the state and central levels, the pollution control boards to control/ regulate environmental pollution in India. Amended twice in 1978 and 88, the Act vests regulatory authority on the State Pollution Control Boards and empowers them to establish and enforce effluent standards for industries and local authorities discharging effluents.

- Section 73 vests regulatory authority on the State Pollution Control Boards and empowers them to enforce effluent discharge standards to prevent water pollution (both for industries and local authorities)
- Section 24 of the act prohibits use of stream or well or on land disposal for polluting substances that violate disposal standards laid down by the board

- Section 25 of the act requires an application to be made to the state board to establish any treatment and disposal system that is likely to discharge sewage or trade effluent into a stream or well or sewer on land
- Sections 41 and 44 provide for penalties for not complying with the various provisions or directives of the board
- Section 48 deals with offences committed by Government Departments
- Section 55 asserts that all local authorities shall render help & assistance and furnish information to the board as required for discharge of functions, and shall make available to the board, for inspection and examination, such records, maps, plans and other documents as may be necessary.

1.6.4 AIR (PREVENTION AND CONTROL OF POLLUTION) ACT, 1981

Like Water Act, the Air Act provides regulatory authority from the State Pollution Control Boards and empowers them to enforce air quality standards for the prevention of air pollution in the country. Section 21 of the act requires an application to be made to the state board to establish or operate any industrial operation.

1.6.5 FOREST (CONSERVATION) ACT, 1980 AS AMENDED IN 1988, 2003

As per Section 26 of Indian Forest Act, 1927 several activities are prohibited in forest areas and prior approval is required from the Central government to use forest land for non-forest purposes. The Forest (Conservation) Act, 1980 prohibits large-scale diversion of forest land for non-forest use. As amended in 1988, no State Government or authority shall make such diversions except with the prior approval of the Central Government.

1.6.6 WILDLIFE PROTECTION ACT, 1972

This act is promulgated to provide for the protection of wild animals, birds and plants and matters connected there with. The provisions under this act are covered below:

- Section 9 of the Act mentions that no person shall hunt any wild animal.
- The act prohibits picking, uprooting, damaging, destroying, acquiring any specified plant from any forest land
- It bans the use of injurious substances, chemicals, explosives that may cause injury or endanger wildlife in a sanctuary
- No alteration of the boundaries of a National Park shall be made except on a resolution passed by the Legislature of State

- Destruction or damage of wildlife property in a National Park is prohibited

1.6.7 MANUFACTURE STORAGE AND IMPORT OF HAZARDOUS CHEMICAL RULES, 1989, 2016

These rules aim at controlling the generation, storage and import of hazardous chemicals. According to these rules, the user of hazardous chemicals has to perform the following and dispose hazardous waste as mentioned in the rules:

- Identify the potential hazards of the chemicals and take adequate steps to prevent and control such hazards
- Develop or provide information about the chemical in the form of safety data sheets
- Label the specified information on the container of the hazardous chemical

1.6.8 THE MOTOR VEHICLES ACT, 1988

In 1988, the Indian Motor Vehicles Act empowered the State Transport Authority (usually the Road Transport Office) to enforce standards for vehicular pollution prevention and control. The authority also checks the emission standards of registered vehicles, collects road taxes and issues licenses. In August 1997, the Pollution under Control certificate (PUC) program was launched as an attempt to crack down on the vehicular emissions in the States. Since this act is applicable for all states, this will be applicable for this project.

1.6.9 ANCIENT MONUMENTS AND ARCHAEOLOGICAL SITES AND REMAIN ACT, 1958

An Act formulated for the preservation of ancient and historical monuments and archaeological sites and remains of national importance, for the regulation of archaeological excavations and for the protection of sculptures, carvings and other like objects.

1.6.10 ANCIENT MONUMENTS AND ARCHAEOLOGICAL SITES AND REMAIN (AMENDMENT AND VALIDATION) ACT, 2010

This act clearly demarcates the buffer area surrounding the protected monument into prohibited area (100m) and regulated area (200m). Thus, the construction related activities shall be prohibited within the buffer area.

1.6.11 THE RIGHT TO FAIR COMPENSATION AND TRANSPARENCY IN LAND ACQUISITION, REHABILITATION AND RESETTLEMENT ACT, 2013

In India, an ew bill, Land Acquisition and Rehabilitation and Resettlement Bill has been passed by the Parliament in 2013 to repeal the Land Acquisition Act of 1894. This is the first National/Central Law about Rehabilitation & Resettlement of families affected and displaced because of land acquisition. Only R&R provisions will apply when private companies purchase land for a project, and the same exceeds the area thresholds set by the State Governments for such purchase.

As per this Act, compensation will be given within a period of three months from the date of the award. Where an award has been made but the affected individuals have not accepted compensation or have not yet given up possession, and the proceedings have been pending for 5years or more, provisions of the new law will apply. This Act stipulates mandatory consent of at least 70% of affected people for acquiring land for Public Private Partnership (PPP) projects and 80% for acquiring land for private companies. Under the new legislation, compensation for the owners of the acquired land will be four times the market value in rural areas and twice in urban areas. It also stipulates that the land cannot be vacated until the entire compensation is awarded to the affected parties.

1.6.12 OTHER LEGISLATION APPLICABLE TO ROAD CONSTRUCTION PROJECTS

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

- **Workmen's Compensation Act 1923** (the Act provides for compensation in case of injury by accident arising out of and during the course of employment);
- **Payment of Gratuity Act, 1972** (gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed 5years);
- **Employees PF and Miscellaneous Provision Act 1952** (the Act provides for monthly contributions by the employer plus workers);
- **Maternity Benefit Act, 1951** (the Act provides for leave and some other benefits to women employees in case of confinement or miscarriage, etc.);
- **Contact Labor (Regulation and Abolition) Act, 1970** (the Act provides for certain welfare measures to be provided by the contractor to contract labour);

- **Minimum Wages Act, 1948** (the employer is supposed to pay not less than the Minimum Wages fixed by appropriate Government as per provisions of the act);
- **Payment of Wages Act 1936** (it lays down as to by what date the wages are to be paid, when it will be paid and what deductions can be made from the wages of the workers);
- **Equal Remuneration Act, 1979** (the Act provides for payment of equal wages for work of equal nature to Male and Female workers and not for making discrimination against Female employees);
- **Payment of Bonus Act, 1965:** The Act provides for payments of annual bonus subject to a minimum of 83.3% of wages and maximum of 20% of wages);
- **Industrial Disputes Act, 1947:** The Act lays down the machinery and procedure for resolution of industrial disputes, in what situations a strike or lock-out becomes illegal and what are the requirements for laying off or retrenching the employees or closing down the establishment);
- **Industrial Employment (Standing Orders) Act; 1946** (the Act provides for laying down rules governing the conditions of employment);
- **Trade Unions Act, 1926** (the Act lays down the procedure for registration of trade unions of workers and employers. The trade unions registered under the Act have been given certain immunities from civil and criminal liabilities);
- **Child and Adolescent Labour (Prohibition and Regulation) Act, 1986** (the Act prohibits employment of children below 14-18 years of age in certain occupations and processes and provides for regulation of employment of children in all other occupations and processes. Employment of child labour is prohibited in Building and Construction Industry);
- **Inter-State Migrant Workmen's (Regulation of Employment and Conditions of Service) Act, 1979** (the inter-state migrant workers, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, travelling expenses from home to the establishment and back, etc.);
- **The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 and the Cess Act of 1996** (all the establishments who carry on any building or other construction work and employs 10 or more workers are covered under this Act; the employer of the establishment is required to provide safety measures at the building or construction work and other welfare measures, such as canteens, first-aid facilities, ambulance, housing accommodation for Workers near the workplace, etc.);

- **The Factories Act, 1948** (the Act lays down the procedure for approval of plans before setting up a factory, health and safety provisions, welfare provisions, working hours and rendering information- regarding accidents or dangerous occurrences to designated authorities);

1.6.13 MORTH & IRC SPECIFICATIONS

Specifications for Road and Bridge Works, Fourth Revision, MORTH, Published by IRC, 2001

All road works in India are to be in accordance with the MoRTH specifications for road and bridge works and guidelines of Indian Roads Congress (IRC). The MoRTH specifications have special provisions towards protection of environment under Clause 501 and the contractor is to satisfy the provisions. Apart from the clause 501, there are provisions for control of erosion, drainage, dust suppression, borrow area and haul road management under relevant sections. Provisions of clause 501 cover the environmental aspects as given in **Table: 1-3**.

Table 1-3: Environmental aspects as per clause 501 of IRC, 2001

General	The contractor shall take all necessary measures and precautions to carry out the work in conformity with the statutory and regulatory environmental requirements The contractor shall take all measures and precautions to avoid nuisance or disturbance from the work. It shall be precautionary measures than abatement measures taken after generation of nuisance In the event of any spoil, debris, waste or any deleterious material from site being deposited on adjacent land, the same shall be removed and affected area shall be restored to its original state.
Water	The contractor shall prevent any interference with supply/ abstraction of water resources. Water used for dust suppression shall be reused after settlement of material in collected water Liquid waste products to be disposed of such that it does not cause pollution No debris is to be deposited or disposed into/ adjacent to water courses

Air	The contractor to devise and arrange methods to control dust, gaseous or other air borne emissions in such a way that adverse impacts on air quality is minimized Dust shall be minimized from stored material and stockpiles by spraying water Covering of material likely to rise dust during transport is to be covered with tarpaulin Spraying of water on haul roads if found necessary
Noise	The contractor shall use all necessary measures to reduce noise from construction equipment and maintain all silencing equipment in good condition
Control of wastes	No uncontrolled disposal of wastes shall be permitted. The contractor shall make specific provisions for disposal of all forms of fuel and engine oil, all types of bitumen, cement, surplus aggregate, gravels, bituminous mixtures etc. conforming to local regulations and acceptance of the engineer
Emergency Response	The contractor shall plan and provide for remedial measures in case of occurrence of emergencies as spillages of oil, bitumen or chemicals

In addition to the above conditions, avoidance measures and control of activities having potential for generation of environmental impacts are devised. These include:

Section 111	Precautions for safeguarding the environment
Clause 201.2	Preservation of Property/Amenities during clearing and grubbing
Clause 301.3.2	Stripping and storing of topsoil for reuse during excavation for roadway and drains
Clause 302.4	Restriction on timings for blasting operations
Clause 304.3.6	Public safety near towns and villages where excavation is carried out
Clause 305.2.2.2	Locations of borrowing and relevant regulations
Clause 305.3.3	Stripping and storing of topsoil at borrow locations
Section 306	Soil erosion and sedimentation control
Clause 407.4.2	Provisions for turfing on median and islands
Section 517	Recycling of bituminous pavement and excavated material
Clause 701.2.1	Use of geotextiles for control of soil erosion

Section 810	Use of Metal beam crash barriers for safety, relevant regulations and specifications
Clause 1010	Quality of water for curing and construction
Clause 2501	Precaution during river training works

Guidelines for Environmental Impact Assessment, IRC: 104-1988, IRC SP108:2015

The guidelines endorse application of Environmental Protection Act, 1986 for highway projects. It recommends that the methods of measuring air pollution should be in conformance with IS: 5182-1977 and in case of noise pollution: IS: 3028-1980, Measurement of noise emitted by moving road vehicles; IS: 4758-1968, Method of measurement of noise emitted by machines; IS: 10399-1982, Method of measurement of noise emitted by stationary road vehicles are to be followed. As regards Highway aesthetics, use of provisions made in IRC: SP: 21-1979, Manual on landscaping of roads are to be followed.

Guidelines for Environmental Impact Assessment, IRC: 104-198891.

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Table 1-3: COMPLIANCE OF TOR DATED 29.04.2022

S.NO.	CONDITIONS	REPLY	REFERENCE
i.	NHAI will design the alignment as per the suggestions of the concerned Forest Department of Govt. of Jharkhand with necessary structural provisions for safe passage of wildlife and re-alignment for saving of forest patch.	Proposed alignment does not fall in the state of Jharkhand. However NHAI has designed the alignment as per suggestion of concerned forest department of respective state.	
ii.	Cumulative impact assessment study should be carried out along the entire stretch including the other packages and the current stretch under consideration.	Cumulative Impact Assessment study will be submitted at the time of Final EIA Submission	
iii.	The proponent shall carry out a detailed traffic flow study to assess inflow of traffic from adjoining areas like airport/urban cities. The detailed traffic planning studies shall include complete design, drawings and traffic circulation plans (taking into consideration integration with proposed alignment and other state roads etc.) Whatever required adequate connectivity in terms of VUP (vehicle underpass)/ PUP (Pedestrian underpass) needs to be	Detailed traffic study and adequate connectivity in terms of LVUP (vehicle underpass) PUP (Pedestrian underpass) is given in Chapter 2 of the EIA report. Accordingly, there are 17 no.s of Major Bridges, 191 no.s of Minor Bridges and 11 nos. MNB at Interchange, 11 no.s of VUP, 11 no.s of VOP, 71 no.s of LVUP, 51no.s of SVUP, 16 no.s of Wildlife Underpasses, 04 no.s of ROB, 2 no.s of Structure over Gas Pipe	Please refer Chapter-2 Refer Annexure-II for Detailed traffic analysis report.

	included.	Line, 16 nos. (Flyover) at MCW and 2nos. flyovers at Interchange location, 8 nos. Elevated/Viaducts , 469 no. of Box Culverts at MCW and 13 no. at Interchange and 6 no.s of Elephant Corridors are provided along the project alignment.	
iv.	Road safety audit (along with accident/black spots analysis) by any third-party competent organization at all stages namely at detailed design stage, construction Stage and pre-opening stage to ensure that the project road has been constructed considering all the elements of road safety.	Road Safety Audit is given in Chapter 7 of the DEIA report	Refer Annexure III
v.	Provide compilation of road kill data on the wildlife on the existing roads (national and state highways) in the vicinity of the proposed project. Provide measures to avoid road kills of wildlife by the way of road kill management plan.	Road Safety Audit is given in Chapter 7 of the DEIA report	Refer Annexure III
vi.	The alignment of road should be such that the cutting of trees is kept at bare minimum and for this the proponent shall obtain permission from the competent authorities. Alignment also should be such that it will avoid cutting old and large	Approx. 108 ha of protected/reserve forest land including (Road crossing and canal crossing) needs to be diverted for construction of proposed highway. There is approximately 32000 no. of trees along the project alignment.	Please refer chapter 4.

	and heritage trees if any. All such trees should be geo-tagged, photographed and details be submitted in the EIA —EMP report.	(12000 no. of trees on non-forest land and approx. 20000 of trees on protected forest). Joint tree enumeration with forest department is under progress. The Details of tree inventory is enclosed in chapter 4 of the DEIA report with brief of Girth size. The tree felling will be restricted within construction zone and will be saved as best as possible.	
vii.	The proponent shall carry out a comprehensive socio-economic assessment and also impact on biodiversity with emphasis on impact of on-going land acquisition on the local people living around the proposed alignment. The Social Impact Assessment should have social indicators which can reflect on impact of acquisition on fertile land. The Social Impact Assessment shall take into consideration of key parameters like people's dependency on fertile agricultural land, socio-economic spectrum, impact of the project at local and regional levels.	The detailed socio-economic carried out for this project with keeping in mind of the social indicators. Hence, SIA studies carried out as per key parameters and have been discussed in Chapter 4 and its impact has been studied and given Chapter 5 of the DEIA report.	Please refer Chapter 4, chapter 5, EB study has been carried out in provide in Chapter 4.

viii.	The proponent shall carry out a comprehensive socio-economic assessment and also impact on biodiversity with emphasis on impact of on-going land acquisition on the local people living around the proposed alignment. The Social Impact Assessment should have social indicators which can reflect on impact of acquisition on fertile land. The Social Impact Assessment shall take into consideration of key parameters like people's dependency on fertile agricultural land, socio-economic spectrum, impact of the project at local and regional levels.	The detailed socio-economic carried out for this project with keeping in mind of the social indicators. Hence, SIA studies carried out as per key parameters and have been discussed in Chapter 4 and its impact has been studied and given Chapter 5 of the DEIA report.	Please refer Chapter 4, chapter 5, EB study has been carried out in provide in Chapter 4.
GREEN BELT/TREE CUTTING			
ix.	A comprehensive plan for plantation of three rows of native species, as per IRC guidelines, shall be provided in consultation with state forest department including the costs involved. Such plantation alongside of forest stretch will be over and above the compensatory afforestation. Tree species should be same as per the forest type.	Approximately 1,37,005 numbers of trees and shrubs will be planted along the roadside and in median portion respectively. The plantation shall be carried out as per IRC: SP: 21-2009 guidelines and Green Highway Policy- 2015. Adequate space has been left on both sides of the road for greenbelt development apart from the plantation at median.	Refer Chapter 9.
COMPLIANCE OF CIRCULARS/OMs			

x.	As per the Ministry's Office Memorandum F. No. 22-65/2017-IA.III dated 30 th September, 2020, the project proponent, based on the commitments made during the public hearing, shall include all the activities required to be taken to fulfil these commitments in the Environment Management Plan along with cost estimates of these activities in addition to the activities proposed as per recommendations of EIA Studies and the same shall be submitted to the ministry as part of the EIA Report. The EMP shall be implemented at the project cost or any other funding source available with the project proponent.	All commitments made during Public Hearing will be included in design & civil cost in Final EIA report. Environment Management plan with cost estimates are given in Chapter 9.	Refer Chapter 9
xi.	In pursuance of Ministry's OM is required to state in an additional annexure in the EIA report stating that all the commitments made by the PP to the public during public hearing and the same be submitted to the Ministry and the EAC.	Will be complied in Final EIA report.	
xii.	The Action Plan on the compliance of the recommendations of the CAG as per Ministry's Circular No. J-11013/71/2016-IA. 1(M), dated 25 th October, 2017 needs to be submitted	All the recommendations made in circular via Circular No. J-11013/71/2016-IA.I (M), dated 25 th October, 2017 is complied in the EIA report.	

	at the time of appraisal of the project and included in the EIA/EMP Report.		
	GENERAL CONDITIONS		
(i)	A Brief description of the project, project name, nature, size, its importance to the region/state and the country shall be submitted.	The highway starts at Kamalpur village to Uluberia, Howrah from 387.200 (near Kamalpur village, Jharkhand/WB Border) to Km 622.000 NH-16, near Uluberia, Howrah District, in the state of West Bengal under Bharatmala Pariyojana Phase-II (lot-9 package-3). The length of the proposed alignment is 234.800 km approx. Project Highway Alignment (Greenfield) of 234.800 km and proposed RoW is 90 m in non-forest Area and 60 m in Forest areas as per the requirement keeping in view the fully access controlled Highway with 4/6-lane dual carriage way configuration. This is a green field alignment, and is proposed for 4/6 Lane. The road passes through the important talukas like Jhalda-II, Jaipur, Purulia-I, Purulia-II, Hura, Pancha in District of Purulia ,	Please refer Chapter 2.

		talukas like Indpur, Taldangra, and Simalpal in District of Bankura, talukas like Garbeta-I, Chandrakona-II, Chandrakona-I, Ghatal in District of Pashchim Mednipur, talukas like Khanakul-I, Khanakul-II, in District of Hoogli, talukas like Amta-II, Amta-II in District of Howrah in the District of Kolkata in the state of West Bengal.	
(ii)	Details of any litigation(s) pending against the project and/or any directions or orders passed by any court of law/any statutory authority against the project to be detailed out.	No litigation(s) and/or any directions or orders passed by any court of law/any statutory authority against the project.	
(iii)	Bridge design in eco sensitive area /mountains be examined keeping in view the rock classification hydrology etc.	Noted	
(iv)	Examine the road design standards, safety equipment specifications and Management System training to ensure that design details take account of safety concerns and submit the traffic management plan.	Details regarding road design standards and traffic management plan is given in Chapter 2 of the draft EIA report.	Traffic safety details are given in Annexure IV.
	FOREST/GREEN BELT		
(v)	In case the project involves diversion of forests land,	Accordingly, the proposal involves a diversion of 108 ha reserve/protected	

	guidelines under OM dated 20.03.2013 shall be followed and necessary action be taken accordingly.	forest land. The proposal has been prepared with consultation of forest department and has been submitted to them	
(vi)	The information shall be provided about the details of the trees to be cut including their species and whether it also involves any protected or endangered species. Measures taken to reduce the number of the trees to be removed should be explained in detail. The details of compensatory plantation shall be submitted. The possibilities of relocating the existing trees shall be explored.	There is approximately 32000 no. of trees (12000 no. of trees on non-forest land and approx. 20000 no. of trees on protected/reserve forest). Trees shall be cut with the approval of competent authority. No protected or endangered species are noted. The proposed alignment finalizations are geometry design endeavoured to conserve the maximum amount of trees especially those that are falling outside the construction zone. The possibilities of relocating of existing trees shall be finalized in consultation with DFO. 2 nos. of trees shall be planted for every tree to be cut. Compensatory afforestation would be carried out as per the state Forest Guidelines.	Please refer chapter 4.
(vii)	Necessary green belt shall be provided on both sides of the highway with proper central verge and cost provision should be made for regular maintenance.	Approximately 1,37,005 numbers of trees and shrubs will be planted along the roadside and in median portion respectively. The plantation shall be carried out as per IRC: SP: 21-2009 guidelines and	Please refer Chapter 9.

		Green Highway Policy-2015. Adequate space has been left on both sides of the road for greenbelt development apart from the plantation at median.	
(viii)	Land use map of the study area to a scale of 1: 25,000 based on recent satellite imagery delineating the crop lands (both single and double crop), agricultural plantations, fallow lands, waste lands, water bodies, built-up areas, forest area and other surface features such a railway tracks, ports, airports, roads, and major industries etc. along with detailed ground survey map on 1:2000 scale showing the existing features falling within the right of way namely trees, structures including Archaeological & religious, monuments etc. if any, shall be submitted.	Detail land use study with Land use map has been given in chapter 4 of EIA report.	Please refer chapter 4

(ix)	If the proposed route involves tunneling, the details of the tunnel and locations of tunneling with geological structural fraction should be provided. In case the road passes through a flood plain of a river, the details of micro-drainage, flood passages and information on flood periodicity at least of the last 50 years in the area shall be examined and submitted.	No tunneling is involved in the project. The proposed project doesn't pass through the flood plain of any river. Bridges are proposed at all river crossings. Hence, no such study is required. Also the rivers being crossed by the road are not flood prone.	
	PROJECT ALIGNMENT PASSING THROUGH ESA/ESZ etc.		
(x)	If the project is passing through/ located within the notified ecologically sensitive zone (ESZ) around a notified National Park/Wildlife Sanctuary or in the absence of notified ESZ, within 10 km from the boundary of notified National Park/Wildlife Sanctuary, the project proponent may simultaneously apply for the clearance for the standing committee of NBWL. The EC for such project would be subject to obtaining the clearance from the standing committee of NBWL.	Neither any wildlife sanctuary nor its ESZ boundary falls within 10 km of the proposed alignment.	Please refer Chapter 4. Refer Annexure V for 10 km buffer map clearly showing distance of nearest wild life sanctuary.
	FLORA/FAUNA		
(xi)	Study regarding the animal	11 no.s of VUP, 11 no.s of VOP, 71	Please refer

	bypasses/underpasses etc. across the habitation areas shall be carried out. Adequate cattle passes for the movement of agriculture material shall be provided at the stretches passing through habitation areas. Underpasses shall be provided for the movement of Wild animals.	no.s of LVUP, 51no.s of SVUP,16 no.s of Wildlife Underpasses, 04 no.s of ROB, , 469 no. of Box Culverts at MCW and 13 no. at Interchange and 6 no.s of Elephant Corridors are proposed in the habitation areas.	chapter 2.
(xii)	Study regarding in line with the recent guidelines prepared by Wildlife Institute of India for linear infrastructure with strong emphasis on animal movement and identifying crossing areas and mitigation measures to avoid wildlife mortality.	The proposed project does not passes through any national park/wildlife sanctuary conservation reserve	
(xiii)	If there is a possibility that the construction/widening of road may cause an impact such as destruction of forest, poaching or reduction in wetland areas, examine the impact and submit details.	Approx. 108 ha of protected/reserve forest land including (Road crossing and canal crossing) needs to be diverted for construction of proposed highway. Compensatory afforestation is planned to neutralize the effects of tree felling. There is no reduction in wetland area involved in the project. Suitable number of bridges and cross drainage structures shall be provided to avoid the impact on water bodies. Details of bridges and structures are provided in chapter 2 of EIA report.	Please refer Chapter 5.

	ALIGNMENT		
(xiv)	Detailed alignment plan, with details such as nature of terrain (plain, rolling, hilly), land use pattern, habitation, cropping pattern, forest area, environmentally sensitive areas, mangroves, notified industrial areas, sand dunes, sea, rivers, lakes, details of villages, tehsils, districts and states, latitude and longitude for important locations falling on the alignment by employing remote sensing techniques followed by "ground truthing" and also through secondary data sources shall be submitted.	The project site is characterized by mostly plain terrain. The land-use pattern of the project is mostly agricultural with patches of protected forest and some settlements. Detailed regarding land use and environmental sensitive area has been in Chapter 4.	
(xv)	Describe various alternatives considered, procedures and criteria adopted for selection of the final alternative with reasons.	3 different alternatives have been considered for the project. Proposed alignment has been found most suitable option in terms of Technical suitability, Socio-Economic and Environment impact associated. The detailed analysis of Alternatives has been provided in Chapter 3 of this report.	Refer Chapter 3.

(xvi)	If the proposed route is passing through a city or town, with houses and human habitation on either side of the road, the necessity for provision of By passes/ diversions/ under passes shall be examined and submitted. The proposal should also indicate the location of wayside amenities, which should include petrol stations/service centres, rest areas including public conveyance, etc.	This is a Greenfield highway project. The Road is not passing through any major urban settlement. Traffic crossover facilities in the form of interchanges, under passes are provide to facilitate the traffic cross over in the entire project length. Details are provided in chapter 2 of the EIA report. There is also provision of toll plaza, Bus/truck bays. Details have been given in chapter 2 of EIA report.	Please refer chapter 2 and Annexure IV for way side amenities details.
(xvii)	Details about measures taken for the pedestrian safety and construction of underpasses and foot-over bridges along with flyovers and interchanges shall be submitted.	Various safety measures are taken for pedestrian safety. Provision of traffic signals at intersections, direction boards and reflectors etc.	Please refer chapter 2. Please refer chapter 7.
(xviii)	The possibility that the proposed project will adversely affect road traffic in the surrounding areas (e.g. by causing increases in traffic congestion and traffic accidents) shall be addressed.	The proposed project is Greenfield in nature and shall reduce the traffic congestion on existing alternate roads.	Please refer Chapter 8.
(xix)	If the proposed route is passing through any hilly area, the measures for ensuring stability of slopes and proposed measures to control soil erosion from embankment shall be examined and submitted.	The project route doesn't pass through any low lying area.	Please Refer Annexure- VI (Drainage Map).

(xx)	In case of river/creek crossing, details of the proposed bridges connecting on either banks, the design and traffic circulation at this junction with simulation studies.	There are 17 major bridges in the proposed alignment. A detail has been given in chapter 2 of EIA report.	Please refer Chapter 2. Please refer Annexure-VII.
(xxi)	If there will be any change in the drainage pattern after the proposed activity, details of changes shall be examined and submitted.	There is no change in drainage pattern due to the project. Sufficient nos. of culverts are provided to maintain the natural drainage pattern of the area.	
(xxii)	In case of bye passes, the details of access control from the nearby Habitation/habitation which may come up after the establishment of road.	Proposed project is Greenfield in nature.	
(xxiii)	Details to ensure free flow of water in case the alignment passes through water bodies/river/streams etc.	Bridge / culvert (as the case may be) are proposed on water bodies. Hence, free flow of the water bodies shall not be affected.	Please refer Chapter 2.
RECYCLE/REUSE OF MATERIAL			
(i)	The details of use of fly ash in the road construction, if the project road is located within the 100 km from the Thermal Power Plant shall be examined and submitted.	The proposed project stretch is about 50 Km from Raghunath Super Thermal Power Station. In compliance to Fly Ash Notifications S.O. 763(E) dated 14 Sept 1999, its amendment notification on S.O 979(E) dated 27 Aug 2003, notification S.O 2804(E) dated 3 Nov 2009 and amendment notification dated 25th January,	Please refer chapter 5.

		2016 by MoEF&CC, Fly ash shall be utilized in proposed road.	
(ii)	The possibilities of utilizing debris/waste materials available in and around the project area shall be explored.	We have examined and we did found no such waste in the Area. IRC and MoRTH guidelines will be followed.	Please refer chapter 1.
(iii)	The details on compliance with respect to Research Track Notification of Ministry of Road, Transport and Highways shall be submitted.	IRC and MoRTH guidelines will be followed.	
(iv)	The details of sand quarry and borrow area as per OM No.2-30/2012-IA-III dated 18.12.2012 on 'Rationalization of procedure for Environmental Clearance for Highway Projects involving borrow areas for soil and earth" as modified vide OM of even No. dated 19th March 2013, shall be examined and submitted.	Twenty Borrow area locations have been identified along the project roads which are within 5 km periphery of project site. Two sand quarry and two aggregate quarry has been identified for the proposed project.	Please refer chapter 5. Quarry and Borrow area details are given in Annexure VIII.
DATA COLLECTION			
(v)	Climate and meteorology (max and min temperature, relative humidity, rainfall, frequency of tropical cyclones and snow fall); the nearest	The nearest IMD station from the project stretch is Purulia. Information for Climate and meteorology of Purulia	Please refer Chapter 4.

	IMD meteorological station from which climatological data have been obtained to be indicated.	observatory is provided in Chapter 4 of this report.	
(vi)	The water bodies including the seasonal ones within the corridor of impacts along with their status, volumetric capacity, quality and likely impacts on them due to the project along with the mitigation measures shall be examined and submitted.	The air quality monitoring has been carried out as per the new notification issued on 16 th November, 2009 and is given in Chapter 4 of this report. Air quality modelling is provided in Chapter 5 of EIA report.	Please refer chapter 4 section 4.4.1 page no.4-37 to 4-49. Please refer chapter 5 section 5.2.2 page no. 5-11 to 5-21.
(vii)	The details of water quantity required and source of water including water requirement during the construction stage with supporting data and also classification of ground water based on the CGWA classification, shall be examined and submitted.	The total water demand of the project is 7500 KLD, The requirement would be sourced through Surface water for construction purpose: Construction purpose Domestic consumption and utilities requirement. (135 KLD). Gardening/ green belt development. (417KLD). Dust Suppression(3 KLD)	
(viii)	Accident data and geographic distribution shall be reviewed and analyzed to predict and identify trends - in case of expansion of the existing highway and provide Post accident emergency assistance and medical care to accident victims.	It is a new project. Hence, not required.	

	POLLUTION CONTROL		
(i)	The air quality monitoring shall be carried out as per the notification issued on 16 th November, 2009. Input data used for Noise and Air quality modelling shall be clearly delineated.	The air quality monitoring has been carried out as per the new notification issued on 16 th November, 2009 and is given in Chapter 4 of this report. Air quality modelling is provided in Chapter 5 of EIA report.	Please refer chapter 4 section 4.4.1 page no.4-37 to 4-49. Please refer chapter 5 section 5.2.2 page no. 5-11 to 5-21.
(ii)	The project activities during construction and operation phases, which will affect the noise levels and the potential for increased noise resulting from this project, shall be identified. Discuss the effect of noise levels on nearby habitations during the construction and operational phases of the proposed highway. Identify noise Reduction measures and traffic management strategies to be deployed for reducing the negative impact if any. Prediction of noise levels shall be done by using Mathematical modelling at different representative locations.	Construction phase Operation of DG sets dozers, trucks and batching plants. Operation phase Plying of vehicles The mitigation measures for reducing the effects of the above are provided in Chapter 5 of this report.	Please refer chapter 5 section 5.3 page no. 5-21 to 5-31.
(iii)	The impact during construction activities due to generation of fugitive dust from crusher units, air	The impacts of the construction activities due to generation of fugitive dust are provided in	Please refer Chapter 5 section 5.2.2 page no. 5-11

	emissions from hot mix plants and vehicles used for transportation of materials and prediction of impact on ambient air quality using appropriate mathematical model, description of model, input requirement and reference of derivation, distribution of major pollutants and presentation in tabular form for easy interpretation shall be examined and carried out.	Chapter 5 of this report. Mathematical modelling of ambient air along with incremental load is provided in Chapter 5 of this report.	to 5-21.
(iv)	The details about the protection to existing habitations from dust, noise, odour etc. during construction stage shall be examined and submitted.	Measures for Dust and Noise controls are discussed in respective section of Chapter 5. IRC guidelines shall be followed for traffic safety while passing through the habitat.	Please refer Chapter 5 section 5.3 page no. 5-21 to 5-31.
(v)	If the proposed route involves cutting of earth, the details of area to be cut, depth of cut, locations, soil type, volume and quantity of earth and other materials to be Removed with location of disposal/ dump sites along with necessary permission.	Total 29 locations of borrow area for the proposed Highway have been identified that are within 5 km periphery of project site. The excavation from these areas would be carried out after having agreement with the owner. The rehabilitation of borrow are would be carried out after construction as per IRC and MoRT&H guidelines.	Please refer Chapter 5.
(vi)	If the proposed route is passing through low lying areas, details of	The project route doesn't pass through any low lying area.	Please Refer Annexure- VI

	filling materials and initial and final levels after filling above MSL shall be examined and submitted.		(Drainage Map).
	SAFETY		
(vii)	The details of measures taken during constructions of bridges across rivers/ canals/major or minor drains keeping in view the flooding of the rivers and the life span of the existing bridges shall be examined and submitted. Provision of speed breakers, safety signals, service lanes and foot paths shall be examined at appropriate locations throughout the proposed road to avoid accidents.	Since it is a Greenfield project, there are no existing bridges. In this project, 17 no.s of Major Bridges, 191 no.s of Minor Bridges and 11 nos. MNB at Interchange, 11 no.s of VUP, 11 no.s of VOP, 71 no.s of LVUP, 51no.s of SVUP, 16 no.s of Wildlife Underpasses, 04 no.s of ROB, 2 no.s of Structure over Gas Pipe Line, 16 nos. (Flyover) at MCW and 2nos. flyovers at Interchange location, 8 nos. Elevated/Viaducts , 469 no. of Box Culverts at MCW and 13 no. at Interchange and 6 no.s of Elephant Corridors . The life spans of the structures are considered as per the relevant IRC standards. The approach roads for all the bridges are with adequate width to avoid sharp turns.	Please refer Annexure IV. Details regarding provision of speed breakers, safety signals, service lanes and foot paths.
(viii)	The details of road safety, signage, service roads, vehicular under passes, accident prone zones and the mitigation measures, shall be submitted.	The location of underpasses and other facilities details are provided in the Chapter 2 of this report. Its impacts and mitigation measures are discussed in Chapter 4 of the	Please refer Chapter 2.

		report.	
(ix)	IRC guidelines shall be followed for widening & upgradation of roads.	The entire road design has been carried out based on IRC/MORTH guidelines.	
(x)	Details of blasting if any, methodology/technique adopted, applicable regulations/permissions, timing of blasting, mitigation measures proposed keeping in view mating season of wildlife.	No blasting is required in this project.	
	OTHER DETAILS		
(xi)	Rain water harvesting pit shall be at least 3 - 5 m above the highest ground water table. Provisions shall be made for oil and grease removal from surface runoff.	Rain water harvesting pits has been kept more than 5 mtrs above the highest ground water table. In addition, the oil interceptors will considered in design to avoid water contamination.	Please refer Chapter 5.
(xii)	The details of social impact assessment due to the proposed construction of the road shall be submitted.	Outcome of Social Impact Assessment is discussed in Chapter 4 of the EIA report.	Please refer Chapter 4.
(xiii)	If the proposed project involves any land reclamation, details shall be provided of the activity for which land is to be reclaimed and the area of land to be reclaimed.	Not required	
(xiv)	Details of the properties, houses, business activities etc likely to be effected by land acquisition and an	A total of 535 structures are likely to be affected by the construction of the project.	

	estimation of their financial losses, shall be submitted.		
(xv)	Detailed R&R plan with data on the existing socio-economic status of the population in the study area and broad plan for resettlement of the displaced population, site for the resettlement colony, alternative livelihood concerns/employment and rehabilitation of the displaced people, civil and housing amenities being offered, etc and the schedule of the implementation of the specific project, shall be submitted.	The R & R Plan has been prepared based on right to fare compensation and transparency in Land Acquisition, rehabilitation and resettlement act 2013.	
(xvi)	The environment management and monitoring plan for construction and operation phases of the project shall be submitted. A copy of your corporate policy on environment management and sustainable development shall also be submitted.	Details of environmental management and monitoring plan are discussed in Chapter 9 of this EIA report.	Please refer Chapter 9.
(xvii)	Estimated cost of the project including that of environment management plan (both capital and recurring) and source of funding. Also, the mode of execution of the Project, viz, EPC, BOT, etc, shall be submitted.	An amount of INR 60.08 Cr has been earmarked for implementation of EMP.	Please Refer Chapter 9.
(xviii)	Details of litigation pending against the project, if any, with direction/order	No litigation pending against the project	

	passed by any Court of Law against the Project should be given.		
(xix)	The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.	Total Project cost is 9250 cr Details of environmental management and monitoring plan are discussed in chapter 9.	Please refer Chapter 9.
(xx)	Any further clarification on carrying out the above studies including anticipated impacts due to the project and mitigative measure, project proponent can refer to the model ToR available on Ministry website " http://moefinic.in/Manual/Highways ".	Noted	

CHAPTER 2 – PROJECT DESCRIPTION

2.1 IMPORTANCE OF PROJECT ROAD

The proposed access-controlled project with new alignment has been envisaged through an area which shall have the advantage of simultaneous development as well as shall result in a shorter distance to travel. The junctions with existing road will be planned in the form of interchanges and flyover to ensure uninterrupted flow of traffic.

The proposed road would act as the prime artery for the economic flow to this region. It will enhance economic development, provide employment opportunities to locals, strengthen tourist development, ensure road safety, and provide better transportation facilities and other facilities such as way side amenities. Vehicle operating cost will also be reduced due to improved road quality. The compensatory plantation and road side plantation shall further improve the air quality of the region.

2.1.1 EXISTING CARRIAGE WAY AND PAVEMENT DETAIL

This is a completely new proposed Green Field Alignment where there is no existing road. This road is proposed to connect from Kamalpur village, Purulia District to Uluberia, Howrah District which will be a part of Bharatmala Pariyojana to improve the efficiency of the Freight movement in India. The whole section is proposed to be of Flexible Pavement type confirming to IRC: 37:2018. Rigid pavement shall be constructed in the section(s) for Toll Plaza only. The configuration of the carriageway shall confirm to IRC: SP: 84:2014 and the Structures shall be constructed as 4/6 lane configurations.

The highway starts at Kamalpur village to Uluberia, Howrah from 387.200 (near Kamalpur village, Jharkhand/WB Border) to Km 622.500 NH-16, near Uluberia, Howrah District, in the state of West Bengal under Bharatmala Pariyojana Phase-II (lot-9 package-3). The length of the proposed alignment is 235.300 km approx.

Project Highway Alignment (Greenfield) of 235.300 km and proposed RoW is 70 m in non-forest Area and 60 m in Forest areas as per the requirement keeping in view the fully access controlled Highway with 4/6-lane dual carriage way configuration. This is a green field alignment, and is proposed for 4/6 Lane.

The road passes through the important talukas like Jhalda-II, Jaipur, Purulia-I, Purulia-II, Hura, Pancha in District of Purulia, talukas like Indpur, Taldangra, and Simlpal in District of Bankura, talukas like Garbeta-I, Chandrakona-II, Chandrakona-I, Ghatal in District of Pashchim Medinipur,

talukas like Khanakul-I, Khanakul-II, in District of Hoogli, talukas like Amta-II, Amta-II in District of Howrah in the District of Kolkata in the state of West Bengal.



Figure 2-1: Shows the start point & end point of the project road

2.2 LOCATION & PROJECT DETAIL

2.2.1 LOCATION OF PROJECT ROAD

The road passes through the important talukas like Indpur, Taldangra, and Simalpal in District of Bankura, talukas like Garbeta-I, Chandrakona-II, Chandrakona-I, Ghatal in District of Pashchim Mednipur, talukas like Khanakul-I, Khanakul-II, in District of Hoogli and talukas like Amta-II, Amta-II in District of Howrah in the state of West Bengal.

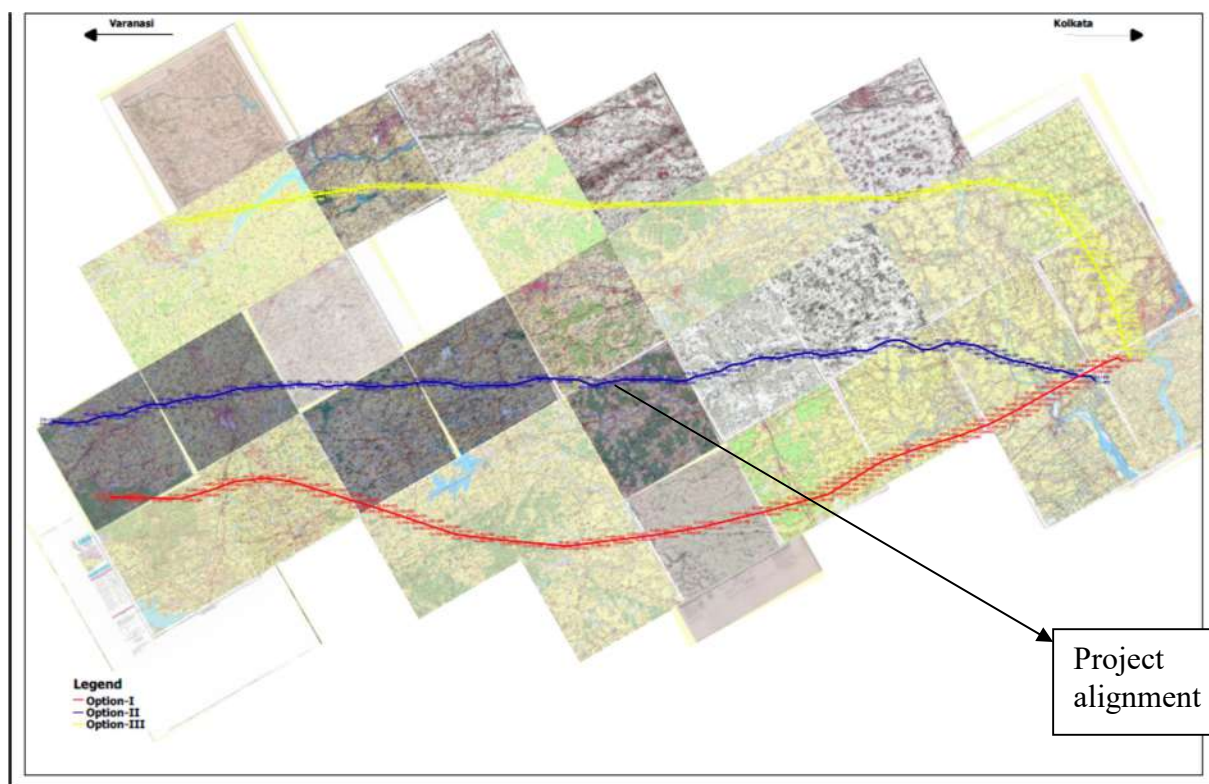


Figure 2-2: Shows the location of the project road marked on Topo sheet

2.2.2 THE PROJECT AREA

The project area is mainly passing through the village settlement, forest area and urban patches on a plain terrain.

2.2.3 LAND AND SETTLEMENTS ALONG PROJECT ROAD

The existing land use around the proposed project primarily comprises of agricultural land both under private and government ownership, land for cattle grazing, forest. The project alignment passes through approx. 315 no. of villages, through important talukas like Jhalda-II, Jaipur, Purulia-I, Purulia-II, Hura, Pancha in District of Purulia, talukas like Indpur, Taldangra, and Simlupal in District of Bankura, talukas like Garbeta-I, Chandrakona-II, Chandrakona-I, Ghatal in District of Pashchim Medinipur, talukas like Khanakul-I, Khanakul-II, in District of Hoogli, talukas like Amta-II, Amta-II in District of Howrah in the District of Kolkata in the state of West Bengal.

Table 2-1: Land Use

S.No.	Land use/Land cover	Area (ha)	Percentage %	Remarks if any
1.	Private land	1294.6	62.39	Agriculture/Barren Land
2.	Government land	673.4	32.41	Agriculture/Barren Land
3.	Forest land	108	5.20	Forest Land
	Total	2078	100	-

2.2.4 LIST OF TOWNS AND VILLAGES ALONG PROJECT ROAD

There are total about 315 major villages/towns along the proposed highway.

Sl. No.	District	Tehsil	Village
1)	Purulia	Jhalda-II	Guridih, Chitmu, Sajumahatu, Korche, Sulunglahar, Barametyala, Damrughutu, Damra, Tatuara, Amra
		Jaipur	Parga, Nutandi, Dhabani, Hatimuri, Howangda, Hargara, Silphor, Joypur, Balibhasa, Durma, Chaitandih, Kusumtikri, Ramamoti, Agharpur, Gunja, Phuljhorla, Bargram
		Purulia-I	Golbera, Rudra, Shyamadasdi Alias Shyampur, Gandhudi, Kanali, Khojda, Kalidasdi, Bhuinadi, Gangudi, Shibdi, Hoolka, Kultanr Alias Nadiyara, Nadiara, Ghongha, Mahalitora
		Purulia-II	Chargali, Sihuli, Manipur, Dumdumi, Podlara, Bongabari, Hatuara, Jhupra, Dhurahi, Singhbazar, Gengra, Karcha, Latuliya, Sandradi, Bhangra, Sidpur, Kathaldiha, Chanchra, Haramjanga, Chirumacha, Chhota Chanchra, Karcha
		Hura	Jojodi, Arjunjora, Sijumakhana, Panchudi, Kulabahal, Hullang, Chargali, Nadiha, Dumkadi, Hatikundar, Keshargar, Amlatora, Chhatumadar,

			Kajali, Bariarpur, Baragram, Sarchakalda, Chyakhgopalpur, Rangametya
		Puncha	Napara, Bankanali, Kundhurka, Damodarpur, Shyampur, Kanra, Niasa, Kanchannagar, Bhatadi, Bagda, Bhagaband, Kendbani, Laharia, Poradi, Simakanali, Debgram, Haridi, Chakia
2)	Bankura	Indpur	Kharakanali, Kadamdewli, Nischintapur, Jiarda, Chalkaltasahar, PanchpuKhuriya, Tunamara, Bankata, Botkula, Ramchandrapur, Erodihi, Mauladanga, Jugda, Goyladanga, Gobindapur, Upar Kechanda, Salkap, Harishchandrapur, Upargerakula, Nayada, Jugibaid, Chhatapur, Nishchintapur, Binodpur, Kurusthlaiya
		Taldangra	Paryardanga, Raghunathpur, Surbhagabandh, Chak Nutangram, Payna Damodarpur, Kadamara, Taltala, Mahada, Dhengashimul, Narottampur, Nachna, Bhutama Maheshpur, Bheduya, Haruliya, Harakona, Khatbanda, Banshkopa, Kanaipur, Radhanagar, Panchmura, Deulbhira, Lalabandh, Bhetuyadanga, Jambediya, Kaniyari, Murakati
		Simalpal	Karakanali, Balrampur, Mataskhal, Pachpathar, Shyampur, Siuli, Balarampur, Barakhulia, Keotdhara
3)	Pashchim Mednipur	Garbeta - I	Bhandirban, Kukrajhuri, Khoyarbani, Benachapra, Chatakonda, Tilbhandar, Aushabandi, Bara Nohari, Royda, Kasua, Raghunathpur, Meghula, Ramchak, Saldangra, Agra, Golahat, Barabhandarkhada, Moledanga, Baratalbeta, Hingisol, Patpur, Tasargeria, Bajrakha Bankati, Kankrasole, Garanga, Kashidanga, Dakshin

			Konda, Sapdaha, Darji, Bandarboni, Manglapota, Dhanyachhora, Madnahari, Kumardubi, Pathartoria, Baharabani, Khyarpara, Gamarkushi, Kadambandi, Birjapur, Chandabila, Ghoramara, Muraboni, Anandnagar
		Chandrakona-II	Khandanga, Maheshpur, Kunarpur, Murakata, Deulbere, Ishanagar, Nischintapur, Kshirati, Bhairabpur, Ghoskira, Shirsa, Kalla, Khursi, Dhaikhanda, Langalbhangra, Shimla
		Chandrakona - I	Paramanandapur, Kochgeriya Rmchak, Ghola, Dogaria Ramchak, Rejna, Jara, Narayanpur, Tegerya Dharampur, Arjungerya, Belgerya, Goyalsini, Madhabpur, Amdhere, Goyaldanga, Hajra, Kankabati, Shyamkhuri, Purshuri, Betagram, Beurgram, Agar, Kasanda, Amdhare
		Ghatal	Kamdebpur, Gobindapur, Jadupur, Krishnabati, Kharar (Municipality), Gopinathpur, Shyamsundarpur, Ajodhyakundra, Brindabanchak, Lalkundu, Mansukha, Daulatchak, Shrirampur, Chauli Singpur, Gangaprasad
4)	Hoogli	Khanakul-I	Paschim Thakurani Chak, Purbba Thakurani Chak
		Khanakul-II	Kaknan, Ramchandrapur, Radhakrishnapur, Dhannyaghari, Ghoradaha, Bar Nandanpur, Nandanpur, Banhijli, Hanuya, Jagatpur, Chandkunda, Dhaldanga, Marokhana
5)	Howrah	Amta-II	Uttar Bhatora, Sholbaga, Kashmuli, Nignan, Kharigeria, Fatikberia, Hiop, Dakshin Khalna

		Amta-II	Karia, Kulepairi, Purba Bainan, Paschim Bainan, Bangalpur, Joka, Olanpara, Khadinan, Chandrapur

Table 2-2: Important Villages/Towns along Project Highway

Sl. No.	Existing Location		Name of Village/ Town
	From (km)	To (km)	
1	375+600	384+300	Jhalda-II
2	384+300	395+200	Jaipur
3	395+200	500+000	Purulia-I
4	500+000	510+200	Purulia-II
5	510+200	525+200	Hura
6	525+200	532+100	Puncha
7	532+100	545+100	Indpur
8	540+100	555+320	Taldangra
9	555+320	565+120	Simalpal
10	565+120	575+100	Garbeta - I
11	575+100	585+200	Chandrakona-II
12	585+200	597+100	Chandrakona - I
13	597+100	612+000	Ghatal, Khanakul-I, Khanakul-II, Amta-II, Amta-II

2.2.5 TERRAIN

Terrain is classified by the general slope of the country across the highway alignment as per IRC: 73-1980 and with this criteria the entire length of the project terrain across the Purulia, Bankura, Pashchim Mednipur, Hoogli, Howrah district in the state of West Bengal is basically plain in nature.

2.2.6 ROAD SECTION AND PAVEMENT

The carriageway of the Project Highway is generally of 4/6-lane configuration.

2.2.7 ALIGNMENT

The present road alignment is linear throughout except at few locations, where alignment needs geometric improvements. The carriageway of the Project Highway is generally of 4/6-lane.

2.2.8 RIGHT -OF-WAY

Project Highway Alignment (Greenfield) of 235.300 km and proposed RoW is 70 m in non-forest Area and 60 m in Forest areas as per the requirement keeping in view the fully access controlled Highway with 4/6-lane dual carriage way configuration.

2.3 STRUCTURES DETAILS

The proposed alignment from near Kamalpur village, Jharkhand/WB Border to near Uluberia, Howrah District, West Bengal mainly traverses through Plain terrain. As this is a completely new proposed Green Field Alignment, it passes through few rivers and canals. Various structures have been proposed according to the settlements, hydrology data, and convenience of traffic movements. Total there are 17 no.s of Major Bridges, 191 no.s of Minor Bridges and 11 nos. MNB at Interchange, 11 no.s of VUP, 11 no.s of VOP, 71 no.s of LVUP, 51 no.s of SVUP, 16 nos. of Wildlife Underpasses, 04 no.s of ROB, 2 no.s of Structure over Gas Pipe Line, 16 nos. (Flyover) at MCW and 2 nos. flyovers at Interchange location, 8 nos. Elevated/Viaducts , 469 no. of Box Culverts at MCW and 13 no. at Interchange) and 6 no.s of Elephant Corridors.

2.3.1 MAJOR & MINOR BRIDGES:

Table 2-3: MAJOR BRIDGE (OVER RIVERS/ STREAMS/ NALLAS)

Sl. No.	Design Chainage (Km)	Name (River/Streams/Nallah)	Span Arrangement t c/c Expansion joint in Square direction (Nos. x Span length)	Structure Type	Deck Configuration (m)	Width of Open Median (m)
1	538+640	SHILABATI RIVER	8x30	PSC I GIRDER	2X16	3
2	559+010	SHILABATI RIVER	3x27	PSC I GIRDER	2X16	3
3	561+289	KETHA RIVER	3x32	PSC I GIRDER	2X16	3

Table 2-4: MAJOR BRIDGE (OVER POND)

Sl. No.	Design Chainage (Km)	Span Arrangement c/c Expansion joint in Square direction (Nos. x Span length)	Structure Type	Deck Configuration (m)	Width of Open Median (m)
1	493+870	4x30	PSC I GIRDER	2x16	3
2	554+346	3x35	PSC I GIRDER	2x16	3
3	605+830	4x30	PSC I GIRDER	2x16	3

Table 2-5: MAJOR BRIDGE (OVER IRRIGATION CANAL)

Sl. No.	Design Chainage (Km)	Name of Canal	Span Arrangement c/c Expansion joint in Square direction (Nos. x Span length)	Structure Type	Deck Configuration (m)	Width of Open Median (m)
1	593+800	Aroa Khal	2x35	PSC I GIRDER	2x16	3

Table 2-6: MAJOR BRIDGE CUM UNDERPASS (OVER RIVERS/ STREAMS/ NALLAS)

Sl. No.	Design Chainage (Km)	Span Arrangement c/c Expansion joint in Square direction (m)	Type of Structure	Deck Configuration (m)	Width of Open Median (m)
1	514+940	4x30x4	PSC I GIRDER	2x16	3
2	584+770	6x30x4	PSC I GIRDER	2x16	3
3	588+800	10x60x4	SEGMENTAL BOX GIRDER	2x16	3
4	589+300	2x33x4	PSC I GIRDER	2x16	3
5	617+400	(3x30+14x60+3x30)x4	SEGMENTAL BOX	2x16	3

			GIRDER		
6	621+150	(7x60+2x30)x4	SEGMENTAL BOX GIRDER	2x16	3

Table 2-7: MAJOR BRIDGE CUM UNDERPASS (OVER POND)

Sl. No.	Design Chainage (Km)	Span Arrangement c/c Expansion joint in Square direction (m)	Type of Structure	Deck Configuration (m)	Width of Open Median (m)
1	517+289	3x30x4	PSC I GIRDER	2x16	3

Table 2-8: MAJOR BRIDGE CUM WILDLIFE UNDERPASS

Sl. No.	Design Chainage	Span Arrangement c/c Expansion joint in Square direction	Structure Type	Deck Configuration (m)	Width of Open Median (m)	Minimum vertical clearance (m)
1	500+620	2x50	STEEL PLATE GIRDER	2x16	3	7
2	507+605	3x50	STEEL PLATE GIRDER	2x16	3	7
3	522+120	6x30	PSC I GIRDER	2x16	3	7

Table 2-9: MINOR BRIDGE (OVER RIVERS, STREAMS, NALLAHS)

Sl. No.	Design Chainage (Km)	Span Arrangement c/c Expansion joint/clear opening in Square direction (Nos. x Span length) (m)	Type of Structure	Deck Configuration (m)	Width of Open Median (m)	Remarks
1	389+040	1x10	RCC BOX	2x16	3	-
2	389+550	1x10	RCC BOX	2x16	3	-
3	390+700	1x25	PSC I GIRDER	2x16	3	-
4	395+020	1x25	PSC I GIRDER	2x16	3	-
5	396+583	2x22.5	PSC I GIRDER	2x16	3	-

Sl. No.	Design Chainage (Km)	Span Arrangement c/c Expansion joint/clear opening in Square direction (Nos. x Span length) (m)	Type of Structure	Deck Configuration (m)	Width of Open Median (m)	Remarks
6	397+853	1x25	PSC I GIRDER	2x16	3	-
7	398+250	1x8	RCC BOX	2x16	3	-
8	398+800	1x10	RCC BOX	2x16	3	-
9	400+330	1x25	PSC I GIRDER	2x16	3	-
10	401+300	1x20	RCC I GIRDER	2x16	3	-
11	401+900	1x10	RCC BOX	2x16	3	-
12	402+600	1x20	RCC I GIRDER	2x16	3	-
13	403+650	2x7.5	RCC BOX	2x16+1x12	3	-
14	404+800	2x7.5	RCC BOX	1x16+1x19	3	-
15	406+500	1x10	RCC BOX	2x16	3	-
16	408+400	2x7.5	RCC BOX	2x16	3	-
17	408+900	1x10	RCC BOX	2x16	3	-
18	409+600	1x10	RCC BOX	2x16	3	-
19	409+850	1x10	RCC BOX	2x16	3	-
20	410+500	1x10	RCC BOX	2x16	3	-
21	412+300	1x20	RCC I GIRDER	2x16	3	-
22	413+340	2x7.5	RCC BOX	2x16	3	-
23	414+420	2x7.5	RCC BOX	2x16	3	-
24	415+500	1x10	RCC BOX	2x16	3	-
25	416+070	1x10	RCC BOX	2x16	3	-
26	418+100	1x10	RCC BOX	2x16	3	-
27	421+710	1x25	PSC I GIRDER	2x16	3	-
28	422+540	2x7.5	RCC BOX	2x16	3	-
29	423+405	2x10	RCC BOX	2x16	3	-
30	424+950	2x7.5	RCC BOX	2x16	3	-
31	427+070	1x10	RCC BOX	2x16	3	
32	429+330	2x10	RCC BOX	2x16	3	-
33	430+150	2x5	RCC BOX	2x16	3	-
34	431+000	2x7.5	RCC BOX	2x16	3	-
35	432+850	2x7.5	RCC BOX	2x16	3	-
36	436+200	2x7.5	RCC BOX	2x16	3	-
37	436+500	1x8	RCC BOX	2x16	3	-

Sl. No.	Design Chainage (Km)	Span Arrangement c/c Expansion joint/clear opening in Square direction (Nos. x Span length) (m)	Type of Structure	Deck Configuration (m)	Width of Open Median (m)	Remarks
38	436+940	1x8	RCC BOX	2x16	3	-
39	440+490	2x25	PSC I GIRDER	2x16	3	-
40	440+820	1x10	RCC BOX	2x16	3	-
41	443+100	2x7.5	RCC BOX	2x16	3	-
42	443+245	2x25	PSC I GIRDER	2x16	3	-
43	444+360	2x25	PSC I GIRDER	2x16	3	-
44	446+070	1x20	PSC I GIRDER	2x16	3	-
45	447+567	1x30	PSC I GIRDER	2x16	3	-
46	449+870	2x5	RCC BOX	2x16	3	-
47	450+438	1x25	PSC I GIRDER	2x16	3	-
48	452+600	1x8	RCC BOX	2x16	3	-
49	454+030	2x5	RCC BOX	2x23	3	-
50	456+500	1x10	RCC BOX	2x16	3	-
51	458+160	1x10	RCC BOX	2x16	3	-
52	458+850	1x8	RCC BOX	2x16	3	-
53	459+520	2x7.5	RCC BOX	2x16	3	-
54	461+845	1x30	PSC I GIRDER	2x16	3	-
55	462+460	1x8	RCC BOX	2x16	3	-
56	463+500	2x7.5	RCC BOX	2x16	3	-
57	464+840	2x7.5	RCC BOX	2x16	3	-
58	465+420	1x10	RCC BOX	2x16	3	-
59	466+860	1x10	RCC BOX	2x16	3	-
60	467+950	1x8	RCC BOX	2x16	3	-
61	469+380	2x7.5	RCC BOX	2x16	3	-
62	470+720	1x10	RCC BOX	2x16	3	-
63	470+960	1x10	RCC BOX	2x16	3	-
64	473+780	2x10	RCC BOX	2x16	3	-
65	475+300	1x8	RCC BOX	2x16	3	-
66	477+050	2x7.5	RCC BOX	2x16	3	-
67	478+140	1x10	RCC BOX	2x16	3	-
68	480+160	1x30	PSC I GIRDER	2x16	3	-

Sl. No.	Design Chainage (Km)	Span Arrangement c/c Expansion joint/clear opening in Square direction (Nos. x Span length) (m)	Type of Structure	Deck Configuration (m)	Width of Open Median (m)	Remarks
69	481+380	1x10	RCC BOX	2x16	3	-
70	485+242	2x7.5	RCC BOX	2x16	3	-
71	488+200	3x10	RCC BOX	2x16	3	-
72	491+326	1x20	RCC GIRDER	2x16	3	-
73	491+800	1x8	RCC BOX	2x16	3	-
74	495+950	2x5	RCC BOX	2x16	3	-
75	498+300	2x7.5	RCC BOX	2x16	3	-
76	498+760	1x8	RCC BOX	2x16	3	-
77	500+156	2x5	RCC BOX	2x16	3	-
78	502+515	2x6	RCC BOX	2x16	3	-
79	508+900	2x5	RCC BOX	2x16+2x14	3	-
80	509+220	2x5	RCC BOX	2x16+2x9	3	-
81	509+390	1x8	RCC BOX	2x16	3	-
82	511+970	1x12	RCC BOX	2x16	3	-
83	513+165	1x10	RCC BOX	2x16	3	-
84	515+120	1x8	RCC BOX	2x16	3	-
85	516+710	2x7.5	RCC BOX	2x16	3	-
86	518+865	2x10	RCC BOX	2x16	3	-
87	521+390	1x10	RCC BOX	2x16	3	-
88	529+750	1x30	PSC I GIRDER	2x16	3	-
89	530+450	2x5	RCC BOX	2x16	3	-
90	530+570	1x10	RCC BOX	2x16	3	-
91	531+720	2x6	RCC BOX	2x16	3	-
92	531+910	2x6	RCC BOX	2x16	3	-
93	534+145	1x25	PSC I GIRDER	2x16	3	-
94	540+145	1x8	RCC BOX	2x16	3	-
95	542+989	1x10	RCC BOX	2x16	3	-
96	543+658	1x10	RCC BOX	2x16	3	-
97	544+200	1x8	RCC BOX	2x16	3	-
98	546+546	1x8	RCC BOX	2x16	3	-
99	548+490	1x8	RCC BOX	2x16	3	-
100	554+229	1x10	RCC BOX	2x16	3	-

Sl. No.	Design Chainage (Km)	Span Arrangement c/c Expansion joint/clear opening in Square direction (Nos. x Span length) (m)	Type of Structure	Deck Configuration (m)	Width of Open Median (m)	Remarks
101	557+460	1x8	RCC BOX	2x16	3	-
102	562+388	2x20	RCC GIRDER	2x16	3	-
103	567+320	2x25	PSC I GIRDER	2x16	3	-
104	573+490	1x15	RCC BOX	2x16	3	-
105	580+570	1x25	PSC I GIRDER	2x16	3	-
106	581+820	1x8	RCC BOX	2x16	3	-
107	591+088	1x8	RCC BOX	2x16	3	-
108	591+345	1x8	RCC BOX	2x16	3	-
109	592+823	1x15	RCC BOX	2x16	3	-
110	594+090	2x25	PSC I GIRDER	2x16	3	-
111	594+840	1x12	RCC BOX	2x16	3	-
112	594+930	1x15	RCC BOX	2x16	3	-
113	599+740	1x8	RCC BOX	2x16	3	-
114	600+720	1x8	RCC BOX	2x16	3	-
115	606+752	1x8	RCC BOX	2x16	3	-
116	607+028	1x8	RCC BOX	2x16	3	-
117	607+655	1x15	RCC BOX	2x16	3	-
118	608+822	1x8	RCC BOX	2x16	3	-
119	609+260	1x8	RCC BOX	2x16	3	-
120	612+310	1x8	RCC BOX	2x16	3	-
121	613+700	1x12	RCC BOX	2x16	3	-
122	614+452	1x8	RCC BOX	2x16	3	-
123	616+050	1x8	RCC BOX	2x16	3	-
124	616+770	1x8	RCC BOX	2x16	3	-
125	618+720	1x10	RCC BOX	2x16	3	-
126	620+416	1x8	RCC BOX	2x16	3	-
127	622+218	1x8	RCC Box	2x16	3	-

Table 2-10: MINOR BRIDGE (OVER POND)

Sl. No.	Design Chainage (Km)	Span Arrangement c/c Expansion joint/clear opening in Square direction (Nos. x Span length) (m)	Type of Structure	Deck Configuration (m)	Width of Open Median (m)	Remarks
1	508+630	1x8	RCC BOX	2x16+2x11	3	-
2	516+989	2x7.5	RCC BOX	2x16	3	-

Table 2-11: MINOR BRIDGE (OVER IRRIGATION CANAL)

Sl. No.	Design Chainage (Km)	Name of Canal	Span Arrangement c/c Expansion joint/clear opening in Square direction (Nos. x Span length) (m)	Type of Structure	Deck Configuration (m)	Width of Open Median (m)	Remarks
1	438+765	RBMC	1x10	RCC BOX	2x16	3	-
2	498+898	Dy6/SBc	1x8	RCC BOX	2x16	3	-
3	520+170	MRE/Dy15/BBC	2x6	RCC BOX	2x16	3	-
4	572+723	Dy27/28	1x8	RCC BOX	2x16	3	-

Table 2-12: MINOR BRIDGE CUM UNDERPASS (OVER IRRIGATION CANALS)

	Design Chainage (Km)	Name of Canal	Span Arrangement c/c Expansion joint/clear opening in Square direction (Nos. x Span length) (m)	Type of Structure	Deck Configuration (m)	Width of Open Median (m)	Minimum vertical clearance (m)
1.	483+300	Indpur Main Canal	12+25+12	RCC+PSC I GIRDER	2x16	3	4

	Design Chainage (Km)	Name of Canal	Span Arrangement c/c Expansion joint/clear opening in Square direction (Nos. x Span length) (m)	Type of Structure	Deck Configuration (m)	Width of Open Median (m)	Minimum vertical clearance (m)
2.	487+585	Dy6/IMC	1x15	RCC BOX	1x17.5+1x19.5	3	4
3.	488+796	Canal	1x15x4	RCC BOX	2x16	3	4
4.	490+135	Dy/IMC	1x12x4	RCC GIRDER	2x16	3	4
5.	493+520	Dy2/SBC	1x15x4	RCC BOX	2x16	3	4
6.	494+502	MRA/DY2/SBC	1x15x4	RCC BOX	2x16	3	4
7.	495+542	WC1/SBC	1x(30+15)x4	PSC+ RCC I GIRDER	2x16	3	4
8.	497+090	SBC	1x15x4	RCC BOX	2x16	3	4
9.	499+682	MRA/Dy8/SBC	1x15x4	RCC BOX	2x16	3	4
10.	501+180	Dy/9/SBC	1x15x4	RCC GIRDER	2x16	3	4
11.	503+092	MRA/Dy9/SBC	1x10x4	RCC GIRDER	2x16	3	4
12.	503+735	MRB/Dy/11/SBC	2x20 (LHS) 2x15 (RHS)	RCC GIRDER	2x16	3	4
13.	505+704	DY11/SBC	1x15x4	RCC GIRDER	2x16	3	4
14.	506+462	Dy14/SBC	1x15x4	RCC GIRDER	2x16	3	4
15.	510+295	Dy17/SBC	1x15x4	RCC BOX	2x16	3	4
16.	547+563	Canal	1x25x4	PSC I GIRDER	2x16	3	4
17.	563+152	dy22	1x20x4	RCC GIRDER	2x16	3	4
18.	566+270	Dy25	1x25	PSC I	2x16	3	4

	Design Chainage (Km)	Name of Canal	Span Arrangement c/c Expansion joint/clear opening in Square direction (Nos. x Span length) (m)	Type of Structure	Deck Configuration (m)	Width of Open Median (m)	Minimum vertical clearance (m)
				GIRDER			
19.	567+220	Canal	1x15	RCC BOX	2x16	3	4
20.	568+260	Dy27	1x30	PSC I GIRDER	2x16	3	4
21.	568+995	Dy27	1x10	RCC BOX	2x16	3	4
22.	574+880	Dy27/32	1x10	RCC BOX	2x16	3	4
23.	575+135	Dy27/32	1x20	RCC GIRDER	2x16	3	4

Table 2-13: MINOR BRIDGE CUM UNDERPASS (OVER ROADS & NALLAS)

S.no	Design Chainage (Km)	Span Arrangement c/c Expansion joint/clear opening in Square direction (Nos. x Span length) (m)	Type of Structure	Deck Configuration (m)	Width of Open Median (m)	Minimum vertical clearance (m)
1.	410+600	1x25	PSC I GIRDER	2x16	3	4
2.	492+450	1x15x4	RCC GIRDER	2x16	3	4
3.	507+142	1x25x4	PSC I GIRDER	2x16	3	4
4.	510+240	1x15x4	RCC BOX	2x16	3	4
5.	510+815	1x20x4	PSC I GIRDER	2x16	3	4
6.	512+820	1x30x4	PSC I GIRDER	2x16	3	4

S.no	Design Chainage (Km)	Span Arrangement c/c Expansion joint/clear opening in Square direction (Nos. x Span length) (m)	Type of Structure	Deck Configuration (m)	Width of Open Median (m)	Minimum vertical clearance (m)
7.	525+200	1x25x4	PSC I GIRDER	2x16	3	4
8.	525+815	1x15x4	RCC BOX	2x16	3	4
9.	526+550	1x15x4	RCC BOX	2x16	3	4
10.	527+145	1x15x4	RCC GIRDER	2x16	3	4
11.	534+000	1x12x4	RCC GIRDER	2x16	3	4
12.	535+173	1x10x4	RCC BOX	2x16	3	4
13.	553+808	1x15	RCC BOX	2x16	3	4
14.	555+589	1x20x4	RCC GIRDER	2x16	3	4
15.	560+300	1x25x4	PSC I GIRDER	2x16	3	4
16.	582+390	1x20	RCC GIRDER	2x16	3	4
17.	585+615	1x10	RCC BOX	2x16	3	4
18.	587+480	1x12	RCC BOX	2x16	3	4
19.	587+720	1x15	RCC BOX	2x16	3	4
20.	590+295	1x25	PSC I GIRDER	2x16	3	4
21.	591+840	3x10	RCC BOX	2x16	3	4
22.	594+320	1x15	RCC BOX	2x16	3	4
23.	595+435	1x8	RCC BOX	1x11.5+2x16+1x11.5	3	4
24.	596+370	1x7	RCC BOX	1x11.5+2x16+1x11.5	3	4
25.	596+500	1x30	PSC I	2x16	3	4

S.no	Design Chainage (Km)	Span Arrangement c/c Expansion joint/clear opening in Square direction (Nos. x Span length) (m)	Type of Structure	Deck Configuration (m)	Width of Open Median (m)	Minimum vertical clearance (m)
			GIRDER			
26.	596+700	1x7	RCC BOX	2x16	3	4
27.	596+980	1x15	RCC BOX	2x16	3	4
28.	605+440	1x12	RCC BOX	2x16	3	4
29.	607+350	1x30+1x20	PSC I GIRDER	2x16	3	4
30.	608+200	1x15	RCC BOX	2x16	3	4
31.	610+980	1x20	RCC GIRDER	2x16	3	4
32.	612+746	1x40	PSC I GIRDER	2x16	3	4
33.	619+686	1x15	RCC BOX	2x16	3	4
34.	619+730	1x30	PSC I GIRDER	2x16	3	4

Table 2-14: MINOR BRIDGE CUM WILDLIFE UNDERPASS

Sl. No.	Design Chainage (Km)	Span Arrangement c/c Expansion joint/clear opening in Square direction (Nos. x Span length) (m)	Type of Structure	Deck Configuration (m)	Width of Open Median (m)	Minimum vertical clearance (m)
1	523+260	2x30	PSC I GIRDER	2x16	3	7

2.3.2 VEHICULAR UNDERPASSES (VUP)

There are 11 no. of Vehicular under Pass proposed in this stretch to allow the users to connect across the road. The details of the VUP's are summarized below:

Table 2-15: Details of VUP

S. No.	Design Chainage (km)	Type of Crossing	Type of Structure	Clear Span/Opening in square direction (m)	Deck Configuration (m)	Width of Open Median (m)
1	418+732	Nadiyara-Dumdumi-Gurguria-Chharra Rd (MDR)	RCC GIRDER	1x20	2x16	3
2	449+200	Hijuli Main Rd (MDR)	RCC GIRDER	1x20	2x16	3
3	465+550	Patkua-Poradih Rd (MDR)	RCC GIRDER	1x20	2x16	3
4	468+170	Salanpur-Simakanali Rd (MDR)	RCC GIRDER	1x20	2x16	3
5	476+890	Boro Jorda-Dakshin Kamalpur Rd (MDR)	RCC GIRDER	1x20	2x16	3
6	498+014	Harmasra-Painada Modarpur Rd (MDR)	RCC GIRDER	1x20	2x16	3
7	547+084	Dhanyachhara-Purshasha Rd (MDR)	RCC GIRDER	1x20	2x16	3
8	550+604	Dhanyachhara-Purshasha Rd (MDR)	RCC GIRDER	1x20	2x16	3
9	562+190	Palaschabri-Srinagar Rd (MDR)	RCC GIRDER	1x20	2x16	3
10	570+140	Hematpur-Tatatpur Rd (MDR)	RCC GIRDER	1x20	2x16	3
11	615+845	Bainan Rd (ODR)	RCC GIRDER	1x20	2x16	3

2.3.2 VEHICULAR OVERPASSES (VOP)

There are 4 no. of Vehicular over Pass proposed in this stretch to allow the users to connect across the road. The details of the VOP's are summarized below:

Table 2-16: DETAILS OF VEHICULAR OVERPASS

S. No.	Design Chainage (Km)	Name of Cross Road	Type of structure	Clear Span Arrangement in Square direction (m)	Deck Configuration
1	387+786	Guridi-Chitmu Rd	PSC I GIRDER	2x35	1x12
2	393+080	Damrughutu-Damra Rd	PSC I GIRDER	2x35	1x12
3	417+410	NH-218	PSC I-GIRDER	2x35	1x12
4	444+895	Dumkadi-Keshargarh Road	PSC I-GIRDER	2x35	1x12

2.3.2 LIGHT VEHICULAR UNDERPASSES (LVUP)

There are 71 no. of Light Vehicular under Pass proposed in this stretch to allow the users to connect across the road. The details of the LVUP's are summarized below:

Table 2-17: Details of LVUP

S. No.	Design Chainage (km)	Type of Structure	Clear Opening in square direction (m)	Deck Configuration (m)	Width of Open Median (m)
1	389+965	RCC BOX	1x12	2x16	3
2	394+310	RCC BOX	1x12	2x16	3
3	397+120	RCC BOX	1x12	2x16	3
4	398+118	RCC BOX	1x12	2x16	3
5	399+560	RCC BOX	1x12	2x16	3
6	403+950	RCC BOX	1x12	2x16+1x12	3
7	407+785	RCC BOX	1x12	2x16	3
8	409+249	RCC BOX	1x12	2x16	3
9	411+000	RCC BOX	1x12	2x16	3
10	411+518	RCC BOX	1x12	2x16	3
11	413+885	RCC BOX	1x12	2x16	3
12	420+300	RCC BOX	1x12	2x16	3
13	422+727	RCC BOX	1x12	2x16	3
14	424+746	RCC GIRDER	1x12	2x16	3
15	425+620	RCC GIRDER	1x12	2x16	3
16	431+830	RCC BOX	1x12	2x16	3

S. No.	Design Chainage (km)	Type of Structure	Clear Opening in square	Deck Configuration (m)	Width of Open Median (m)
17	433+390	RCC BOX	1x12	2x16	3
18	434+270	RCC BOX	1x12	2x16	3
19	436+730	RCC BOX	1x12	2x16	3
20	439+457	RCC GIRDER	1x12	2x16	3
21	441+955	RCC BOX	1x12	2x16	3
22	452+130	RCC GIRDER	1x12	2x16	3
23	453+650	RCC GIRDER	1x12	2x16	3
24	455+822	RCC BOX	1x12	2x16	3
25	458+400	RCC BOX	1x12	2x16	3
26	460+720	RCC BOX	1x12	2x16	3
27	461+926	RCC BOX	1x12	2x16	3
28	469+528	RCC BOX	1x12	2x16	3
29	471+678	RCC BOX	1x12	2x16	3
30	472+236	RCC BOX	1x12	2x16	3
31	475+980	RCC GIRDER	1x12	2x16	3
32	489+706	RCC GIRDER	1x12	2x16	3
33	495+103	RCC BOX	1x12	2x16	3
34	496+640	RCC Girder	1x12	2x16	3
35	499+545	RCC Girder	1x12	2x16	3
36	502+128	RCC Girder	1x12	2x16	3
37	503+028	RCC GIRDER	1x12	2x16	3
38	506+124	RCC GIRDER	1x12	2x16	3
39	516+530	RCC BOX	1x12	2x16	3
40	519+060	RCC GIRDER	1x12	2x16	3
41	520+407	RCC GIRDER	1x12	2x16	3
42	530+833	RCC BOX	1x12	2x16	3
43	534+435	RCC BOX	1x12	2x16	3
44	536+990	RCC GIRDER	1x12	2x16	3
45	539+080	RCC BOX	1x12	2x16	3
46	541+455	RCC GIRDER	1x12	2x16	3
47	542+589	RCC BOX	1x12	2x16	3
48	544+040	RCC BOX	1x12	2x16	3
49	544+283	RCC GIRDER	1x12	2x16	3
50	545+065	RCC GIRDER	1x12	2x16	3
51	546+220	RCC BOX	1x12	2x16	3
52	552+618	RCC BOX	1x12	2x16	3
53	556+940	RCC BOX	1x12	2x16	3

S. No.	Design Chainage (km)	Type of Structure	Clear Opening in square	Deck Configuration (m)	Width of Open Median (m)
54	557+754	RCC BOX	1x12	2x16	3
55	572+515	RCC BOX	1x12	2x16	3
56	577+305	RCC BOX	1x12	2x16	3
57	578+160	RCC BOX	1x12	1x11.5+2x16+1x11.5	3
58	579+625	RCC BOX	1x12	2x16	3
59	586+630	RCC BOX	1x12	2x16	3
60	587+210	RCC BOX	1x12	2x16	3
61	592+070	RCC BOX	1x12	2x16	3
62	600+215	RCC BOX	1x12	2x16	3
63	601+230	RCC BOX	1x12	2x16	3
64	606+065	RCC BOX	1x12	2x16	3
65	611+142	RCC BOX	1x12	2x16	3
66	611+435	RCC BOX	1x12	2x16	3
67	614+584	RCC BOX	1x12	2x16	3
68	615+054	RCC BOX	1x12	2x16	3
69	616+420	RCC BOX	1x12	2x16	3
70	618+395	RCC BOX	1x12	2x16	3
71	618+775	RCC BOX	1x12	2x16	3

2.3.3 SMALL VEHICULAR UNDER PASSES

There are 51 numbers of SVUP proposed across the Village/ODR roads to facilitate the movement of the users. The details of the SVUP are summarized below:

Table 2-18: Details of SVUP

S. No.	Design Chainage (km)	Type of Structure	Clear Opening in square direction (m)	Deck Configuration (m)	Width of Open Median (m)
1	395+457	RCC BOX	1x7	2x16	3
2	400+980	RCC BOX	1x7	2x16	3
3	403+025	RCC BOX	1x7	2x16	3
4	412+540	RCC BOX	1x7	2x16	3
5	415+775	RCC BOX	1x7	2x16	3
6	416+645	RCC BOX	1x7	2x16	3
7	418+000	RCC BOX	1x7	2x16	3
8	420+860	RCC BOX	1x7	2x16	3

S. No.	Design Chainage (km)	Type of Structure	Clear Opening in square direction (m)	Deck Configuration (m)	Width of Open Median (m)
9	422+215	RCC BOX	1x7	2x16	3
10	428+010	RCC BOX	1x7	2x16	3
11	434+865	RCC BOX	1x7	2x16	3
12	438+065	RCC BOX	1x7	1x16 + 1x19.5	3
13	441+162	RCC BOX	1x7	2x16	3
14	447+240	RCC BOX	1x7	2x16	3
15	452+945	RCC BOX	1x7	2x16	3
16	456+284	RCC BOX	1x7	2x16	3
17	462+693	RCC BOX	1x7	2x16	3
18	467+310	RCC BOX	1x7	2x16	3
19	470+337	RCC BOX	1x7	2x16	3
20	475+445	RCC BOX	1x7	2x16	3
21	477+573	RCC BOX	1x7	2x16	3
22	479+196	RCC BOX	1x7	2x16	3
23	482+110	RCC BOX	1x7	2x16	3
24	482+950	RCC BOX	1x7	2x16	3
25	485+380	RCC BOX	1x7	2x16	3
26	486+078	RCC BOX	1x7	2x16	3
27	487+285	RCC BOX	1x7	1x15+2x16+1x11.5	3
28	489+980	RCC BOX	1x7	2x16	3
29	491+544	RCC BOX	1x7	2x16	3
30	500+722	RCC BOX	1x7	2x16	3
31	512+230	RCC BOX	1x7	2x16	3
32	513+453	RCC BOX	1x7	2x16	3
33	514+700	RCC BOX	1x7	2x16	3
34	517+045	RCC BOX	1x7	2x16	3
35	517+590	RCC BOX	1x7	2x16	3
36	518+104	RCC BOX	1x7	2x16	3
37	520+820	RCC BOX	1x7	2x16	3
38	522+918	RCC BOX	1x7	2x16	3
39	528+060	RCC BOX	1x7	2x16	3
40	529+025	RCC BOX	1x7	2x16	3
41	530+315	RCC BOX	1x7	2x16	3
42	532+575	RCC BOX	1x7	2x16	3
43	551+375	RCC BOX	1x7	2x16	3
44	552+102	RCC BOX	1x7	2x16	3
45	552+990	RCC BOX	1x7	2x16	3

S. No.	Design Chainage (km)	Type of Structure	Clear Opening in square direction (m)	Deck Configuration (m)	Width of Open Median (m)
46	553+305	RCC BOX	1x7	2x16	3
47	554+805	RCC BOX	1x7	2x16	3
48	560+451	RCC BOX	1x7	2x16	3
49	560+675	RCC BOX	1x7	2x16	3
50	572+140	RCC BOX	1x7	2x16	3
51	573+530	RCC BOX	1x7	2x16	3

2.3.4 WILDLIFE UNDER PASS

Table 2-19: WILDLIFE UNDERPASS

Sl. No.	Design Chainage (Km)	Span Arrangement c/c Expansion joint/clear opening in Square direction (Nos. x Span length) (m)	Type of Structure	Deck Configuration (m)	Width of Open Median (m)	Minimum vertical clearance (m)	Remarks
1	504+09 0	6x50	STEEL PLATE GIRDER	2x16	3	7	-
2	504+94 0	2x50	STEEL PLATE GIRDER	2x16	3	7	-
3	505+45 0	2x50	STEEL PLATE GIRDER	2x16	3	7	-
4	505+90 0	2x50	STEEL PLATE GIRDER	2x16	3	7	-
5	519+27 0	2x30	PSC I GIRDER	2x16	3	7	-
6	520+00 0	2x30	PSC I GIRDER	2x16	3	7	-
7	525+00 0	2x30	PSC I GIRDER	2x16	3	7	-
8	526+68 0	2x30	PSC I GIRDER	2x16	3	7	Vehicular cum

Sl. No.	Design Chainage (Km)	Span Arrangement c/c Expansion joint/clear opening in Square direction (Nos. x Span length) (m)	Type of Structure	Deck Configuration (m)	Width of Open Median (m)	Minimum vertical clearance (m)	Remarks
							Wildlife Underpass
9	527+85 0	2x30	PSC I GIRDER	2x16	3	7	-
10	532+34 0	3x33	PSC I GIRDER	2x16	3	7	-
11	533+26 0	6x33	PSC I GIRDER	2x16	3	7	-
12	538+00 0	3x33	PSC I GIRDER	2x16	3	7	-
13	541+83 0	3x33	PSC I GIRDER	2x16	3	7	-
14	544+86 0	6x33	PSC I GIRDER	2x16	3	7	-
15	549+00 0	3x33	PSC I GIRDER	2x16	3	7	-
16	551+12 0	3x33	PSC I GIRDER	2x16	3	7	-

2. 3.5 ROB

Table 2-20: RAILWAY OVER BRIDGES (ROBs)

Sl. No.	Design Chainage (Km)	Type of Structure	Span Arrangement c/c Expansion in square direction (m)	Deck Configuration (m)	Width of Open Median (m)	Remarks
1	391+515	RCC+COMPOSITE GIRDER	20+62+20	As per Approved GAD	3	-

Sl. No.	Design Chainage (Km)	Type of Structure	Span Arrangement c/c Expansion in square direction (m)	Deck Configuration (m)	Width of Open Median (m)	Remarks
2	426+318	PSC I GIRDER + COMPOSITE	30+62+30	As per Approved GAD	3	-
3	484+170	PSC+ COMPOSITE GIRDER	20+37.2+30	As per Approved GAD	3	-
4	536+130	RCC+ COMPOSITE GIRDER	15+37+30	As per Approved GAD	3	-

2.3.5 STRUCTURE OVER GAS PIPE LINE

Table 2-20: Details of Structure over Gas Pipe Line

Sl. No.	Design Chainage (Km)	Span Arrangement c/c Expansion joint/clear opening in Square direction (Nos. x Span length) (m)	Type of Structure	Deck Configuration (m)	Width of Open Median (m)	Minimum vertical clearance (m)
1	426+500	1x30	PSC I GIRDER	2x16	3	4.5
2	582+100	1x36	PSC I GIRDER	2x16	3	4.5

2.3.5 FLY-OVER/INTERCHANGE

At the starting of the Project road, a Trumpet Interchange has been proposed followed with Fly-Overs which are crossing the National/State Highways. The details are given below:

Table 2-21: Details of Fly-Over

S. No.	Design Chainage (Km)	Intersecting Road	Type of Structure	Span Arrangement t/c/c Expansion joint in Square direction (m)/Clear opening in Square direction (m)	Deck Configuration (m)	Width of Open Median (m)	Minimum Vertical Clearance (m)
1	404+200	Loop/Ramp	PSC I GIRDER	1x30	2x16	3	5.5
2	405+591	NH-18	PSC I GIRDER	1x35	2x16	3	5.5
3	423+993	Loop/Ramp	PSC I GIRDER	1x30	2x16	3	5.5
4	425+200	SH-5	PSC I GIRDER	1x30	2x16	3	5.5
5	429+780	NH-314	PSC I GIRDER	1x30	2x16	3	5.5
6	454+515	Hura-Manbazar Rd	PSC I GIRDER	4x30	2x16	3	5.5
7	486+990	SH-2	PSC I GIRDER	1x30	2x16	3	5.5
8	492+820	SH-2	PSC I GIRDER	2x35	2x16	3	5.5
9	508+723	SH-9	PSC I GIRDER	4x30	2x16	3	5.5
10	540+054	NH-14	PSC I GIRDER	1x30	2x16	3	5.5
11	564+578	Loop/Ramp	PSC I GIRDER	1x30	2x16	3	5.5
12	564+904	SH-7	PSC I GIRDER	1x30	2x16	3	5.5
13	578+720	NH-116A	PSC I GIRDER	4x30	2x16	3	5.5
14	595+920	Garerghat Rd	PSC I GIRDER	4x30	2x16	3	5.5

S. No .	Design Chainage (Km)	Intersecting Road	Type of Structure	Span Arrangement c/c Expansion joint in Square direction (m)/Clear opening in Square direction (m)	Deck Configuration (m)	Width of Open Median (m)	Minimum Vertical Clearance (m)
15	619+122	SH-15	PSC I GIRDER	1x30	2x16	3	5.5
16	621+880	NH-16	PSC I GIRDER	2x35	2x16	3	5.5

2.3.6 DETAILS OF ELEVATED STRUCTURES/VIADUCTS

Table 2-22: Details of Elevated Structures/Viaducts

S. No .	Design Chainage (Km)	Type of Structure	Span Arrangement c/c Expansion joint in Square direction (m)/Clear opening in Square direction	Deck Configuration (m)	Width of Open Median (m)	Remarks
1	391+800 TO 392+560	PSC I GIRDER	26x30	2x16	3	-
2	405+140 TO 405+350	PSC I GIRDER	7x30	2x16	3	-
3	416+800 TO 417+160	PSC I GIRDER	12x30	2x16	3	-
4	(484+136 to 484+553) 484+345	PSC+ COMPOSITE GIRDER	20+37.2+12x30	2x16	3	-
5	563+884 TO 564+454	PSC I GIRDER	19x30	2x16	3	-

S. No.	Design Chainage (Km)	Type of Structure	Span Arrangement c/c Expansion joint in Square direction (m)/Clear opening in Square direction	Deck Configuration (m)	Width of Open Median (m)	Remarks
6	597+200 to 599+660	SEGMENTAL BOX GIRDER	41x60	2x16	3	Viaduct over Flooded Region
7	601+565 to 604+985	SEGMENTAL BOX GIRDER	2x30+54x60+4x30	2x16	3	Viaduct over Flooded Region
8	609+385 to 610+525	SEGMENTAL BOX GIRDER	5x60+1x30+12x60+3x30	2x16	3	Viaduct over Flooded Region

2.3.6 CULVERTS DETAILS

Box type culverts have been proposed in this alignment as cross drainage structures and at many places culverts are being proposed to serve a pathway to the village users in the dry seasons. The details of the culverts are summarised below:

Table 2-23: List of Culverts for Cross Drainage and Cart Track Crossings

S. No.	Design Chainage (Km)	Type of Culvert	Span
			No. x Width(m) x Height (m)
1	387+440	RCC BOX	1x3x3
2	388+270	RCC BOX	1x3x3
3	388+560	RCC BOX	1x3x3
4	388+840	RCC BOX	1x3x3
5	389+360	RCC BOX	1x6x4
6	389+920	RCC BOX	1x3x3
7	390+200	RCC BOX	1x3x3
8	390+540	RCC BOX	1x3x3
9	390+940	RCC BOX	1x6x4
10	391+680	RCC BOX	1x6x4
11	392+780	RCC BOX	1x3x3
12	393+220	RCC BOX	1x3x3
13	393+900	RCC BOX	1x3x3

S. No.	Design Chainage (Km)	Type of Culvert	Span
			No. x Width(m) x Height (m)
14	394+220	RCC BOX	1x3x3
15	394+650	RCC BOX	1x6x4
16	394+780	RCC BOX	1x6x4
17	395+260	RCC BOX	1x3x3
18	395+800	RCC BOX	1x3x3
19	396+040	RCC BOX	1x3x3
20	396+380	RCC BOX	1x6x4
21	396+740	RCC BOX	1x3x3
22	397+020	RCC BOX	1x3x3
23	397+500	RCC BOX	1x3x3
24	397+630	RCC BOX	1x6x4
25	398+440	RCC BOX	1x6x4
26	398+720	RCC BOX	1x3x3
27	398+940	RCC BOX	1x3x3
28	399+060	RCC BOX	1x3x3
29	399+500	RCC BOX	1x3x3
30	399+840	RCC BOX	1x6x4
31	401+150	RCC BOX	1x6x4
32	401+600	RCC BOX	1x6x3
33	402+140	RCC BOX	1x3x3
34	402+380	RCC BOX	1x3x3
35	402+500	RCC BOX	1x3x3
36	402+880	RCC BOX	1x3x3
37	403+080	RCC BOX	1x3x3
38	403+240	RCC BOX	1x3x3
39	403+530	RCC BOX	1x3x3
40	404+060	RCC BOX	1x3x3
41	404+300	RCC BOX	1x3x3
42	404+600	RCC BOX	1x3x3
43	405+160	RCC BOX	1x3x3
44	405+500	RCC BOX	1x3x3
45	405+823	RCC BOX	1x3x3
46	405+865	RCC BOX	1x6x4
47	406+050	RCC BOX	1x3x3
48	406+320	RCC BOX	1x3x3
49	406+800	RCC BOX	1x3x3
50	407+170	RCC BOX	1x6x4

S. No.	Design Chainage (Km)	Type of Culvert	Span
			No. x Width(m) x Height (m)
51	407+370	RCC BOX	1x3x3
52	407+640	RCC BOX	1x3x3
53	408+080	RCC BOX	1x6x4
54	408+723	RCC BOX	1x3x3
55	409+100	RCC BOX	1x3x3
56	409+400	RCC BOX	1x3x3
57	410+100	RCC BOX	1x3x3
58	410+340	RCC BOX	1x3x3
59	411+060	RCC BOX	1x3x3
60	411+350	RCC BOX	1x3x3
61	412+100	RCC BOX	1x3x3
62	413+000	RCC BOX	1x3x3
63	413+720	RCC BOX	1x3x3
64	414+210	RCC BOX	1x3x3
65	415+270	RCC BOX	1x3x3
66	415+630	RCC BOX	1x3x3
67	415+860	RCC BOX	1x3x3
68	416+253	RCC BOX	1x6x4
69	416+450	RCC BOX	1x3x3
70	417+520	RCC BOX	1x3x3
71	417+760	RCC BOX	1x3x3
72	418+223	RCC BOX	1x6x4
73	418+440	RCC BOX	1x6x4
74	419+150	RCC BOX	1x6x4
75	419+270	RCC BOX	1x3x3
76	419+600	RCC BOX	1x3x3
77	419+900	RCC BOX	1x6x4
78	420+635	RCC BOX	1x3x3
79	421+210	RCC BOX	1x3x3
80	421+960	RCC BOX	1x3x3
81	423+070	RCC BOX	1x3x3
82	423+600	RCC BOX	1x3x3
83	423+880	RCC BOX	1x3x3
84	424+140	RCC BOX	1x6x4
85	424+460	RCC BOX	1x3x3
86	425+330	RCC BOX	1x3x3
87	425+900	RCC BOX	1x3x3

S. No.	Design Chainage (Km)	Type of Culvert	Span
			No. x Width(m) x Height (m)
88	426+780	RCC BOX	1x6x4
89	427+420	RCC BOX	1x3x3
90	427+600	RCC BOX	1x3x3
91	427+870	RCC BOX	1x3x3
92	428+560	RCC BOX	1x6x4
93	429+660	RCC BOX	1x3x3
94	430+380	RCC BOX	1x3x3
95	431+200	RCC BOX	1x3x3
96	431+370	RCC BOX	1x3x3
97	431+700	RCC BOX	1x3x3
98	432+110	RCC BOX	1x3x3
99	432+330	RCC BOX	1x3x3
100	433+170	RCC BOX	1x3x3
101	433+820	RCC BOX	1x6x3
102	435+240	RCC BOX	1x3x3
103	435+510	RCC BOX	1x3x3
104	435+680	RCC BOX	1x6x4
105	437+150	RCC BOX	1x6x4
106	437+380	RCC BOX	1x3x3
107	437+640	RCC BOX	1x3x3
108	438+580	RCC BOX	1x6x3
109	439+120	RCC BOX	1x3x3
110	439+890	RCC BOX	1x3x3
111	440+220	RCC BOX	1x3x3
112	441+040	RCC BOX	1x3x3
113	441+240	RCC BOX	1x3x3
114	441+402	RCC BOX	1x6x4
115	441+700	RCC BOX	1x3x3
116	442+080	RCC BOX	1x3x3
117	442+550	RCC BOX	1x3x3
118	442+820	RCC BOX	1x3x3
119	445+500	RCC BOX	1x3x3
120	445+740	RCC BOX	1x6x3
121	447+060	RCC BOX	1x3x3
122	447+750	RCC BOX	1x3x3
123	448+500	RCC BOX	1x3x3
124	448+850	RCC BOX	1x3x3

S. No.	Design Chainage (Km)	Type of Culvert	Span
			No. x Width(m) x Height (m)
125	449+440	RCC BOX	1x3x3
126	450+250	RCC BOX	1x3x3
127	451+120	RCC BOX	1x3x3
128	451+310	RCC BOX	1x6x4
129	451+650	RCC BOX	1x3x3
130	451+955	RCC BOX	1x6x4
131	453+430	RCC BOX	1x3x3
132	454+980	RCC BOX	1x3x3
133	455+480	RCC BOX	1x4x3
134	456+030	RCC BOX	1x4x3
135	456+890	RCC BOX	1x4x3
136	457+560	RCC BOX	1x3x3
137	458+560	RCC BOX	1x3x3
138	459+180	RCC BOX	1x3x3
139	459+821	RCC BOX	1x6x4
140	459+930	RCC BOX	1x6x4
141	460+130	RCC BOX	1x3x3
142	460+570	RCC BOX	1x3x3
143	460+910	RCC BOX	1x3x3
144	461+180	RCC BOX	1x3x3
145	461+720	RCC BOX	1x3x3
146	462+200	RCC BOX	1x3x3
147	463+650	RCC BOX	1x4x3
148	464+200	RCC BOX	1x4x4
149	465+700	RCC BOX	1x4x3
150	466+000	RCC BOX	1x3x3
151	466+300	RCC BOX	1x3x3
152	466+493	RCC BOX	1x6x4
153	467+100	RCC BOX	1x3x3
154	467+540	RCC BOX	1x3x3
155	468+600	RCC BOX	1x3x3
156	470+020	RCC BOX	1x3x3
157	471+265	RCC BOX	1x3x3
158	471+880	RCC BOX	1x3x3
159	472+040	RCC BOX	1x3x3
160	472+910	RCC BOX	1x6x4
161	473+560	RCC BOX	1x3x3

S. No.	Design Chainage (Km)	Type of Culvert	Span
			No. x Width(m) x Height (m)
162	474+040	RCC BOX	1x3x3
163	474+390	RCC BOX	1x3x3
164	475+810	RCC BOX	1x3x3
165	476+120	RCC BOX	1x4x3
166	476+312	RCC BOX	1x6x4
167	476+360	RCC BOX	1x4x3
168	476+740	RCC BOX	1x3x3
169	478+295	RCC BOX	1x6x3
170	478+745	RCC BOX	1x6x3
171	479+080	RCC BOX	1x3x3
172	479+420	RCC BOX	1x3x3
173	479+880	RCC BOX	1x3x3
174	480+570	RCC BOX	1x3x3
175	480+810	RCC BOX	1x3x3
176	481+000	RCC BOX	1x4x4
177	481+500	RCC BOX	1x4x4
178	481+840	RCC BOX	1x3x3
179	482+820	RCC BOX	1x3x3
180	483+770	RCC BOX	1x3x3
181	483+960	RCC BOX	1x3x3
182	484+720	RCC BOX	1x3x3
183	485+560	RCC BOX	1x3x3
184	486+440	RCC BOX	1x3x3
185	486+760	RCC BOX	1x3x3
186	487+700	RCC BOX	1x3x3
187	487+830	RCC BOX	1x3x3
188	488+590	RCC BOX	1x3x3
189	488+710	RCC BOX	1x3x3
190	489+180	RCC BOX	1x3x3
191	489+390	RCC BOX	1x3x3
192	490+370	RCC BOX	1x6x4
193	490+760	RCC BOX	1x3x3
194	490+980	RCC BOX	1x3x3
195	492+020	RCC BOX	1x3x3
196	493+135	RCC BOX	1x6x4
197	493+250	RCC BOX	1x3x3
198	494+180	RCC BOX	1x3x3

S. No.	Design Chainage (Km)	Type of Culvert	Span
			No. x Width(m) x Height (m)
199	494+850	RCC BOX	1x3x3
200	495+693	RCC BOX	1x6x4
201	496+130	RCC BOX	1x3x3
202	496+390	RCC BOX	1x3x3
203	496+750	RCC BOX	1x3x3
204	497+350	RCC BOX	1x3x3
205	497+600	RCC BOX	1x6x4
206	498+490	RCC BOX	1x3x3
207	499+030	RCC BOX	1x3x3
208	500+060	RCC BOX	1x3x3
209	500+367	RCC BOX	1x6x4
210	501+010	RCC BOX	1x3x3
211	501+340	RCC BOX	1x3x3
212	501+720	RCC BOX	1x4x3
213	502+760	RCC BOX	1x3x3
214	503+300	RCC BOX	1x4x3
215	503+410	RCC BOX	1x4x3
216	503+560	RCC BOX	1x4x3
217	504+440	RCC BOX	1x3x3
218	505+270	RCC BOX	1x4x3
219	506+260	RCC BOX	1x3x3
220	506+745	RCC BOX	1x6x4
221	506+910	RCC BOX	1x3x3
222	507+410	RCC BOX	1x4x3
223	507+850	RCC BOX	1x6x4
224	508+010	RCC BOX	1x3x3
225	508+190	RCC BOX	1x3x3
226	509+040	RCC BOX	1x3x3
227	509+550	RCC BOX	1x6x4
228	509+830	RCC BOX	1x3x3
229	510+650	RCC BOX	1x3x3
230	510+850	RCC BOX	1x4x3
231	511+130	RCC BOX	1x3x3
232	511+620	RCC BOX	1x3x3
233	512+520	RCC BOX	1x3x3
234	513+250	RCC BOX	1x3x3
235	513+350	RCC BOX	1x3x3

S. No.	Design Chainage (Km)	Type of Culvert	Span
			No. x Width(m) x Height (m)
236	514+319	RCC BOX	1x3x3
237	515+930	RCC BOX	1x3x3
238	516+150	RCC BOX	1x3x3
239	516+880	RCC BOX	1x4x3
240	517+190	RCC BOX	1x3x3
241	517+720	RCC BOX	1x3x3
242	518+390	RCC BOX	1x3x3
243	518+590	RCC BOX	1x3x3
244	519+200	RCC BOX	1x3x3
245	519+554	RCC BOX	1x5x5
246	519+767	RCC BOX	1x4x3
247	519+840	RCC BOX	1x6x3
248	520+070	RCC BOX	1x4x3
249	520+620	RCC BOX	1x5x5
250	520+924	RCC BOX	1x4x3
251	521+030	RCC BOX	1x4x3
252	521+150	RCC BOX	1x4x3
253	521+620	RCC BOX	1x6x3
254	521+869	RCC BOX	1x3x3
255	522+320	RCC BOX	1x3x3
256	522+600	RCC BOX	1x6x3
257	523+414	RCC BOX	1x6x4
258	523+700	RCC BOX	1x3x3
259	524+350	RCC BOX	1x6x3
260	524+700	RCC BOX	1x3x3
261	524+870	RCC BOX	1x6x3
262	525+140	RCC BOX	1x3x3
263	525+500	RCC BOX	1x3x3
264	526+160	RCC BOX	1x3x3
265	526+310	RCC BOX	1x3x3
266	527+360	RCC BOX	1x3x3
267	527+700	RCC BOX	1x3x3
268	528+740	RCC BOX	1x6x3
269	529+300	RCC BOX	1x3x3
270	529+380	RCC BOX	1x6x3
271	529+580	RCC BOX	1x3x3
272	530+130	RCC BOX	1x3x3

S. No.	Design Chainage (Km)	Type of Culvert	Span
			No. x Width(m) x Height (m)
273	531+340	RCC BOX	1x3x3
274	532+970	RCC BOX	1x4x3
275	533+150	RCC BOX	1x6x3
276	533+682	RCC BOX	1x6x4
277	534+510	RCC BOX	1x3x3
278	535+440	RCC BOX	1x3x3
279	535+840	RCC BOX	1x4x3
280	536+030	RCC BOX	1x3x3
281	536+510	RCC BOX	1x3x3
282	536+790	RCC BOX	1x3x3
283	537+160	RCC BOX	1x3x3
284	537+300	RCC BOX	1x3x3
285	537+400	RCC BOX	1x3x3
286	537+734	RCC BOX	1x4x3
287	538+210	RCC BOX	1x4x3
288	539+020	RCC BOX	1x4x3
289	539+420	RCC BOX	1x3x3
290	540+313	RCC BOX	1x3x3
291	540+680	RCC BOX	1x3x3
292	540+830	RCC BOX	1x6x3
293	541+000	RCC BOX	1x3x3
294	541+300	RCC BOX	1x6x3
295	541+950	RCC BOX	1x4x3
296	542+190	RCC BOX	1x3x3
297	542+350	RCC BOX	1x3x3
298	542+686	RCC BOX	1x6x3
299	542+937	RCC BOX	1x6x3
300	543+420	RCC BOX	1x3x3
301	543+910	RCC BOX	1x3x3
302	544+090	RCC BOX	1x3x3
303	545+200	RCC BOX	1x3x3
304	545+490	RCC BOX	1x3x3
305	545+920	RCC BOX	1x6x4
306	546+150	RCC BOX	1x3x3
307	546+380	RCC BOX	1x3x3
308	546+890	RCC BOX	1x3x3
309	547+200	RCC BOX	1x3x3

S. No.	Design Chainage (Km)	Type of Culvert	Span
			No. x Width(m) x Height (m)
310	547+950	RCC BOX	1x3x3
311	548+240	RCC BOX	1x3x3
312	548+630	RCC BOX	1x3x3
313	549+590	RCC BOX	1x3x3
314	549+800	RCC BOX	1x3x3
315	550+200	RCC BOX	1x3x3
316	550+410	RCC BOX	1x3x3
317	550+830	RCC BOX	1x3x3
318	551+010	RCC BOX	1x3x3
319	551+820	RCC BOX	1x3x3
320	552+350	RCC BOX	1x3x3
321	553+160	RCC BOX	1x3x3
322	553+600	RCC BOX	1x3x3
323	554+120	RCC BOX	1x3x3
324	554+650	RCC BOX	1x3x3
325	555+190	RCC BOX	1x3x3
326	556+310	RCC BOX	1x3x3
327	556+590	RCC BOX	1x3x3
328	556+720	RCC BOX	1x4x3
329	557+200	RCC BOX	1x3x3
330	558+340	RCC BOX	1x3x3
331	559+120	RCC BOX	1x6x4
332	559+800	RCC BOX	1x3x3
333	560+600	RCC BOX	1x6x3
334	561+090	RCC BOX	1x3x3
335	561+580	RCC BOX	1x3x3
336	561+880	RCC BOX	1x3x3
337	562+740	RCC BOX	1x3x3
338	563+270	RCC BOX	1x6x3
339	563+400	RCC BOX	1x3x3
340	564+540	RCC BOX	1x3x3
341	564+720	RCC BOX	1x3x3
342	564+860	RCC BOX	1x3x3
343	565+090	RCC BOX	1x6x3
344	565+410	RCC BOX	1x3x3
345	565+740	RCC BOX	1x4x3
346	566+000	RCC BOX	1x4x3

S. No.	Design Chainage (Km)	Type of Culvert	Span
			No. x Width(m) x Height (m)
347	566+480	RCC BOX	1x4x3
348	566+680	RCC BOX	1x4x3
349	566+830	RCC BOX	1x4x3
350	567+150	RCC BOX	1x6x4
351	567+630	RCC BOX	1x3x3
352	568+600	RCC BOX	1x3x3
353	569+470	RCC BOX	1x3x3
354	569+870	RCC BOX	1x3x3
355	570+520	RCC BOX	1x3x3
356	571+220	RCC BOX	1x3x3
357	571+990	RCC BOX	1x3x3
358	572+290	RCC BOX	1x3x3
359	573+160	RCC BOX	1x3x3
360	573+390	RCC BOX	1x3x3
361	573+810	RCC BOX	1x3x3
362	573+930	RCC BOX	1x3x3
363	575+410	RCC BOX	1x5x5
364	575+500	RCC BOX	1x5x5
365	575+750	RCC BOX	1x5x5
366	576+000	RCC BOX	1x5x5
367	576+250	RCC BOX	1x5x5
368	576+500	RCC BOX	1x5x5
369	576+750	RCC BOX	1x5x5
370	577+000	RCC BOX	1x5x5
371	577+200	RCC BOX	1x5x5
372	577+600	RCC BOX	1x5x5
373	577+900	RCC BOX	1x5x5
374	578+500	RCC BOX	1x5x5
375	579+200	RCC BOX	1x5x5
376	579+400	RCC BOX	1x5x5
377	579+800	RCC BOX	1x5x5
378	580+000	RCC BOX	1x5x5
379	580+200	RCC BOX	1x5x5
380	580+400	RCC BOX	1x5x5
381	580+700	RCC BOX	1x5x5
382	580+900	RCC BOX	1x5x5
383	581+100	RCC BOX	1x5x5

S. No.	Design Chainage (Km)	Type of Culvert	Span
			No. x Width(m) x Height (m)
384	581+300	RCC BOX	1x5x5
385	581+500	RCC BOX	1x5x5
386	581+700	RCC BOX	1x5x5
387	582+250	RCC BOX	1x5x5
388	582+780	RCC BOX	1x5x5
389	583+120	RCC BOX	1x5x5
390	583+320	RCC BOX	1x5x5
391	583+520	RCC BOX	1x5x5
392	583+720	RCC BOX	1x5x5
393	583+920	RCC BOX	1x5x5
394	584+020	RCC BOX	1x5x5
395	584+500	RCC BOX	1x5x5
396	585+200	RCC BOX	1x5x5
397	585+400	RCC BOX	1x5x5
398	585+750	RCC BOX	1x5x5
399	585+825	RCC BOX	1x5x5
400	585+950	RCC BOX	1x5x5
401	586+160	RCC BOX	1x5x5
402	586+270	RCC BOX	1x5x5
403	586+420	RCC BOX	1x5x5
404	586+810	RCC BOX	1x6x5
405	586+900	RCC BOX	1x5x5
406	587+100	RCC BOX	1x5x5
407	587+300	RCC BOX	1x5x5
408	587+600	RCC BOX	1x5x5
409	588+000	RCC BOX	1x5x5
410	588+250	RCC BOX	1x5x5
411	589+400	RCC BOX	1x5x5
412	589+600	RCC BOX	1x5x5
413	589+705	RCC BOX	1x5x5
414	589+900	RCC BOX	1x5x5
415	590+040	RCC BOX	1x5x5
416	590+500	RCC BOX	1x5x5
417	590+560	RCC BOX	1x5x5
418	590+800	RCC BOX	1x5x5
419	591+540	RCC BOX	1x5x5
420	591+700	RCC BOX	1x5x5

S. No.	Design Chainage (Km)	Type of Culvert	Span
			No. x Width(m) x Height (m)
421	592+200	RCC BOX	1x5x5
422	592+400	RCC BOX	1x5x5
423	592+590	RCC BOX	1x5x5
424	592+950	RCC BOX	1x5x5
425	593+150	RCC BOX	1x5x5
426	593+380	RCC BOX	1x5x5
427	593+600	RCC BOX	1x5x5
428	594+500	RCC BOX	1x5x5
429	594+700	RCC BOX	1x5x5
430	595+000	RCC BOX	1x5x5
431	595+200	RCC BOX	1x5x5
432	595+600	RCC BOX	1x5x5
433	599+900	RCC BOX	1x5x5
434	600+100	RCC BOX	1x5x5
435	600+345	RCC BOX	1x5x5
436	600+545	RCC BOX	1x5x5
437	600+935	RCC BOX	1x5x5
438	605+200	RCC BOX	1x5x5
439	606+215	RCC BOX	1x5x5
440	606+415	RCC BOX	1x5x5
441	607+800	RCC BOX	1x5x5
442	608+000	RCC BOX	1x5x5
443	608+440	RCC BOX	1x5x5
444	608+695	RCC BOX	1x5x5
445	610+620	RCC BOX	1x5x5
446	610+820	RCC BOX	1x5x5
447	611+250	RCC BOX	1x5x5
448	611+480	RCC BOX	1x5x5
449	611+600	RCC BOX	1x6x4
450	611+800	RCC BOX	1x6x4
451	612+500	RCC BOX	1x5x5
452	612+860	RCC BOX	1x5x5
453	613+100	RCC BOX	1x6x4
454	613+340	RCC BOX	1x6x4
455	613+600	RCC BOX	1x6x4
456	613+900	RCC BOX	1x5x5
457	614+150	RCC BOX	1x5x5

S. No.	Design Chainage (Km)	Type of Culvert	Span
			No. x Width(m) x Height (m)
458	614+700	RCC BOX	1x5x5
459	615+250	RCC BOX	1x5x5
460	615+450	RCC BOX	1x5x5
461	615+720	RCC BOX	1x3x3
462	616+700	RCC BOX	1x5x5
463	618+456	RCC BOX	1x5x5
464	618+830	RCC BOX	1x5x5
465	618+900	RCC BOX	1x5x5
466	619+300	RCC BOX	1x5x5
467	619+900	RCC BOX	1x5x5
468	620+100	RCC BOX	1x5x5
469	620+600	RCC BOX	1x5x5

2.3.7 Road Interchange Details

Table 2-24: Road Interchange Details

Pkg. No.	Location (km)	Connecting Road	Type of Interchange
14	405+591	NH-18, Purulia-Bokaro Road	Double Trumpet
	425+200	SH-5, Purulia-Raghunathpur Road	Single Trumpet with Junction Improvement at SH-5
15	454+515	Hura-Manbazar Road	Flyover with At Grade Round about
16	487+000	SH-2, Bankura-Mukutmanipur Road	Flyover with At Grade Junction Improvement
17	508+723	SH-9, Bankura-Simlapal Road	Flyover with At Grade Round about
18	540+054	NH-14, Bankura-Medinipur Road	Diamond Interchange
19	564+578	Kharagpur-Moregram Economic Corridor	Double Trumpet with Junction Improvement at SH-7
20	578+720	NH-116A, Ranibazar-Arambagh Road	Flyover with At Grade Round about
	595+920	Garerghat Road	Flyover with At Grade Round about
21	621+880	NH-16, Kolkata-Mumbai Road	Cloverleaf Interchange

2.3.8 Toll Plaza Details PKG-4

Table 2-25: Toll Plaza Details PKG-4

Sr.No.	Chainage and description
1	1 Nos. at Km 405+591 on Ramps (3+1, entry and 5+1 exit lanes)
2	1 Nos. at Km 425+200 on Interchange (3+1 lanes On entry and exit ramps of interchange)
3	1 Nos. at Km 454+515 on Ramps (3+1, entry and exit lanes)
4	1 Nos. at Km 487+000 on Ramps (3+1, entry and exit lanes)
5	1 Nos. at Km 508+723 on Ramps (3+1, entry and exit lanes)
6	1 Nos. at Km 540+054 on Ramps (3+1 entry and 4+1 exit lanes)
7	1 Nos. at Km 564+578 on Ramps (3+1 entry and 4+1 exit lanes)
8	1 Nos. at Km 578+720 on Ramps (4+1 entry and exit lanes)
9	1 Nos. at Km 595+920 on Ramps (3+1 entry and exit lanes)
10	1 Nos. at Km 619+390 on MCW (15+2 lanes)

2.3.9 ELEPHANT CORIDOR

Table 2-26: Details of Elephant Corridor

S. No.	Location of major elephant corridor	GPS Reading of Site	Mouza	Beat	Range	Remark
1	Benachapra Protected Forest	N-22°53'27" E-87°17'28"	Benachapra	Nohari	Garhbeta	Forest Land
2	Shaldanga Non-forest Area	N-22°52'52" E-87°20'38"	Shaldanga	Nohari	Garhbeta	Non-Forest Land
3	Kankrasole Non-Forest Area	N-22°52'14" E-87°22'45"	Kankrasole	Patrisole	Amlagora	Non-Forest Land
4	Chandabila-Ghoramara Protected Forest Area	N-22°50'16" E-87°22'45"	Ghoramara	Chandabila	Amlagora	Forest Land

S. No.	Location of major elephant corridor	GPS Reading of Site	Mouz	Beat	Range	Remark
5	Nohari Protected Forest Area	N-22°53'18" E-87°17'59"	Tibhandra	Nohari	Garhbeta	Forest Land
6	Nalbona Protected Forest Area	N-22°51'44" E-87°24'32"	Nalbona-Mongolapata	Chandabila	Amlagora	Forest Land

2.4 TRAFFIC SURVEY AND FINDINGS

Classified traffic counts were carried out for a period of 7 consecutive days at mid-block locations along 2 corridors. The locations selected were at the outskirts of city where the local traffic is low and regional traffic is high. The surveys were carried out mainly by trained enumerators. The data served as population base during base year and will be used to project traffic. The Survey locations are presented in **Figure 2-3**.

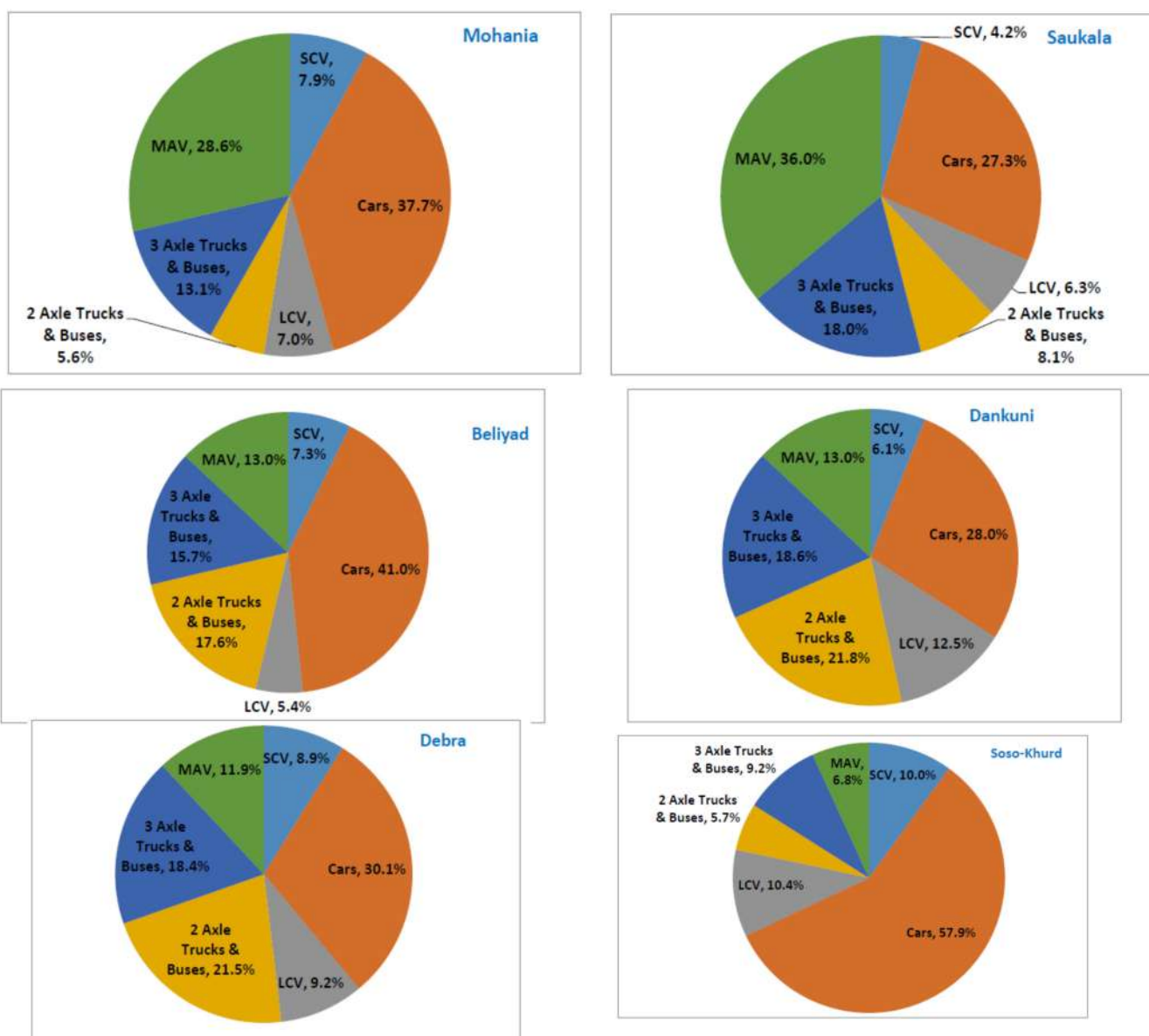


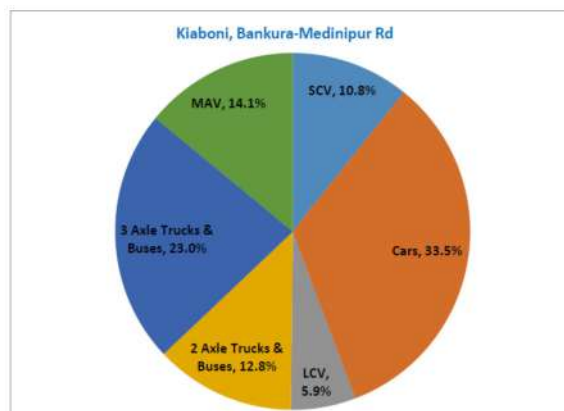
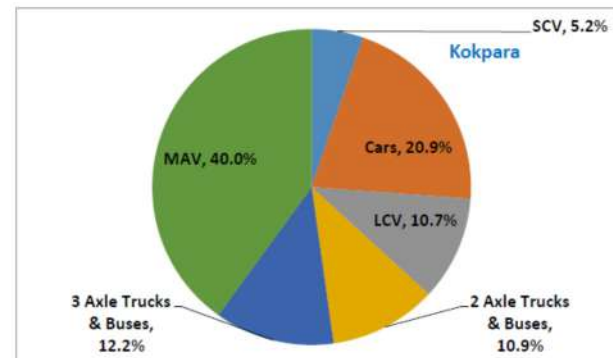
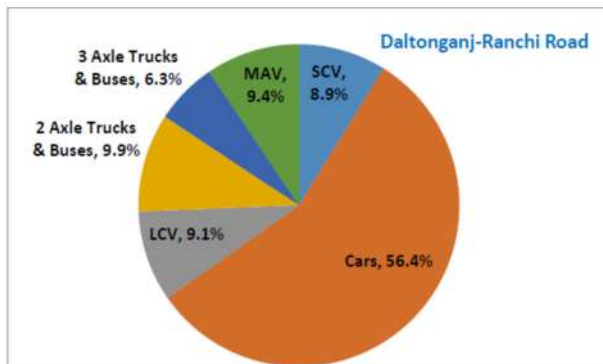
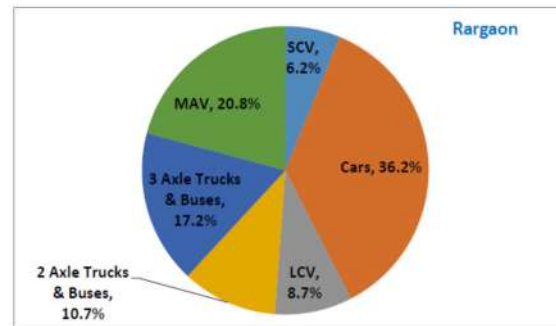
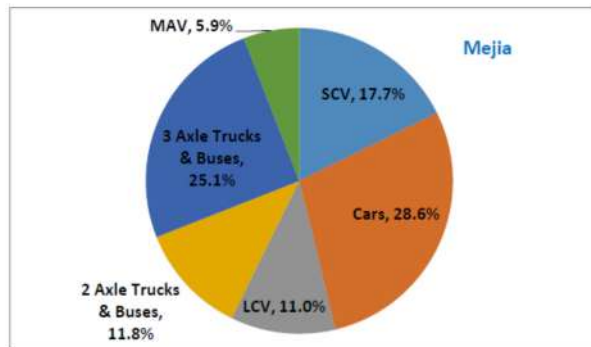
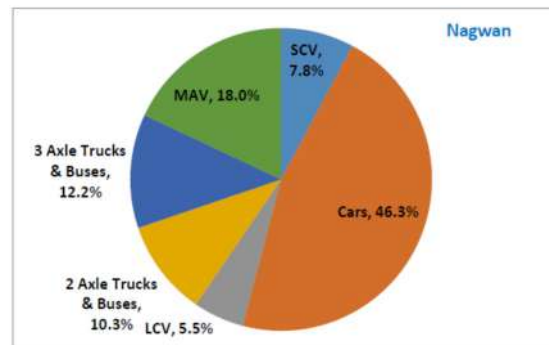
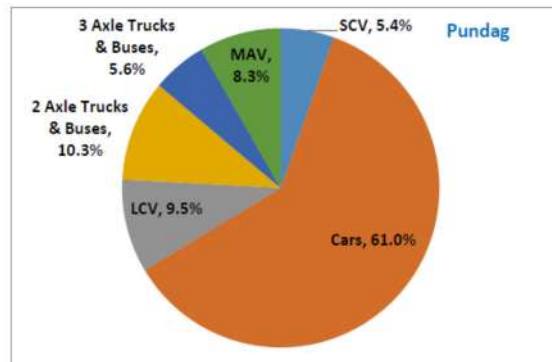
Table 2-27: Summary of ADT and AADT at survey locations

P and M Solution

H60(NewNH14)				
RargaonTollPlaza,NH-43,Ranchi-JamshedpurRd	12789	22876	12894	23492
KokparaTollPlaza,NH-49andNH-18,Jamshedpur-Kharagpur Rd	6265	14063	6360	14520
Daltonganj-Ranchi Road	14146	15452	14127	15671
Kiaboni, Bankura-Medinipur Rd	13631	22600	13734	23192

Figure 2-4 Traffic Composition of All Vehicles At Survey Locations





2.4.2 TRAFFIC GROWTH

Traffic growth on a road facility is generally estimated on the basis of historical trends, in the present case traffic growth rates are estimated using econometric methods. Demand changes are usually because of shifts in the pattern of economic activities in the surrounding regions. The exercise of traffic growth rate estimation has been carried out by us using the elasticity approach. The elasticity method relates traffic growth to changes in the related economic parameters. The estimated growth rate has been mentioned in the table below:

Table 2-27: Projected growth rates of indicators in percentage

Period	Car	Bus	LCV	2A	3A
2022-26	0.90	0.76	1.02	0.53	0.77
2027-31	0.80	0.65	0.97	0.46	0.75
2032-36	0.78	0.61	0.97	0.37	0.66
2037-41	0.73	0.55	0.96	0.26	0.64
>2041	0.71	0.51	0.98	0.21	0.49

2.5 TYPICAL CROSS – SECTIONAL DRAWING

There are 06 nos. of TCS that have been used in this stretch. The detail of the TCS schedule is provided in Fig 2.5 to Fig.2.9 from Design Ch. 387+200 km to Ch. 622+500 km.

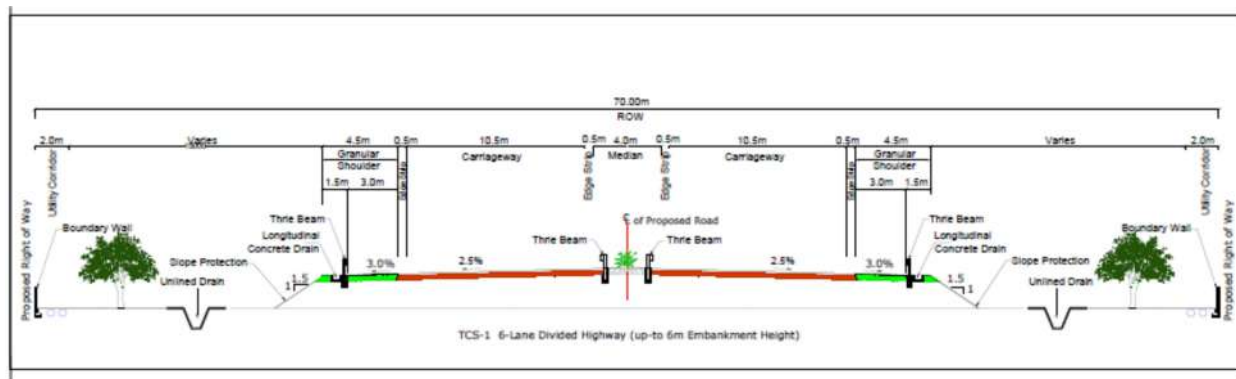


Figure 1-6: Typical Cross Section 1

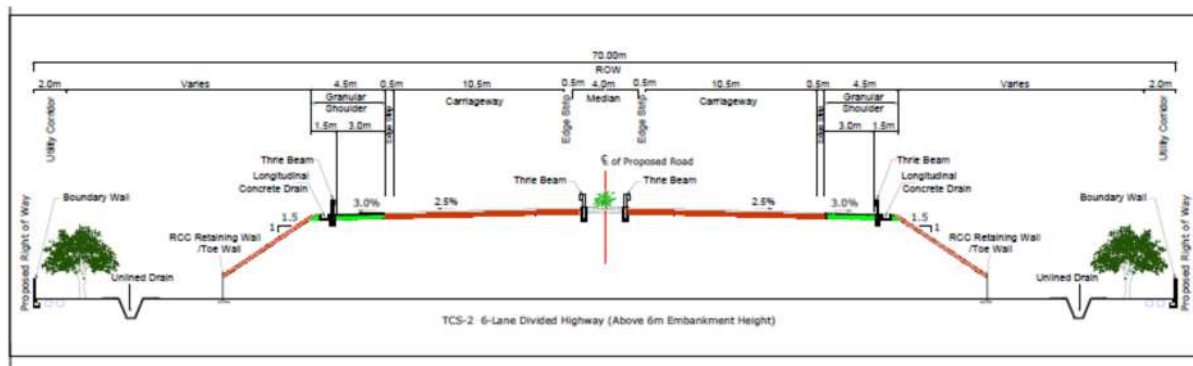


Figure 1-7: Typical Cross Section 2

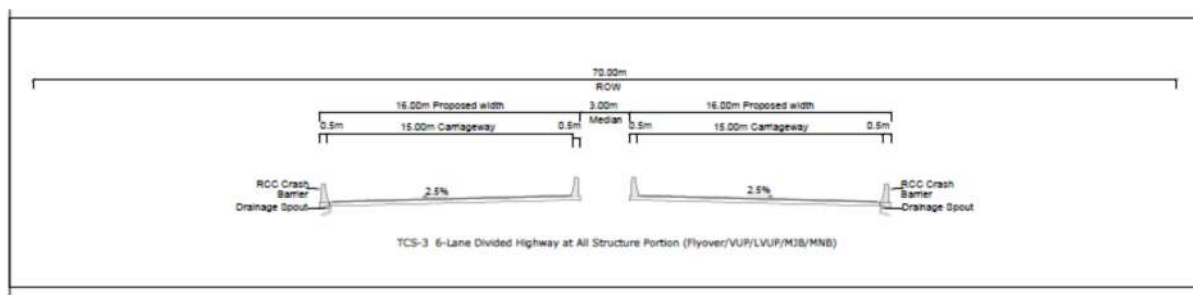


Figure 1-8: Typical Cross Section 3

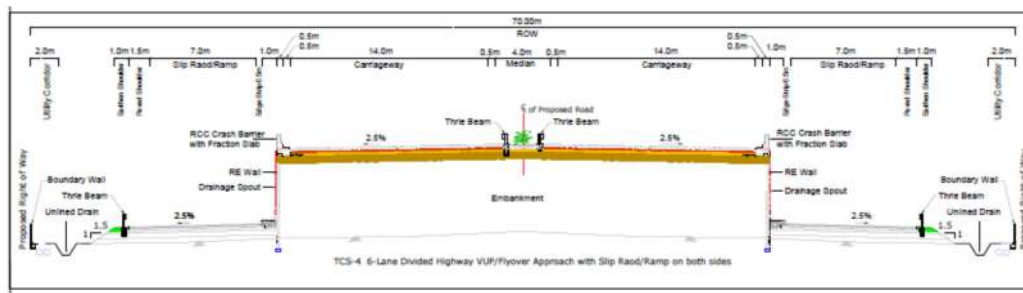


Figure 1-9: Typical Cross Section 4

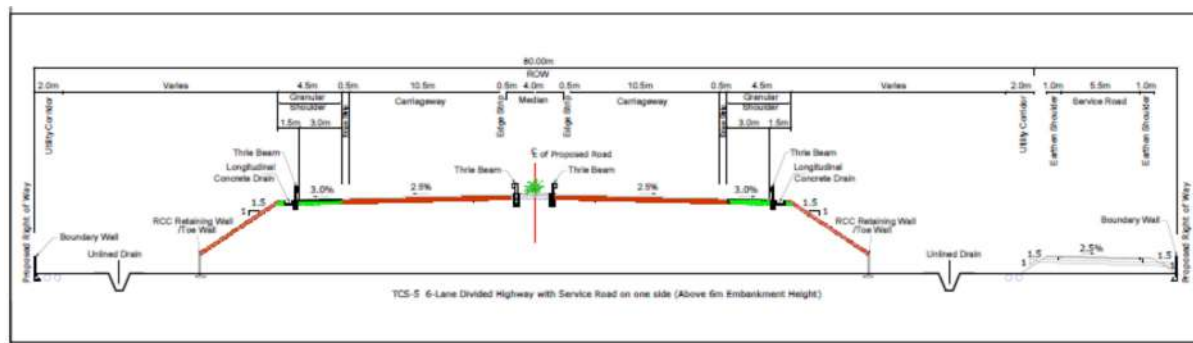


Figure 1-10: Typical Cross Section 5

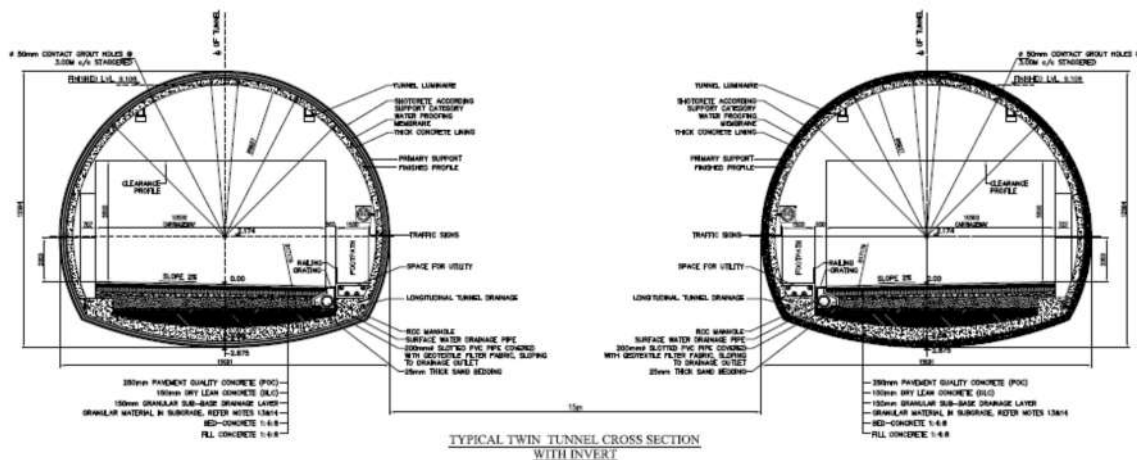


Figure 1-11: Typical Cross Section 6

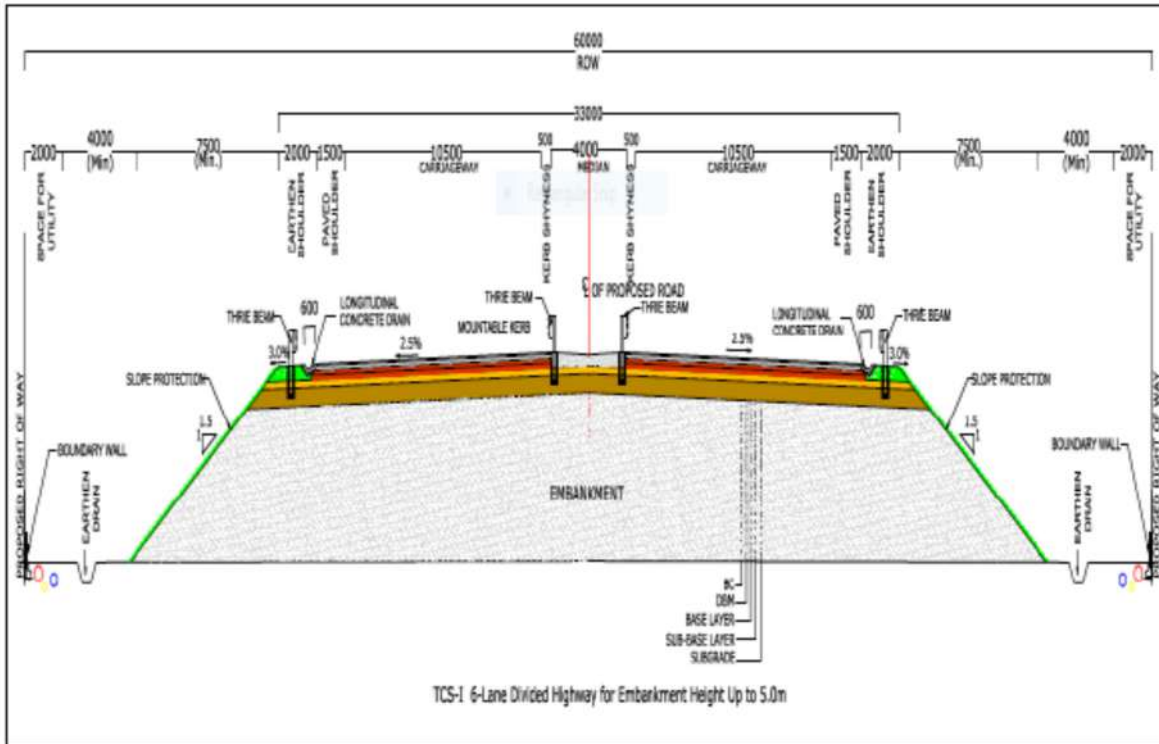


Figure 2-12: Typical Cross Section 1

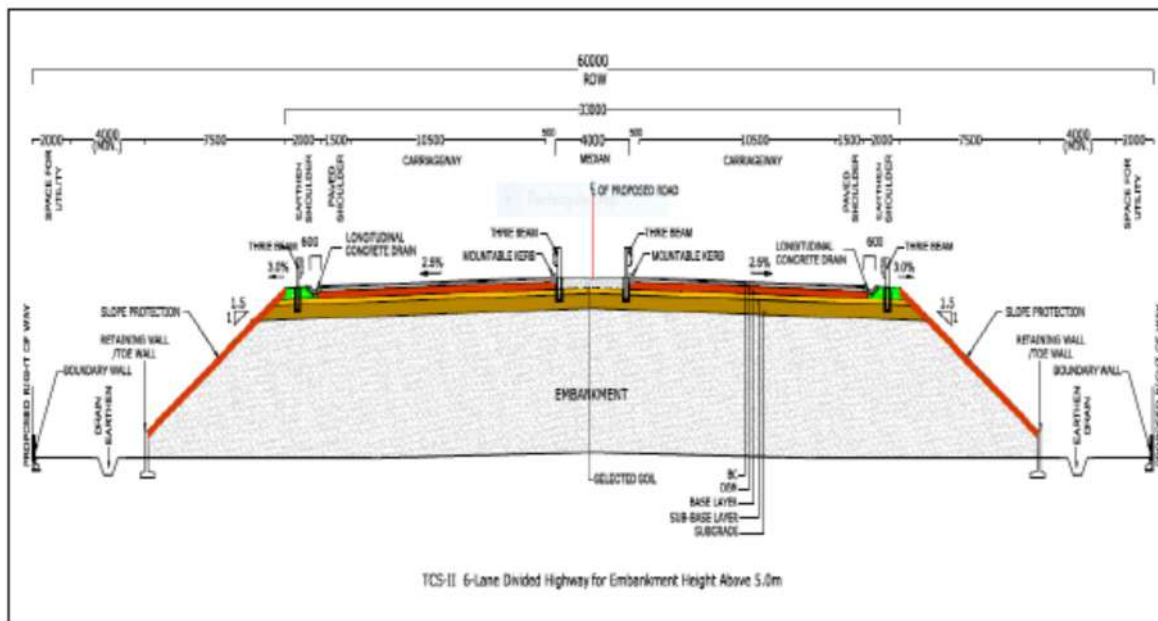


Figure 2-13: Typical Cross Section 2

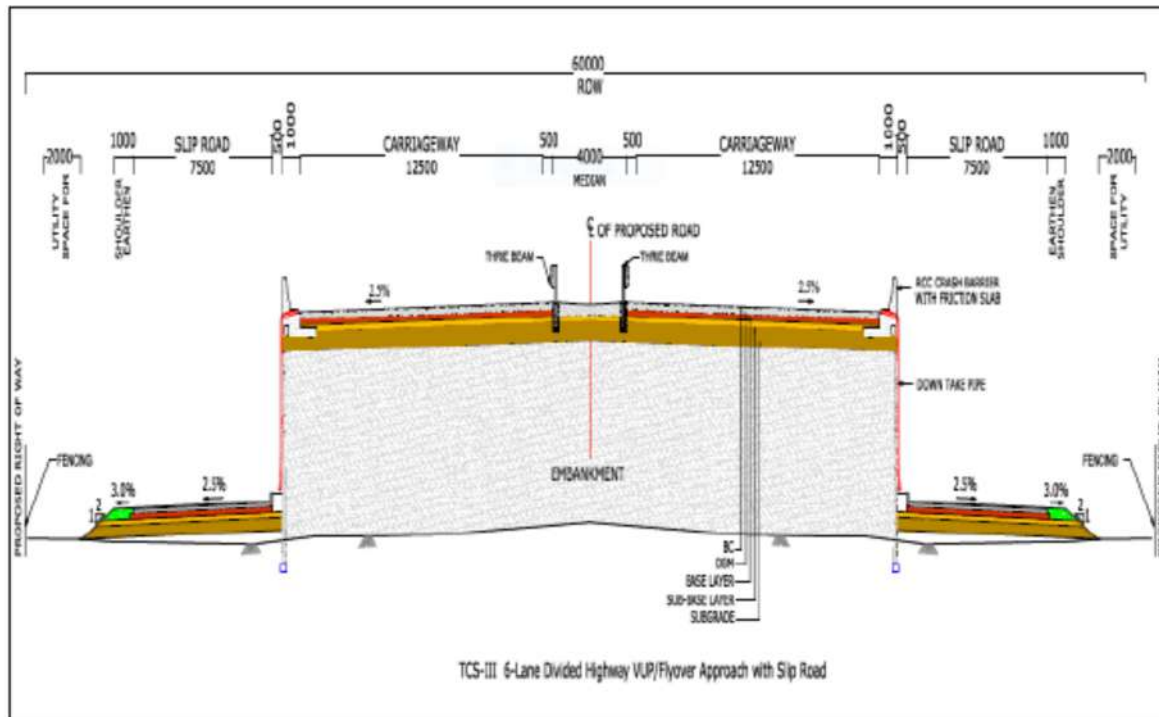


Figure 2-14: Typical Cross Section 3

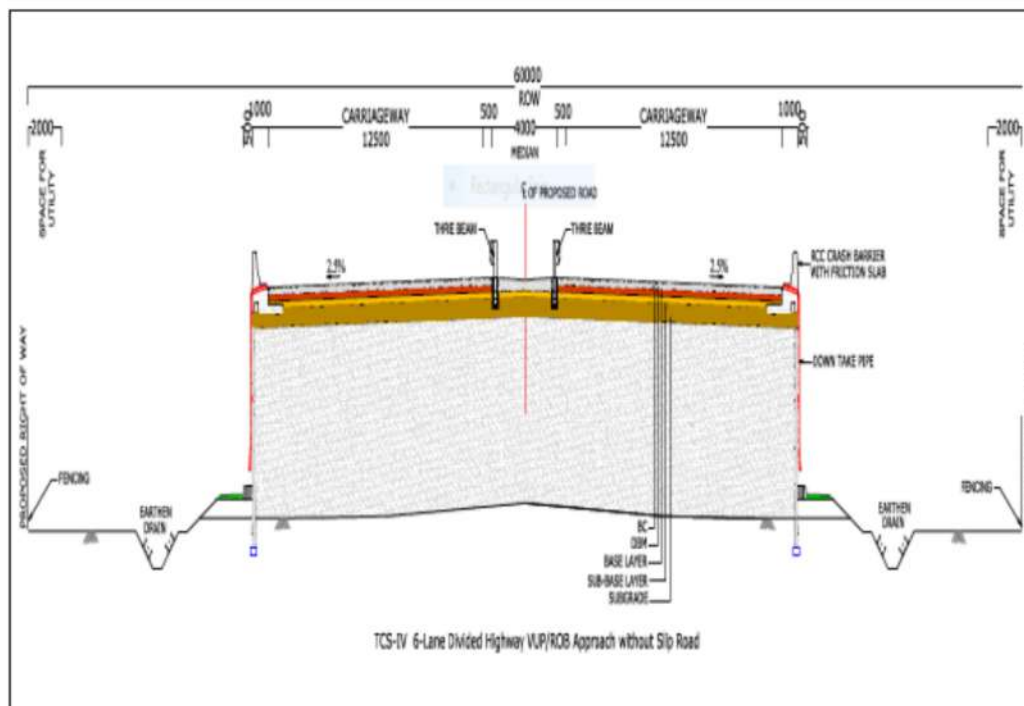


Figure 2-15: Typical Cross Section 4

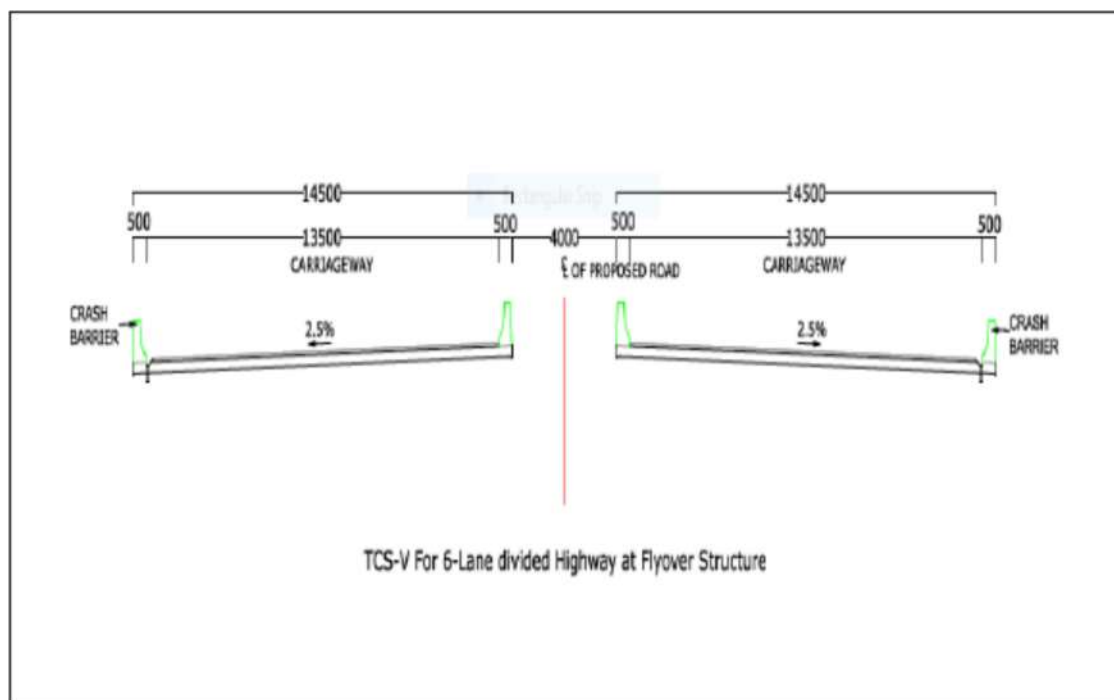


Figure 2-16: Typical Cross Section 5

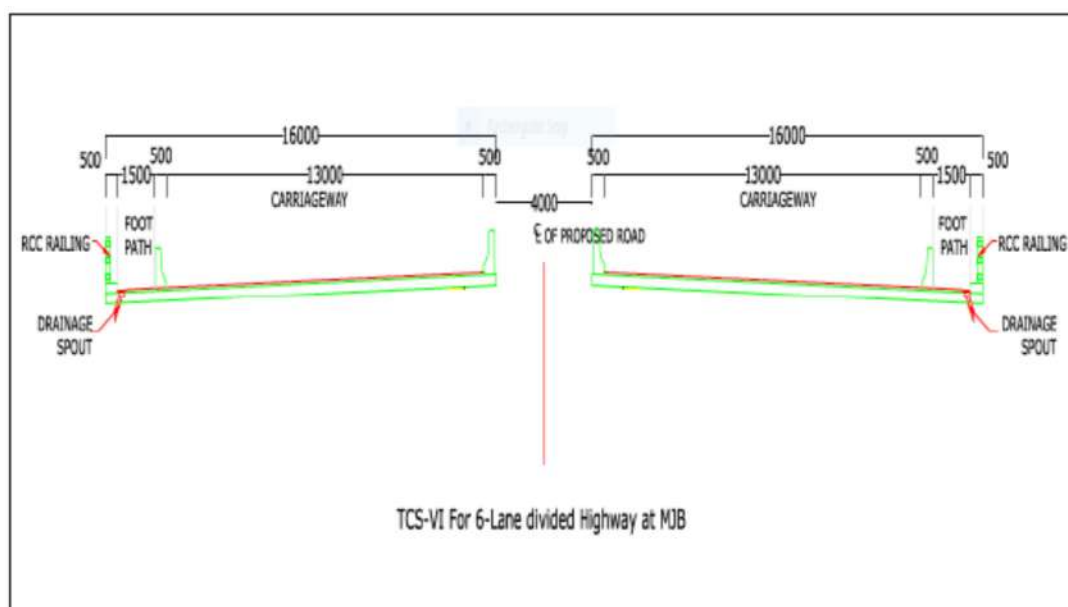


Figure 2-17: Typical Cross Section 6

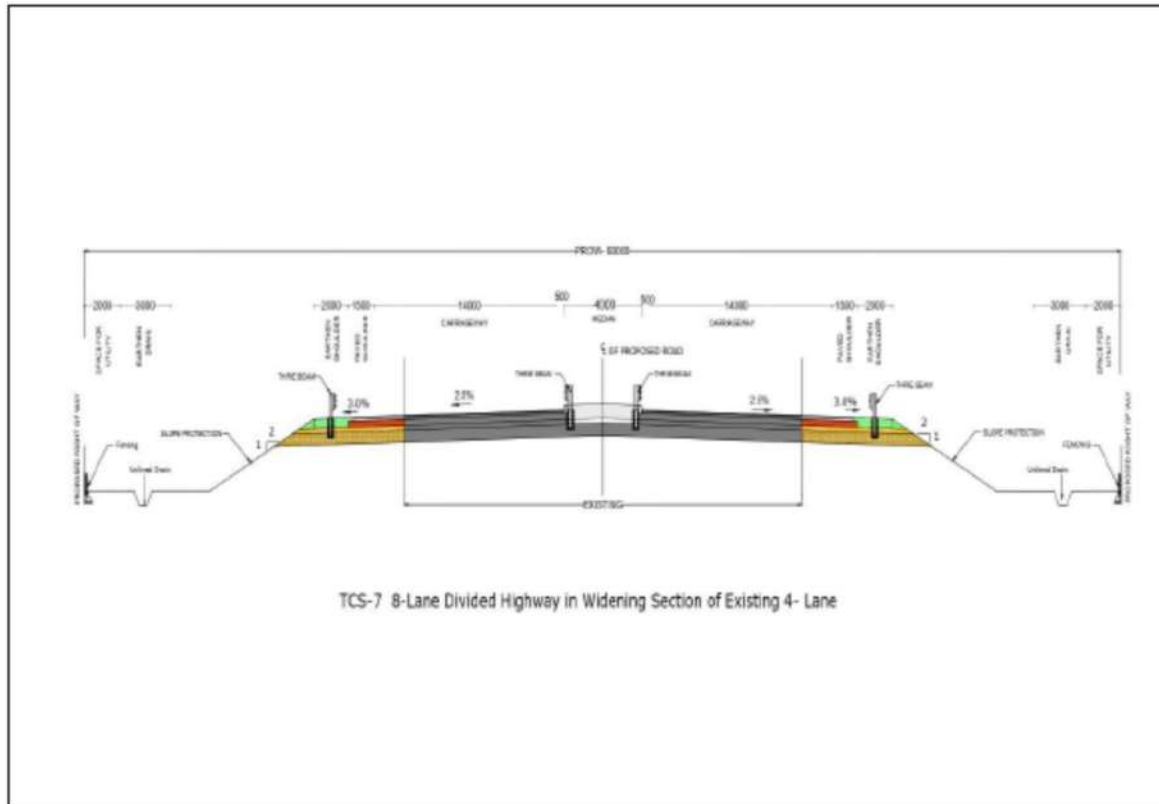


Figure 2-18: Typical Cross Section 7

CHAPTER 3: ANALYSIS OF ALTERNATIVES

3.1 INTRODUCTION

This chapter has been comparing the feasible alternatives to the proposed project with respect to site, technology, design etc. The alternatives examined taking into account all the possible and feasible options and include with and without project scenarios in terms of the potential environmental impacts of the project.

3.2 CRITERIA FOR SELECTION OF SITE

- The project road between two terminal stations should be short and straight as far as possible, but due to engineering, social and environmental considerations, some deviations may be required.
- The project should be constructible and easy to maintain; the Greenfield project should reduce the vehicle operation cost with respect to the existing option already available i.e. using the existing NH/SHs to reach from point A to point B.
- It should be safe at all stages i.e. during design, construction and operation stages.
- Safety audits at each stage should confirm the same.
- The project initial cost, maintenance cost, and operating cost should be optimum to be considered economical with respect to its options.
- The alignment should be finalized giving due consideration to sitting/location of major structures including Major/Minor Bridges, Interchanges and ROBs. The space requirement of interchanges to be kept into consideration to avoid major resettlement.
- Tunnel / Box cutting of Hills should be considered as the last option and should be provided only when it is absolutely necessary.
- The location of spurs for connecting the important towns to be decided while fixing the alignment Options.
- The alignment should follow the unused / barren land to the extent possible to reduce the cost of land acquisition.
- The proposed options in the present case connects the under developed regions of West Bengal which would lead to the development of new growth centers along the proposed highway i.e. paving the way for economic development of the region.

Obligatory points through which alignment options should not pass are detailed below:

Habitations: Proposed alignment is fixed in such a way that traverses at a minimum distance of 150 m from built up areas and avoiding important buildings and structures. However, few isolated buildings falling along the alignment cannot be avoided due to Geometric requirements.

Wildlife Sanctuaries, National Parks, Reserve Forest and other Eco Sensitive Zones: The proposed alignment doesn't pass through any Wildlife Sanctuary, National Park and other Eco Sensitive Zones. However it passes through reserve/protected forest. Utmost care is taken while fixing the alignment near forest areas. The MOEF&CC guidelines have been adhered to and the alignment has been fixed keeping it away from any eco-sensitive zone. It was not possible to completely avoid the reserve forest areas. However, every effort has been made to reduce the acquisition of forest area.

Water Bodies: The proposed alignment has been fixed taking due consideration & importance of retaining the existing water bodies as far as feasible.

Railway Crossings and Important Structures: The components, which increases the project cost, are the presence of the Major bridges, ROBs and other structures. In order to reduce the project cost number of structures and its length were given due consideration while finalizing the alignment.

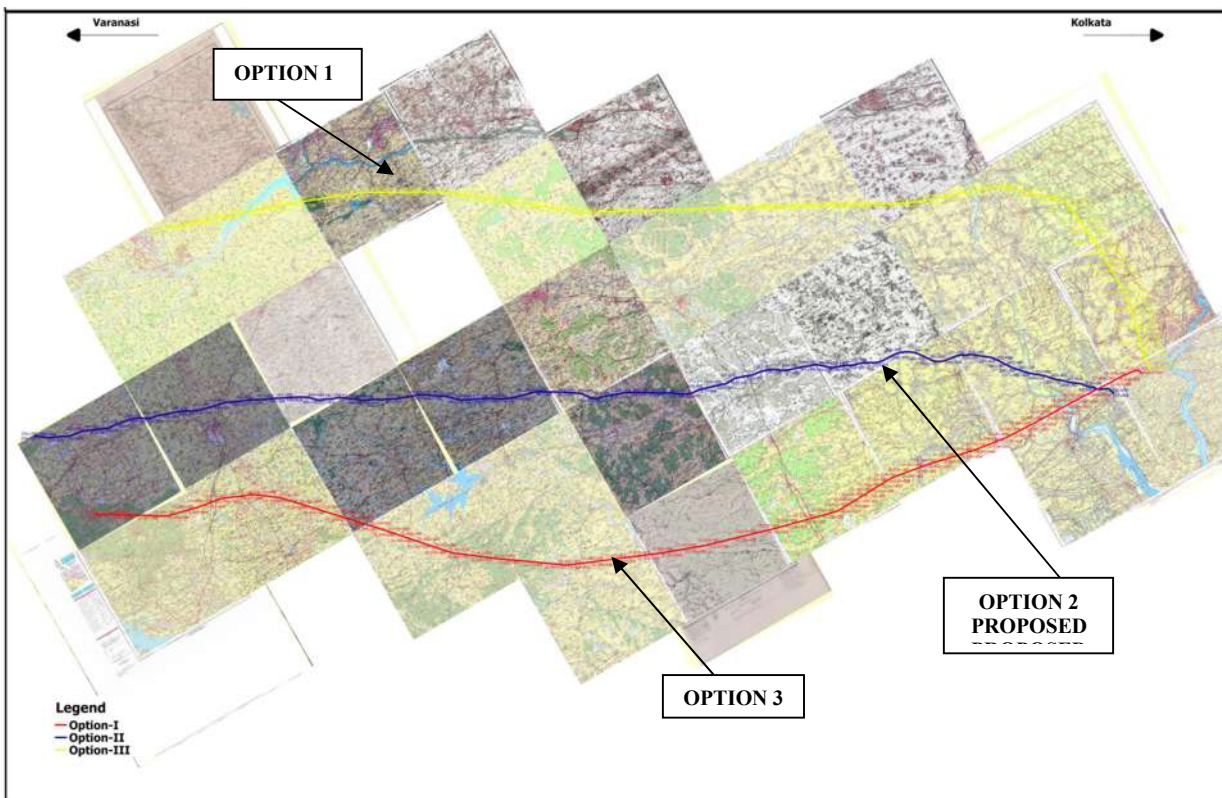


Figure 3-1: Map showing all alignment options

Table 3-1: Comparative statement for all options

S. No	Parameters/Issues	Option 1 (Red)	Option 2 (Proposed final alignment) (Blue)	Option 3 (Yellow)
1	Length (km)	237.1	235.300	237.2
2.	Total land acquired (ha)	2061.9	2078	2083.3
	Govt. land (ha)	615	673.4	595
	Pvt. Land (ha)	1344.9	1294.6	1365.3
	Forest land (ha)*	120	108	123
3.	Area under protected/ important or sensitive species of flora or fauna/Wildlife Sanctuary	The alignment does not pass through any wild life sanctuary, protected area and its eco sensitive zone	The alignment does not pass through any wild life sanctuary, protected area and its eco sensitive zone.	The alignment does not pass through any wild life sanctuary, protected area and its eco sensitive zone
4.	No. of trees	15500	32000 (20000 no. of forest trees and 12000 no. of non-forest trees)	16000
5.	Area under water bodies (ha)*	5.5	16.8	4.5
6.	No. of structure to be impacted due to proposed alignment	645 (include Semi-puca and pucca Structure)	535 (include Semi-puca and pucca Structure)	755 (include Semi-puca and pucca Structure)
7.	No. of families	645	535	755

S. No	Parameters/Issues	Option 1 (Red)	Option 2 (Proposed final alignment) (Blue)	Option 3 (Yellow)
8.	No. of structure to be constructed	Major Bridges – 9 Minor Bridges-25 LVUP- 45 SVUP -35 ROB-4 Fly-5 Intersection-5	Major Bridges-17 Minor Bridges -191 and 11 nos. MNB at Interchange VUP-11 VOP-11 LVUP-71 SVUP-51 Wildlife Underpasses-16 ROB-04 Structure over Gas Pipe Line-2, (Flyover) at MCW-16 and 2nos. flyovers at Interchange location Elevated/Viaducts-8, Box Culverts at MCW -469 and 13 no. at Interchange Elephant Corridors-6	Major Bridges – 10 Minor Bridges-24 LVUP- 55 SVUP -38 ROB-3 Fly-4 Intersection-4
9.	Connectivity	The proposed alignment will be part of Varanasi- Kolkata 4/6 lane expressway will connect city like Varanasi, Bhabhua, Sasaram, Chatra, Hazaribagh, Ramgarh, Ranchi, Bokaro, Purliya, Bankura, Jamshedpur, Kharagpur, Kolkata etc	The proposed alignment will be part of Varanasi- Kolkata 4/6 lane expressway will connect city like Varanasi, Bhabhua, Sasaram, Chatra, Hazaribagh, Ramgarh, Ranchi, Bokaro, Purliya, Bankura, Jamshedpur, Kharagpur, Kolkata etc	The proposed alignment will be part of Varanasi- Kolkata 4/6 lane expressway will connect city like Varanasi, Bhabhua, Sasaram, Chatra, Hazaribagh, Ramgarh, Ranchi, Bokaro, Purliya, Bankura, Jamshedpur, Kharagpur, Kolkata etc
10.	Project cost (cr.)	9355	9250	9325

Based on the above study the following observations are there:-

Option 1 and 3 leads to major impact on flora as more number of trees will be impacted and also extent of forest area is more.

Option 1 and 3 leads to more impact on structure and families as number affected families are high as compared to option 2.

If alignment option 1 or 3 is followed then it will leads to more impacts on Environment & Social components, hence Option 2 is followed

Table 3-2: Analysis of Alternatives

Sr. No.	Factors	Without Project Impacts		With Project Impacts	
		Positive	Negative	Positive	Negative
1.	All weather Accessibility	-	Due to improper drainage system, road may get flooded during heavy rains.	Drainage in some sections will be improved Road will be accessible all along the year since drainage will be improved along all sections.	Only some sections may get good drainage. Due to improper drainage system, road may get flooded during heavy rains.
2.	Road Safety/Accident rate	-	Due to congestion accidents may increase.	With realignment in critical sections, road safety would increase in these sections. Heavily congested areas will	In densely populated/congested areas, accidents may increase.

				be bypassed so less chances of traffic jam/accidents at these section.	Due to congestion accidents may increase at heavily populated areas and at critical road sections.
3.	Transportation/vehicle maintenance /operating cost	-	Increased cost due to heavy traffic at populated/congested areas. And also more wear & tear because of frequent application of sudden brakes.	More comfortable driving at critical sections due to section improvement/realignment Less wear & tear cost, more riding comfort	Increased costs due to more wear & tear at heavily populated/congested areas. Increase in air pollution due to vehicular traffic. And short term increase in dust due to earth work during construction at micro level. Increased cost due to heavy traffic at populated/congested areas. And also more wear & tear because of

					frequent application of sudden brakes.
4.	Travel time / increased speed	-	Travel time is more due to less speed & congestion.	Reduction in travel time and increased speed.	More chances of accidents due to increased speed Travel time is more due to less speed & congestion. No significant change in travel time or speed.
5	Change in Land use pattern	-	-	-	Minor change in land use pattern. Small change in land use pattern. Change in Land use pattern with land diversion from forest to road.

6.	Loss of Property and livelihood	-	-	-	More loss of property & livelihood. Very little loss of property and minor loss of livelihood. Minor Loss of property & significant loss of livelihood due to traffic diversion on bypass.
7.	Change in Environmental quality during construction	-	-	-	Temporary degradation of environmental quality because of vehicular traffic during construction.
8.	Change in Environmental quality after construction Loss of vegetative	-	Project road will further deteriorate and more dust and noise pollution.	Less Noise pollution because of ease in congestion and diversion of traffic through by passes.	Increase in Air pollution due to increased vehicular traffic. No significant change

	cover				
9	Loss of vegetative cover	-	-	Greater loss of vegetative cover than other options.	Loss vegetative cover along the road side will be less. But significant loss of Agricultural land due to bypass. Small amount of vegetative cover loss.
10.	Access to basic facilities such as Markets, schools, Hospitals etc.	-	Difficulty in accessing the basic facilities due to heavy traffic.	Difficulty in accessing the basic facilities due to heavy traffic.	Difficulty in accessing the facilities Easily Accessible as the traffic will be less.

11.	Employment opportunities & local economy growth.	-	Limited business opportunities. Overall development of area will be affected.	Limited business opportunities. Minor increase in business opportunities Faster transportation of Agricultural/commercial/ Perishable goods to prospectus markets. And local employment generation.	
12.	Others	-	Increase in fuel consumption, dust pollution & vehicular emission. And overall economy of the state will be affected.	Minor savings on fuel Consumption. Tourism will flourish (Access to Wadi improved), Improved riding quality & smooth Traffic flow. Will reduce accidents in congested Areas.	Loss of business opportunity in the congested populated area.

CHAPTER 4: DESCRIPTION OF ENVIRONMENT

4.1 INTRODUCTION

The main objective of describing the environment which may be potentially affected, are

- i) To assess present environmental quality and the environmental impacts and
- ii) To identify environmentally significant factors that could preclude development.

Construction activities affect the existing status of environment at site. In order to maintain the existing environmental status at construction site it is essential to study the existing environmental status and assess the impact of upcoming project on various environmental components.

Baseline environmental conditions of air, noise, water, soil, biological and socio-economic environment has been collected. The proposed project as a strip, a radial distance of 10 km is considered as study area for baseline data collection and environmental monitoring. The data has been collected by P & M Solution and its associated laboratories Noida Testing laboratory for various environmental attributes so as to compute the impacts that are likely to arise due to proposed development activity.

4.1.1 STUDY AREA & STUDY PERIOD

The proposed project as a strip, a distance of 10 km within the strip is considered as study area for baseline data collection and environmental monitoring. This area is referred to as study area/ project area in the report. It includes environmental features such as forest areas, conservation areas, water bodies (rivers, lakes ponds and reservoirs), industries, wildlife/National parks and, places of historical importance, tourism etc. The baseline environment quality was carried out during month of **March to May 2024**.

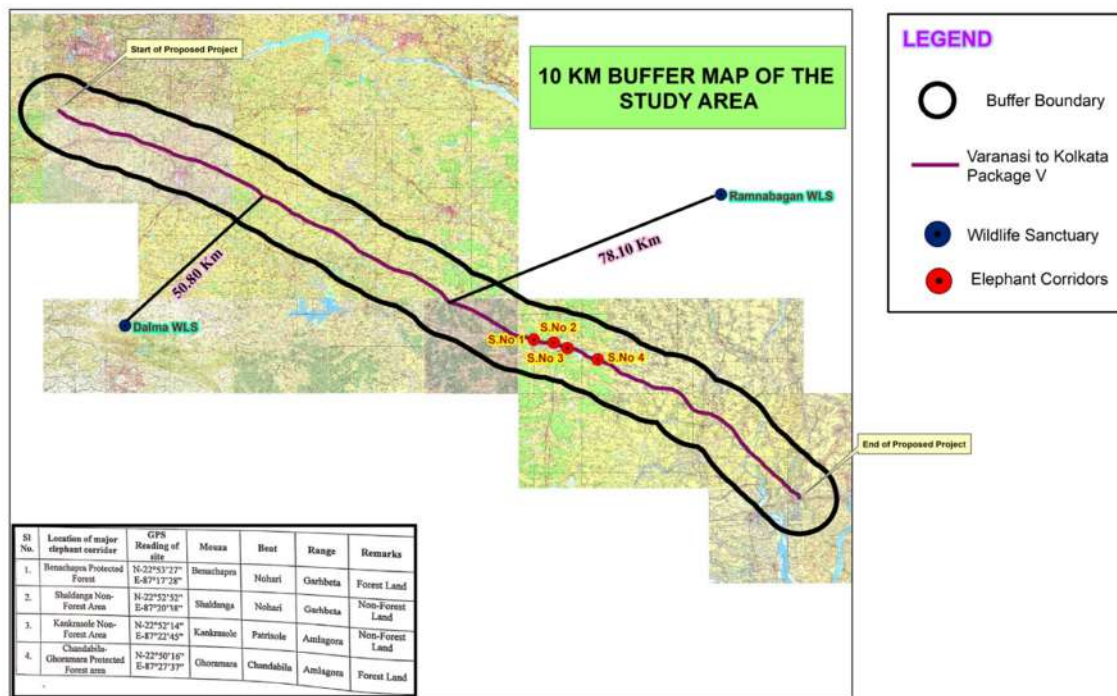


Figure 4-1: Shows that no wildlife is present within 10 km radius of the project area.

4.1.2 SECONDARY AVAILABLE DATA

The secondary data were collected from following sources has been presented in **Table 4-1:**

Table 4-1: Secondary data Sources

1.	Meteorological data	Indian Meteorological Department
2.	Irrigation and hydrogeology data	Central Ground Water Board
3.	General Land use and Cropping Pattern	Agriculture Department
4.	Relief and slope	Survey of India
5.	Rocks and minerals	Geological Survey of India
6.	Industries	District Industries Centre
7.	Maps and Topo sheets	Survey of India
8.	Forest Types, Wild life and Bio-diversity	ate Forest Department, Government of West Bengal.
9.	Archaeological Data	Archaeological Survey of India
10.	Census of India, 2011	Socio-economic data and profile

4.2 PHYSICAL ENVIRONMENTAL SETTINGS

4.2.1 GEOGRAPHY

4.2.1.1 BOUNDARIES AND AREA

Purulia District: The district lies in the south-western part of the state of West Bengal between 22°43' and 23°04' north latitudes and 85°49' and 86°49' east longitudes falling in part of Survey of India toposheet nos. 73 E, 73 I and 73J. Purulia district covers an area of 6259 sq. km. and has population of 2536516.11 is bounded on the north by Bardhaman and Dhanbad (Jharkhand) districts, on the east by Bankura, on the south by Medinipur and Singhbhum (Jharkhand) districts and on the west by Ranchi and Hazaribagh (Jharkhand) districts. The district is subdivided into 3 subdivisions and 3 municipalities, 20 blocks and 170 gram panchayat.

Bankura District: Geographical area is 6884 sq.km. The district is located in the western part of the state and lies between north latitude 22°38' and 23°38' and last longitude 86°36' and 87°46' The district is bounded by Bardhaman district in the north and north-east Medinipur district in the south, Puruliya district in the West and Hugli in the East The district has total 3 Nos. sub- division, namely Bankura, Bishnupur and Khatra, 22 Nos C. D. blocks. 3 Nos Municipalities 190 Gram Panchayets.

Pashchim Medinipur: Geographical area is 9786 sq.km. Paschim Medinipur district is situated in the extreme south western part of West Bengal, bounded by the Latitude 22°57'10" N to 21°36'35"N and the Longitude 88° 12'40" E to 88 25 00" W and covers an area of 9786 Sq. Km (2004-05). The district is bounded by East Medinipur district in the east, Jharkhand West. state in the west, Orissa state in south West, Bankura district in the North, Purulia in North West Hugli and Maora in the north north-east (Plate-1] The district has got 4 Sub-divisions, 29 community development blocks, 29 panchayat samitis, 290 gram panchayat, 27 Policy station and 8 municipalities. The district headquarter is at Medinipur.

Hooghly: Geographical Area: 3149 sq km. Location: The district is located in the eastern part of the State and lies between latitude 22° 39'23" 02'(North) and longitude 87°30'88"30(East). The district is bounded in the East by Baghirathi River. On the North-west by Bankura district, southeast by Puma Medinipur district north by Bardhaman district and south by Haora district. The district is located in the Ganga basin.

Hawrah: Hawrah is the smallest district in West Bengal and it covers an area of about 1474 sq. km. The entire area of the district is occupied by quaternary sediments of Hugli-Bhagirathi River system. It occurs along the River Hugli Damodar, Rupnarayan and their existing tributaries.

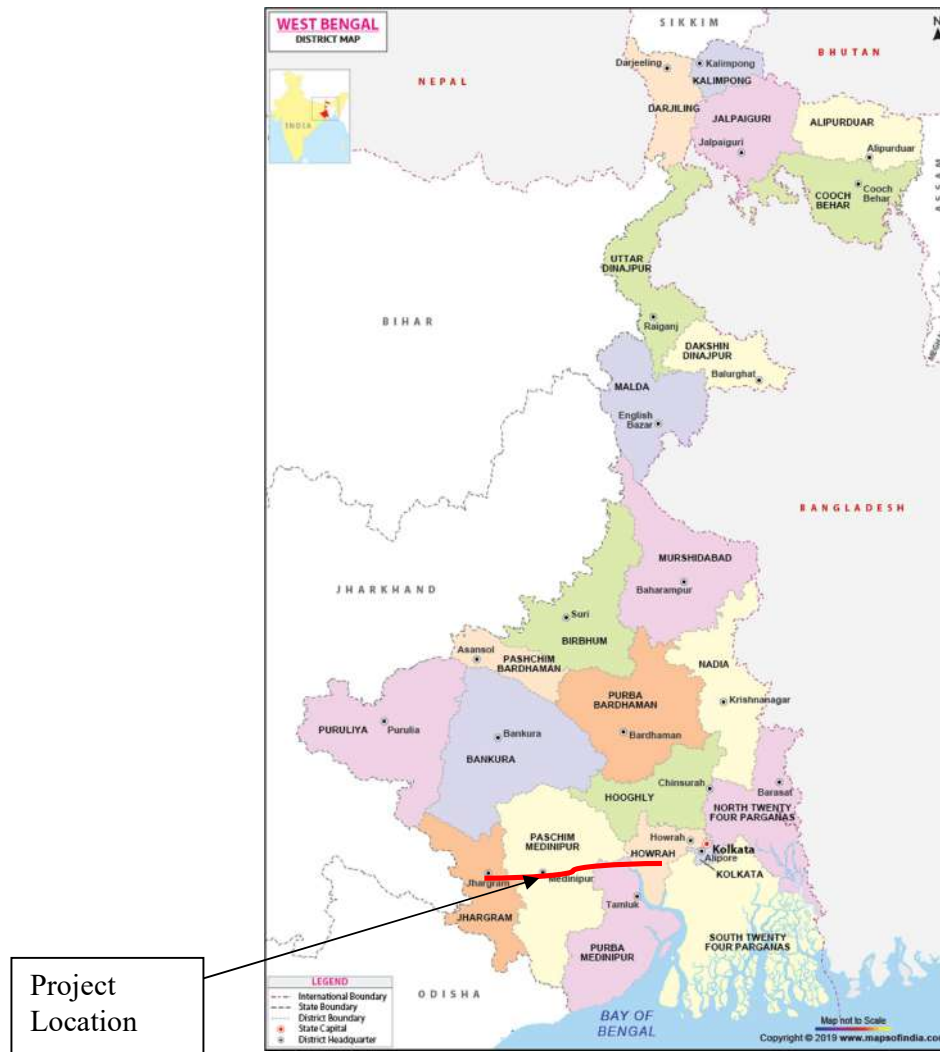


Figure 4-2: Location Map

4.2.1.2 GEOGRAPHICAL LOCATION OF THE PROJECT HIGHWAY

This is a completely new proposed Green Field Alignment where there is no existing road. This road is proposed to connect from Kamalpur village, Jharkhand/WB Border to Uluberia Howrah, WB which will be a part of Bharatmala Pariyojana to improve the efficiency of the Freight movement in India.

The project is starting from Kamalpur village, Jharkhand/WB Border and ends at near Uluberia, Howrah. Total Length: 234.800 km.

The proposed highway starts from Km 387.200 (near Kamalpur village, Jharkhand/WB Border) to Km 622.000 NH-16, near Uluberia, Howrah District, in the state of West Bengal. Geo-Coordinates- Start Location: 23°29'37.35"N, 86°2'32.89"E and End Location: 22°28'15.71"N 87°59'20.11"E.

Project Highway Alignment RoW is 90 m in non-forest Area and 60 m in Forest area. This is a green field alignment, and is proposed for 4/6 Lane.

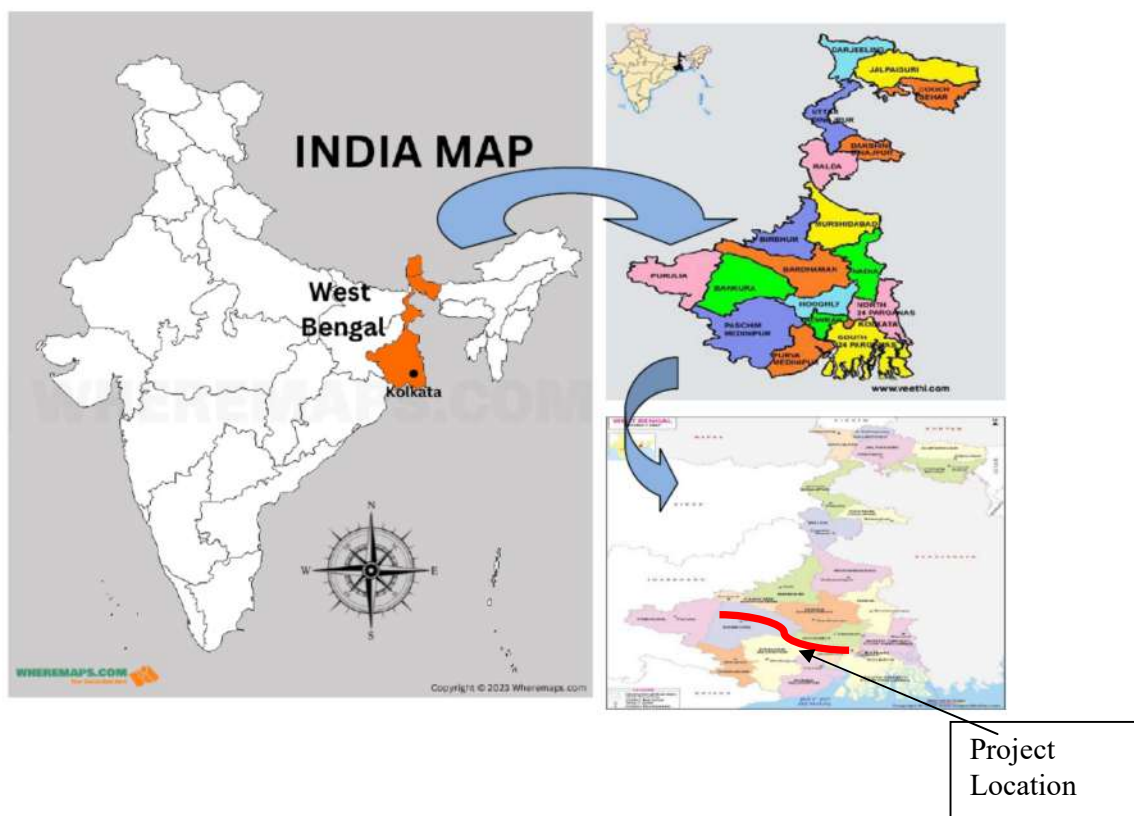


Figure 4-3: Location of project Alignment

4.2.1.3 BASINS & RIVERS & DRAINAGE:

Purulia District: Ground water basin the district is located in the lower part of the Ganga basin. Drainage the river Kasai, Damodar and Subarnarekha are the main perennial rivers of the district. Kasai is the most important river in Purulia which is joined by major tributary Kumri, in the southern part of the district. Darakeswar & Silui or Silabati rivers drain small area in the north eastern and eastern part of the district respectively. The drainage pattern developed in the district is either dendritic or radial.

Bankura District: The main rivers in the districts are Damodar, Darkeswar, Kangsabati, along with their network of tributaries. They have in general a southeasterly flow. The courses of the principal rivers are approximately parallel to each other. The river Darakeswar which flows approximately through the middle of the district and divides into two half.

Pashchim Medinipur: The district is located in the part of Ganga Basin and Subarnarekha Basin. The major rivers are Kasai, Subarnarekha and Rupnarayan. Rivers like Silai, Tamal, Betai, Kubai, Parong, Palasal, Dulung, etc. are the tributaries to the major rivers. Kasai river flows in a meandering course but mainly NW-SE to E-W traverses through Medinipur town and ultimately it meets the Hugli river near Haldia Anchorage in Purba Medinipur District. Rupnarayan river flows along the north-

eastern border of the district marketing its border with the district of Hooghly and Howrah. Subarnarekaha, the other major, enters in the south western part of the district from Mayurbhanj district, Orissa and flows through the towns of Gopiballavpur and Nayagram. It marks the border with Balasore district of Orissa near Dantan and ultimately flows out to the Balassere district of Orissa. Other important rivers draining. The district of Paschim Medinipur e.g. Silainadi passes through the extreme northern past of the district by Garbetta town.

Hooghly District: River Hugli, Damodar, Darakeswar are the main rivers which drain the district.

Howra District: River Hugli, Damodar, Rupnarayan River.

The Project alignment passes through following rivers:

Table 4-2: List of water bodies

S.No.	Name of Type of water bodies
1	Parga Nadi
2	Patloi Nadi
3	Silai Nadi (Bishnupur Branch Canal)
4	Disty No 11
5	Jaipanda Nadi
6	Purundar Nadi
7	Silai Nadi
8	Ghatal Branch Canal
9	Sinkri Nadi
10	Rupnarayan River
11	Mundeshwari River
12	Damodar Kata River
13	Damodar River

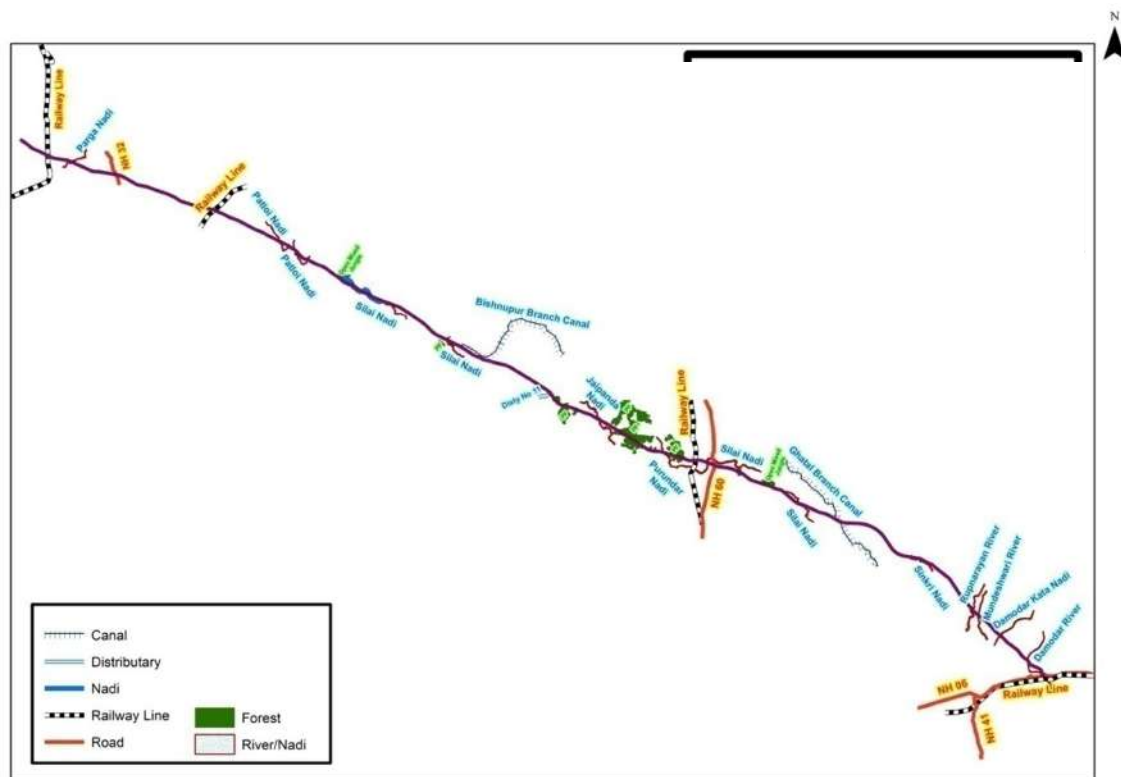


Figure 4-4: Key plan showing water bodies and Forest

4.2.2 LAND USE AND TERRAIN

4.2.2.1 LAND USE

The proposed project exhibits diversity in landuse-land cover owing to variations in the geomorphology, soils, climate groundwater quality and irrigation facilities etc. The landuse-land cover map of the proposed project of length 234.800 km depicts the distribution of forest area, agricultural land, wastelands, and water bodies, built up land, mining area and other land. The major habitations along the highway corridor are Jhalda-II, Jaipur, Purulia-I, Purulia-II, Hura, Pancha, Indpur, Taldangra, Simlupal, Garbeta – I, Chandrakona – II, Chandrakona – I, Ghatal, Khanakul-II, Amta-I, Bagnan-I. The project area is located in the state of West Bengal. Topography of the project area is situated in eastern India, covering much of West Bengal is part of gangatic flood plain and majorly chhotta Nagpur Platues. The topography in the proposed project area is mainly plain and rolling area. The areas have an elevation ranging from 338ft to 1101 ft.

4.2.2.2 LAND COVER

The land use map for a buffer length of 1 km around the proposed project has been prepared to a scale of 1:25000 based on recent satellite imagery. It shows features such as crop lands, agricultural plantations, fallow lands, waste lands, water bodies, built-up areas, forest areas and other surface

features such as railway tracks, roads and ground survey map on 1:2000 scale showing the existing features falling within the right of way namely trees, structures including archaeological & religious, monuments etc.

Table 4-3 describes the land use of the study area. The land use map based on satellite imagery within 1km buffer length of the proposed project has been shown in **Figure 4-5**

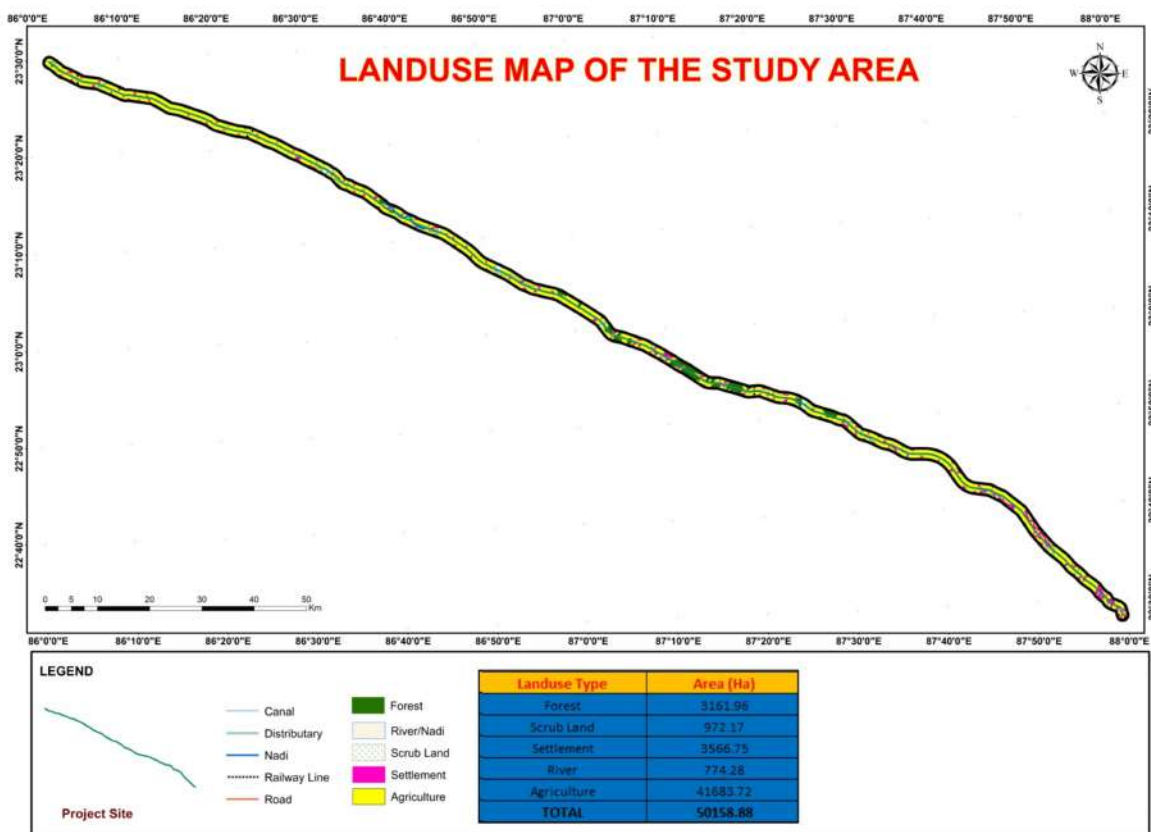


Figure 4-5: Land uses Map of the study area within 1 km

Table 4-3: Land use of the Study Area (1 Km)

S.No.	Particulars	Area (Ha)	Percentage (%)
1	Forest	3161.96	6.304
2	Scrub land	972.17	1.94
3	Settlement	3566.75	7.12
4	River	774.28	1.54
5	Agriculture	41683.72	83.11
	Total	50158.88	100

4.2.3 SEISMICITY

Proposed alignment falls under Seismic Zone III. Zone-III is moderately stable. The project corridor thus is in a zone of stability and proposed highway is located in Moderate Damage Risk as per Wind and Cyclone Hazard Classification of India.

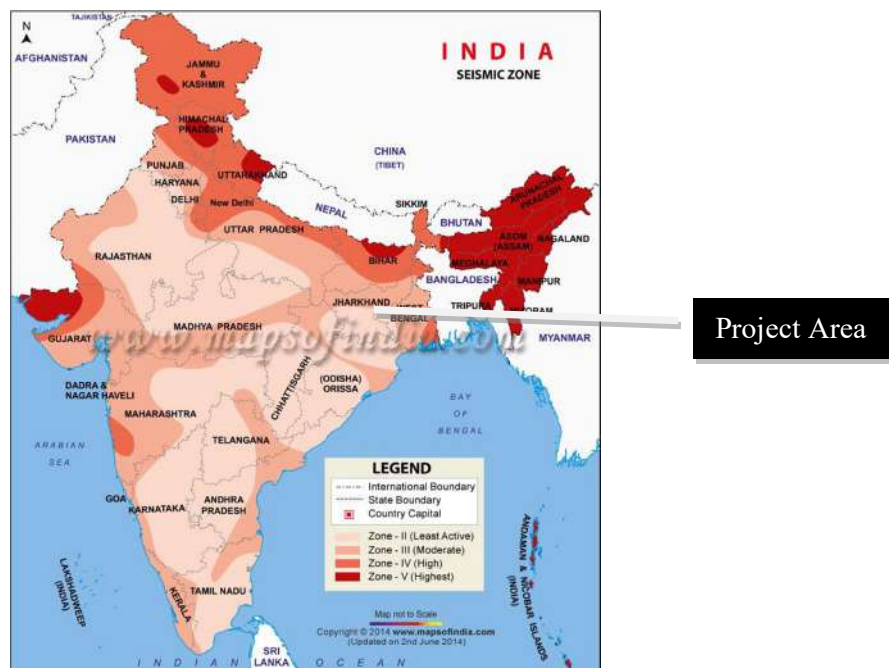


Figure 4-6: Hazard map of the areas covered in the project road

4.2.4 CLIMATE AND MICRO-METEOROLOGICAL PARAMETERS

4.2.4.1 RAINFALL & CLIMATE

Purulia District: Rainfall The district has a dry tropical climate marked by a moderately cold winter and highly oppressive summer. The normal annual rainfall in the district is about 1322 mm. The main source of rainfall in the district is the south west monsoon, which accounts for 80% of the total rainfall. However because of the high run off factor, western and south western parts of the district are affected by draught. Winter in the area lasts from November to February. Temperature of the atmosphere ranges between 4°C to 13°C. Atmospheric temperature during summer ranges between 38°C to 48°C. Summer lasts from late March to 10 June. Humidity in the area varies between 70 to 85%. Dry, hot wind in summer blows across the district with velocity ranging between 5-6km/hr.

Bankura District: Normal annual rainfall is 1300 mm with 1040 mm normal monsoon rainfall average maximum temperature is 44°C and minimum temperature is 8°C respectively.

Pashchim Medinipur District: Normal rainfall of the district is 1542mm of which monsoon rainfall for 4 months from June to September contributes 71.5%. Normal monsoon rainfall is 1178mm and normal non-monsoon rainfall is 364mm. The extreme north-western part of the district i.e Birpur II

and Jamboni Blocks experiences inadequate and irregular rainfall and suffers from tremendous water shortage specially during summer months. The district experiences a humid sub- tropical type of climate with minimum and maximum temperature varying from 7°C in the winter to 45°C in summer respectively. Humidity in this district is quite high particularly in the monsoon months and shows an upward trend from January onwards. It ranges for about 52-88 Percent.

Hooghly District: The annual nonnal rainfall is of the lune of 1477 mm. The district is characterised by humid climate. It receives adequate rainfall from South-West monsoon, which sets in the later half of June and withdraws by the middle of October. Premonsoon rains are received during March-April. Max. and Min. Temp as recorded is 43 and 07 degree centigrade.

Howra District: The average annual rainfall in the district is 1245.06 mm. The variations in the annual rainfall within the district and from year to year not large. The district receives a mean annual rainfall varying from 948.20 mm to 1489.3 mm.

4.2.5 GEOMORPHOLOGY AND SOIL

4.2.5.1 GEOMORPHOLOGY

Purulia District: The district is characterized by undulating topography with rugged hilly terrain in the western and southern part. The general elevation of the land surface ranges between 150m and 300m. The master slope of the land surface being towards the east and the south east. The district can be subdivided physiographically into two distinct units. The one is hilly terrain in the western and southern part, where Ajodhya, Gargaburu, Raika Pahar, Churni Pahar, Aral Dungri and Gurma Pahar are some of the important hills. The other one is the undulating plain with isolated mounds and hills, which comprises 70% of the total area of the district. Important hill in this terrain are Panchet hill, Tilaboni, Ramchandrapur, Barberia, Jaichandipahar, Maguria etc.

Bankura District: There are three distinct geomorphic units with characteristic morphological assemblages, these are-

- a) The hilly terrain in the West: It is covered by crystalline rocks of Achaean age, characterized by hillocks, low ridges and valleys. Susunia hills (493 m) and Biharinath hills (447.8 m) are the highest surface elevation of the unit. The land slope of this unit ranges 10- 20 m/km, towards southeast. There are other small hills like Mejhia, Karo around Gangajalghati block and in other blocks e.g. Khatra Ranibandh, Raipur. The average elevation of these hills in the area ranges between 100-150 m, above mean sea level. The entire geomorphic unit is the continuation of Chotonagpur plateau.
- b) The eastern Plain Land: The eastern part of the district comprising the blocks of Bishnupur, Kotalpur, Indus etc. is flat land which promotes intense cultivation. The surface elevation of this unit ranges between 10-50 m above mean sea level with gentle slope of less than 10 m/km towards southeast. At places the flat land shows dissected type of topography and is devoid of natural swamps.

or lakes. The marginal undulating tract: This is relevant in the central part of the district where hilly terrain of the western part slowly merges into plain alluvial land. This geomorphic unit is favourable for the growth of forest area in the district. The morphology of this unit, presents highly dissected topography where the average surface elevation is of the order of 100 m above mean sea level and the surface slopes with a gradient of 10-20 m/km towards south east.

Pashchim Mednipur District: Geomorphological setting of Paschim Medinipur district can be divided into three units: i) hard rock terrain with extremely rugged topography in the north western part of the district, occasionally covered by laterites. ii) Laterite covered platform sedimentary areas underlain by deposits of older alluvium bearing rolling plains and iii) more or less flat alluvial plain of Recent age to the east and south east. The district presents a gradually sloping topography. The highest altitude is 132 m above M.S.L. near Daspur in the east and 18.06m above M.S.L. near Sansankha in the south east.

Hooghly District: The district has not to slightly undulating alluvial terrain. It can be divided into two (2) geographic units :

1. Older alluvium
2. Recent alluvium

Howra District: Geomorphological characteristic of a river is foremost factor for annual deposition of sedimentary load.

4.2.5.2 AGRICULTURE

Principal Crops of Project area

Rice is considered to be the principal food crop of West Bengal. Other major food crops include maize, pulses, oil seeds, wheat, barley, potatoes and vegetables.

4.2.5.3 SOIL TYPES

Purulia District: Soil in the district are in general of the residual type derived from the weathering of the Archaean granites, gneisses and schists. Lateritic soil prevails in the uplands whereas in the valleys reddish clay loam or white to reddish clay are common. Many textural classes are met with, such as sandy loam, reddish loam, white or reddish stiff clay etc. because of the undulating nature of the topography the soil cover is thin and the soil is generally gravelly. Almost in the entire district soil is acidic and the fertility is low.

Bankura District: Soil of Bankura district can be broadly grouped into three principal types viz. a) Red soil, b) Alluvial soil, 3) Lateritic soil. The typical red soil has limited distribution in the south central-south eastern, and south western parts of the district around Bishnupur, Kotalpur & Raipur respectively the alluvial soil have wide distribution in the east-central and south eastern parts of the district. The older alluvial soils are also a predominant type and this group of soil is unaffected by floods

and siltation and show prolific development, where as the younger or newer alluvial, found mostly in the Damodar flat land areas, are enriched by silt deposition during floods. The lateritic soil have wide distribution in south central to the south western part of the district. According to the textural types, soils of the district can be classified under the following types- 1) Sands, 2) Sandy Loam, 3) Loam, 4) Sandy Clay Loam, 5) Clay Loam. 6) Clay, clay dominated loam and loamy soils are mostly confined to the flood plain of the Damodar and Darakeswar River through sporadic occurrences. These types of occurrences also seen in small river valleys. The district as a whole is covered generally by Sandy Loam soil.

Pashchim Mednipur District: The soil of Pachim Medinipur district is mainly divisible in two groups, namely the Laterite soil and the alluvial soil. The extreme north-western part of the district is covered by transitional soil which is intermediate between colluvial (greissic) soil and laterite soil. Laterite is widely developed in the upland part of the district covering more than two-third area of the district. The alluvial soil covers in the eastern part of the district from around Chandrakona in the north and Keshpur-Debra.

Hooghly: Depending upon the soil types the district is divided in two separate zones. 1. Entisols-It comprises mainly younger alluvial soils, which occupy mostly the entire part of the district. It is yellowish brown in colour with brown concretion at lower depth.

2. Alfisols: It comprises of older alluvial soils. This type of soil is confined mainly to the western extremity in parts of Goghat-II block of the district. It is dark brown to greyish brown in colour

Howra: Silty Clay and Sandy Loam.

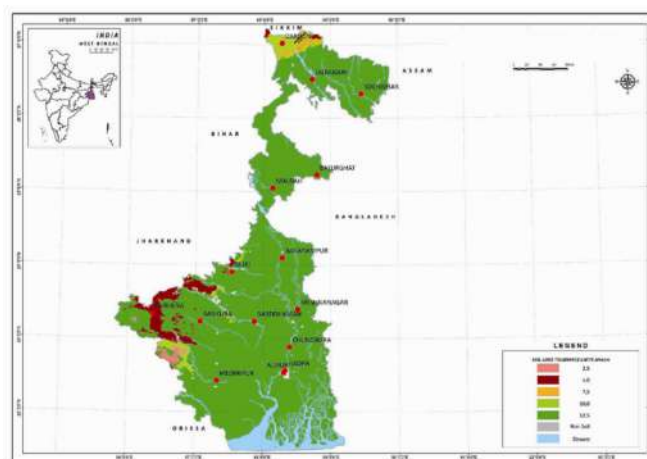


Figure 4-7: Soil Moisture Map of West Bengal showing Project Area

4.2.6 SOIL CHARACTERISTICS

4.2.6.1 FIELD STUDY AND SAMPLING LOCATIONS

For studying soil quality 8 Nos. of sampling location was selected to assess the existing soil conditions in and along the project alignment representing various land use conditions during March 2024 to May 2024. The sample was collected by ramming a core-cutter into the soil up to 90-cm depth. The sample collection, preservation, storage, transportation and analysis were carried out as per the standard methods. The soil samples after collection were immediately subjected to the analysis of various parameters in the NABL Accredited laboratory. The details of the soil sampling locations have been presented in **Table 4-4** and **Figure 4-8**.

Table 4-4: Soil Sampling Locations

S.No.	Sample Code	Location	Chainage	Latitude	Longitude
1.	SQ 1	Guridih	377+900	23°28'58.68"N	86° 3'15.72"E
2.	SQ 2	Ramamoti	394+300	23°26'7.24"N	86°12'14.68"E
3.	SQ 3	Haritard	435+900	23°16'39.97"N	86°34'17.93"E
4.	SQ 4	Mauladanga	476+300	23° 5'18.94"N	86°54'12.52"E
5.	SQ 5	Karakanali	499+100	22°59'0.56"N	87° 5'21.66"E
6.	SQ 6	Maheshpur	537+200	22°49'31.36"N	87°29'21.65"E
7.	SQ 7	Konnagar	576+500	22°39'41.79"N	87°44'8.36"E
8.	SQ 8	Chandrapur	611+816	22°28'8.86"N	87°59'19.59"E

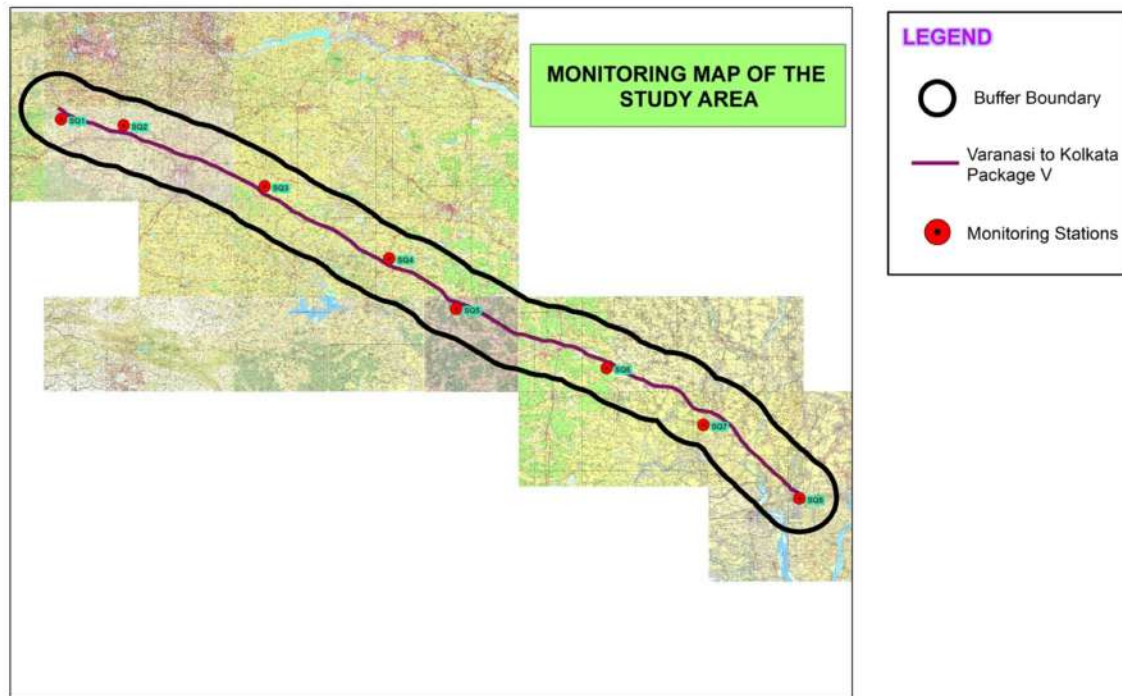


Figure 4-8 Soil Sampling Locations

4.2.6.2 SOIL QUALITY ALONG THE STUDY AREA

All these soil samples were collected along the proposed highway and analysed for the physical, chemical properties and heavy metal concentrations. They were assessed for agricultural and afforestation potential. The characteristic of the soil along the highway has been presented in **Table 4-5**.

Table 4-5: Soil Analysis report

		Location	Guridih	Ramamoti	Haritard	Maula danga	Karakanal	Maheshpur	Konnagar	Chandrapur
Sr. No.	Parameters	Units	Results	Results	Results	Results	Results	Results	Results	Results
1	pH	-	7.80	7.42	7.28	7.66	7.50	7.58	7.15	7.21
2	Conductivity	mhos/cm	362.0	372.0	384.0	376.0	368.0	390.0	380.00	380.00
3	Sodium (as Na)	mg/kg	262.0	274.0	258.0	270.0	254.0	280.0	256.25	282.98
4	Water holding capacity	%	40.02	37.04	44.14	32.28	34.08	35.10	32.18	32.54
5	Potassium (as K)	mg/kg	186.20	151.02	142.22	134.00	160.10	136.4	178.21	125.29
6	Sand	%	68.0	66.0	66.0	67.0	65.0	67.0	68.00	66.00
7	Clay	%	23.0	25.0	24.0	21.0	23.0	22.0	19.00	18.00
8	Silt	%	9.0	9.0	10.0	12.0	12.0	11.0	13.00	16.00
9	Calcium (as Ca)	mg/kg	460.02	392.04	484.02	366.0	426.0	490.0	451.98	583.00
10	Magnesium (as Mg)	mg/kg	136.02	94.06	164.0	170.0	258.0	206.0	167.40	267.12
11	SAR	-	0.98	0.94	0.86	0.92	0.96	1.22	0.94	1.09
12	CEC	eq/100gm	2.26	2.14	2.50	2.84	2.66	2.36	2.87	2.46
13	Phosphorus (as P)	mg/kg	12.20	13.04	10.04	11.32	12.68	10.02	10.53	11.32
14	Organic carbon	%	0.50	0.36	0.44	0.46	0.52	0.48	0.48	0.45
15	Porosity	%	40.02	38.32	46.10	42.12	44.08	50.02	42.91	41.78
16	Permeability	cm/hr	1.86	1.92	1.68	1.72	1.56	1.60	1.72	1.81
17	Bulk Density	kg/cm ³	1.52	1.56	1.68	1.54	1.44	1.38	1.45	1.63
18	Total Kjeldahl Nitrogen (TKN)	%	0.036	0.030	0.024	0.038	0.028	0.042	0.022	0.026

4.2.6.3 INTERPRETATION OF RESULTS

Physical characteristics of soil were characterized through specific parameters viz bulk density, porosity, water holding capacity, pH, electrical conductivity and texture. Soil pH plays an important role in the availability of nutrients. Soil microbial activity as well as solubility of metal ions is also dependent on pH. In the study area, variations in the pH of the soil were found to be slightly neutral to phosphorus (10.02 to 13.04). Electrical conductivity (EC) is a measure of the soluble salts and ionic activity in the soil. In the collected soil samples the conductivity ranged from 362.0- 390.0 $\mu\text{mhos/cm}$. Water holding capacity from 32.18 to 44.14 (%) by mass. Manganese was highly dominant amongst all the metals present and varied from 94.06 to 267.12mg/Kg. The soils with low bulk density have favourable physical condition where as those with high bulk density exhibit poor physical conditions for agriculture crops.

Table 4-6: Standard Soil Classification of Soil

S.No.	Parameters	Classification
1	pH	< 4.5 extremely acidic
		4.51 -5.0 very strong acidic
		5.01-5.5 strongly acidic
		5.51-6.0 moderately acidic
		6.1-6.5 slightly acidic
		6.51-7.3 Neutral
		7.31-7.8 slightly alkaline
		7.81-8.5 moderately alkaline
		8.51-9.0 strongly alkaline
		> 9.0 Very strongly alkaline
	Salinity Electrical Conductivity (mho/cm) 1 mho/cm = 1 ds/m	Upto 1.0 average
		1-2 harmful to germination
		2-3 harmful to crops
	Nitrogen (kg/ha)	Up to 50 very less
		51-100 less
		110-150 good
		151-300 better
		> 300 sufficient
	Phosphorus (kg/ha)	Up to 15 very less
		15-30 less
		31-50 medium
		51-65 on average sufficient
		66-80 sufficient
		>80 more than sufficient
	Potassium (kg/ha)	0-120 very less
		120-180 less
		180-240 medium
		241-300 average
		301-360 better
		>360 more than sufficient

4.2.7 GEOLOGY & HYDROGEOLOGY

4.2.7.1 GEOLOGY

Purulia District: The district is underlain by Pre-Cambrian metamorphics except in a small area in the northeastern part where sedimentary of Gondwana age predominate. Unconsolidated sediments of Recent to Sub-Recent age are restricted to the narrow river channels and to the valleys. The most common rock of widespread occurrence in the district are granites and granite gneisses into which Meta basics occur as intrusive.

Bankura District: Bankura is one of the districts of Burdwan division. It is situated between 22° 38' and 23° 38' north latitude and between 86° 36' and 87° 46' east longitude. It has an area of 6,788 square kilometres 2,621 sq m

Pashchim Mednipur District: The Paschim Medinipur district is covered by the Quarternary unconsolidated formations which are mainly divisible into two units: i. Platforms sediments mainly covered by Laterite forming upland area ii. Recent sediments forming plain area The Laterite upland area are underlain by a thick sequence of Clay, Silt, Sand and various grades and gravel down to the depth of 350 m. The quarternary formation comprises newer alluvium of recent age and older alluvium of Pleistocene age.

Hoogly District: Hugli district is situated in the stable Shelf zone in the western flank of Bengal Basin, Archaean crystalline basement, Gondwana sediments and Rajmahal volcanics of Mesozoic age flank this part of Bengal Basin to the west and northwest. The district is covered by a huge thickness of Quaternary alluvium underlain by Tertiary and Mesozoic formation (Biswas 1959). The sequence of sediments encountered in the borehole drilled under the Stanvac Project in Bardhaman district in the immediate vicinity of Hugli district reflects the change of an initially marine to estuarine depositional environment through a deltaic phase to finally a fluvial framework. Thick flows of basalt encountered at more than 2500m depth. On the surface two types of alluvium of Quaternary age are found - Older Alluvium and Newer Alluvium. Older alluvium mixed with kankar and laterite forms the higher ground in a limited area falling in northwestern part of the district in Goghat block. The rest of the district is covered by Newer alluvium comprising sands of various grades with occasional gravels, clay, kankar and silt. Subsurface structural feature of significance in this stable shelf zone is characterized by regionally homoclinal sedimentary sequence gently dipping towards ESE. The eastern part of the second zone is marked by normal faulting which passes through Arambagh and further eastwards towards Chinsurah there is complete absence of structural features.

Howrah District: Haora district is underlain by unconsolidated Quaternary alluvium laid down by the South flowing Bhagirathi-Hugli river System. The alluvial sediments in the form of flood Plain

deposits consist of the sands of various grades, silt and clay with occasional gravel beds. The sands are fine to coarse grained and sub-rounded. Immediately below the land surface a thick layer of sticky clay ranging in thickness between 30-70 m and often broken either by sand lenses or silt is encountered. Exploratory drilling carried out in parts of the district has revealed the presence of clay bed even around a depth of 300 mbgl. Which continues even beyond a depth of 548 m bgl. Apart from persistence of clay beds at deeper levels, the exploration has also brought to light occurrence of potential and fresh aquifer zones of considerable thickness down to a depth of 300 m bgl.

4.2.7.2 HYDROGEOLOGY

Purulia District: The district of Purulia is underlain by pre-Cambrian metamorphics except in a small area in the north eastern part where sedimentary of Gondwana age predominate. At place particularly in the eastern and southern parts- quartzite, slate, phyllite, schist also occurs in patches. Unconsolidated sediments of Recent to Sub-Recent age are restricted to the narrow river channels and to the valleys. The most common rock of widespread occurrence in the district is granites and granite gneiss into which metabasics occur as intrusives.

Bankura District: A number of flowing tube wells exist along with the banks of the Dwarkeswar, Jaipanda and Silai rivers. These tube wells are of 30-75 m deep (38-50 mm dia.) and free flow discharge to the tune of 23-30 lpm along Dwarkeswar river, and both the banks of Jaipanda river in Taldangra block and Bishnupur block, the depth of existing auto flow tube well ranges between 45-75m and free flow discharge ranges between 126-252 lpm, the pressure head maximum recorded as 1.10 m bgl. These wells are used for small scale irrigation purpose.

Pashchim Mednipur District: As per the CGWB report, the district Paschim Medinipur displays diversified hydrogeological characters that do not have resemblance with the planes. Based on geology and mode of occurrence of groundwater the underline area of the district has been divided into two sectors (i) western sector covered by crystalline rocks of Paleo-Proterozoic age and (ii) Eastern sector covered by Recent Alluvium of Upper Pleistocene to Holocene age.

Hoogly District: In Hooghly District the alluvium in the area forms a rich repository of ground water. Each aquifer system consists of two to three aquifers separated by thin clay layers, which are not regionally extensive. The material of the shallow aquifer is fine to medium grained sands in the upper part and coarser in the lower part. Generally the first aquifer is restricted within 60 to 80mbgl depth.

Howrah District: The aquifer occurs in the depth range of 14-300 m bgl. The sand horizon is separated by impervious clay layers. Amongst 14 blocks of the district, in 5 blocks ground water occurs under water table condition and is fresh down to the explored depth of 350 m bgl whereas in 9 other blocks ground water occur under semi confined to confined condition. The ground water in

aquifer down to 160 m bgl are brackish to saline in nature (EC 590 – 6560 μ S/cm) and the ground water in the aquifer below 160 m down to 300 m is fresh in nature

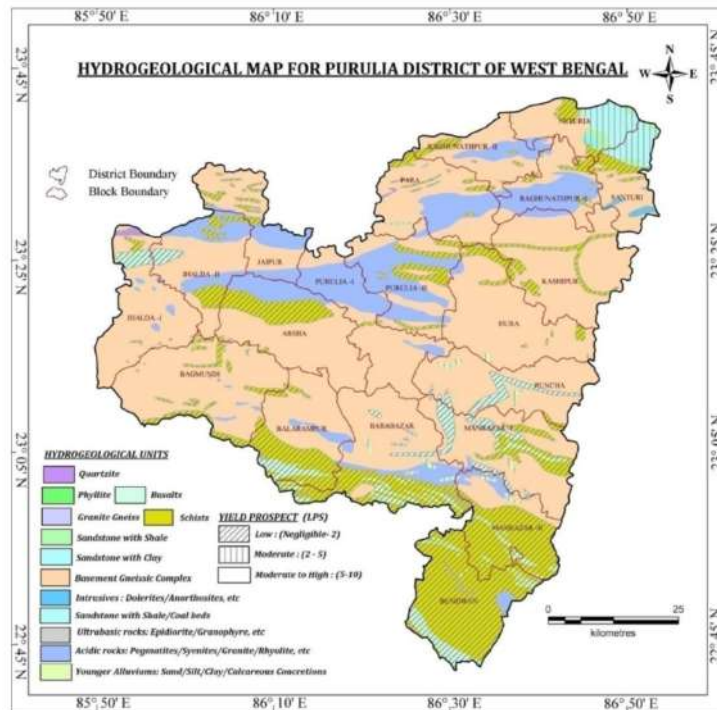


Figure 4-9: Hydrogeological Map of Purulia District

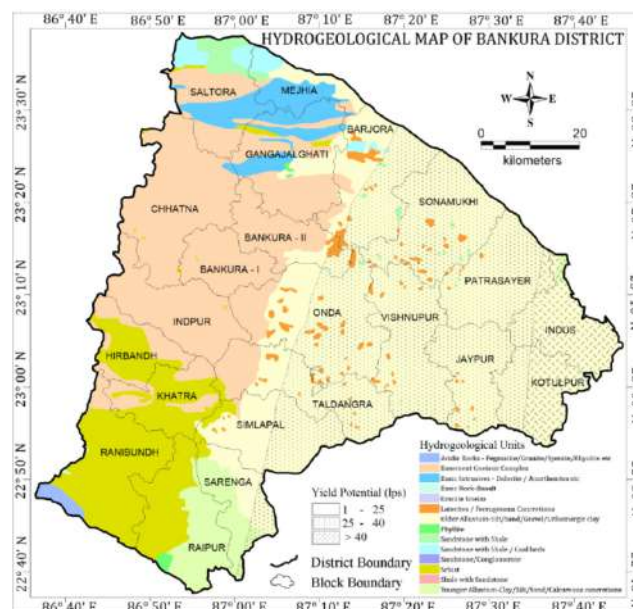


Figure 4-10: Hydrogeological Map of Bankura District

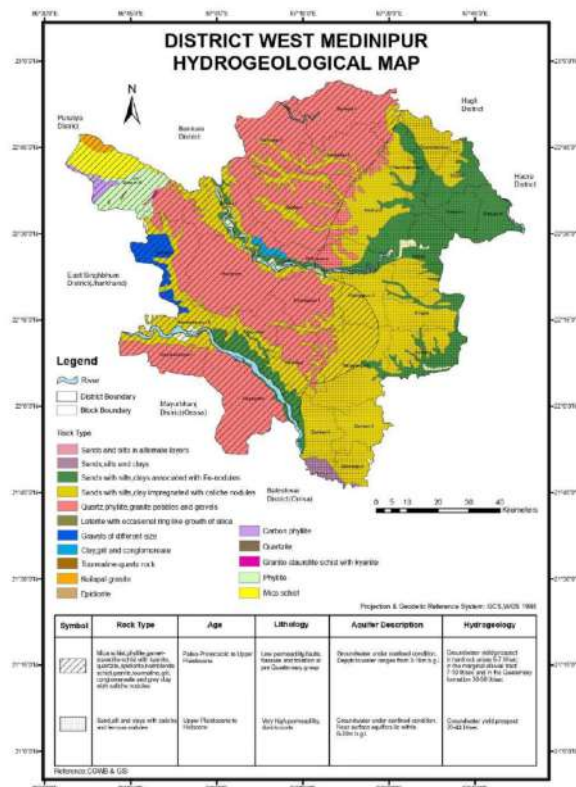


Figure 4-11: Hydrogeological Map of Pashchim Mednipur District

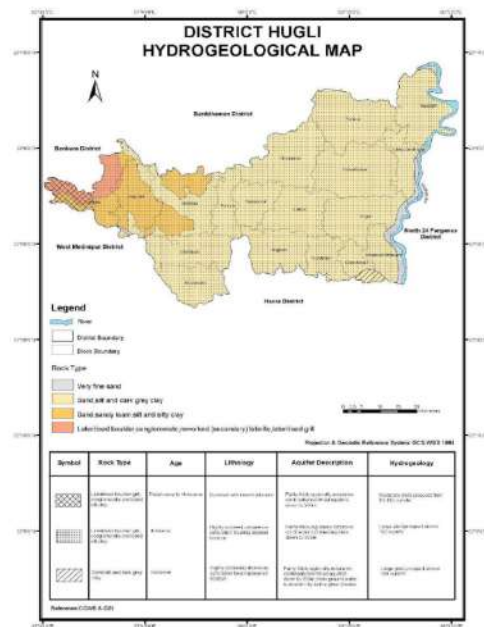


Figure 4-12: Hydrogeological Map of Hoogly District

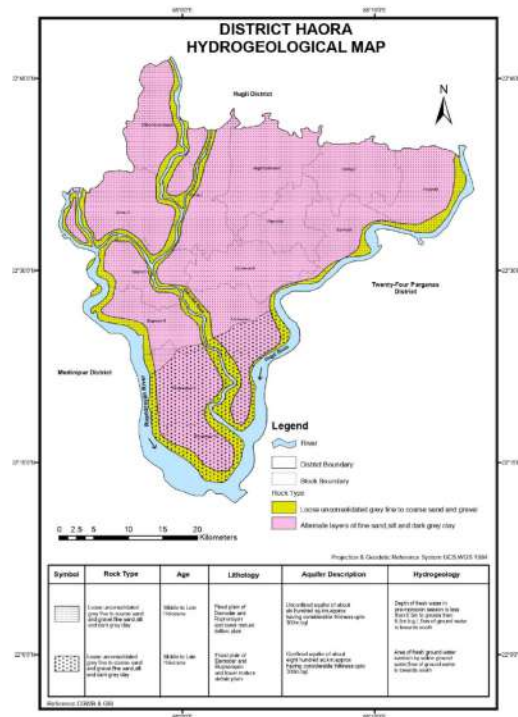


Figure 4-13: Hydrogeological Map of Hawarh District

4.2.7.2.1 DEPTH OF WATER LEVEL

Purulia District: Water level during **pre-monsoon period** mainly varies between 4.32-11.68 m below ground level in the major part of the district.

During post monsoon periods, water level mainly varies between 2.07-5.60 m below ground level in the major part of the district.

Bankura District: Water level during **pre-monsoon period** mainly varies between 5 -13.28 m below ground level in the major part of the district.

During post monsoon periods, water level mainly varies between 2-5 m below ground level in the major part of the district.

Pashchim Mednipur District: During **pre-monsoon season**, the minimum and maximum water levels were observed as 1.18 and 17.70 m bgl respectively. The water level measurement during **post-monsoon season** ranges from 1.28 to as deep as 11.18 m bgl.

Hoogly District: During **pre-monsoon season**, the minimum and maximum water levels were observed as 0.04 and 18.69 m bgl respectively. The water level measurement during **post-monsoon season** ranges from 0.39 to as deep as 14.75 m bgl.

Howrah District: During **pre-monsoon season**, the minimum and maximum water levels were observed as 0.04 and 18.69 m bgl respectively. The water level measurement during **post-monsoon season** ranges from 0.39 to as deep as 14.75 m bgl.

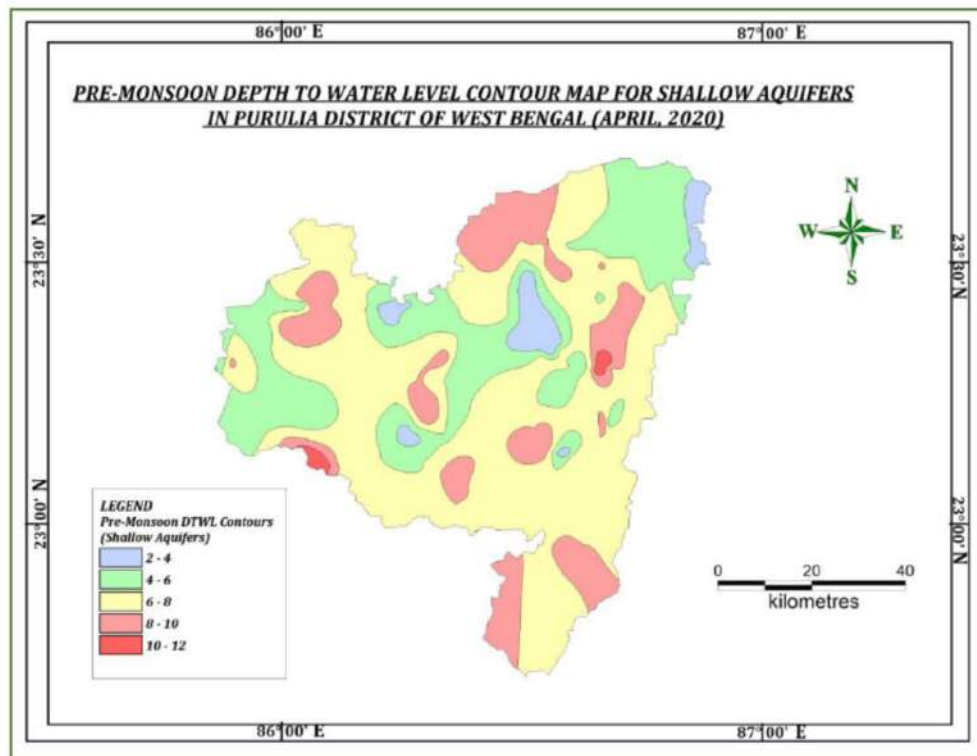


Figure 4-14: Pre-monsoon depth of water level (Purulia District)

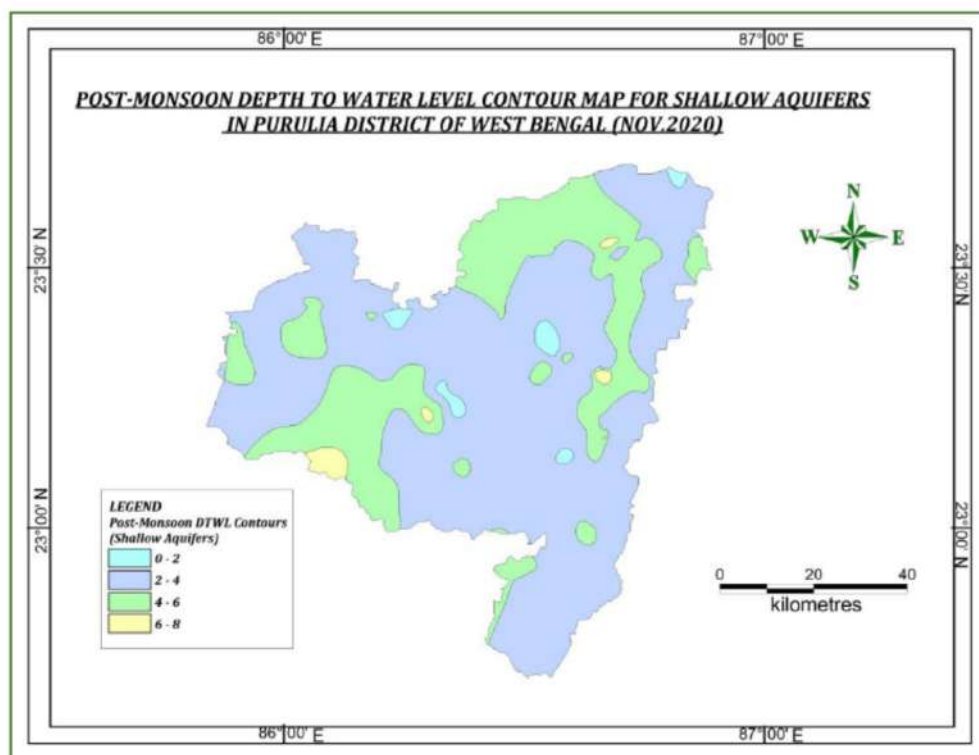


Figure 4-15: Post-monsoon depth of water level (Purulia District)

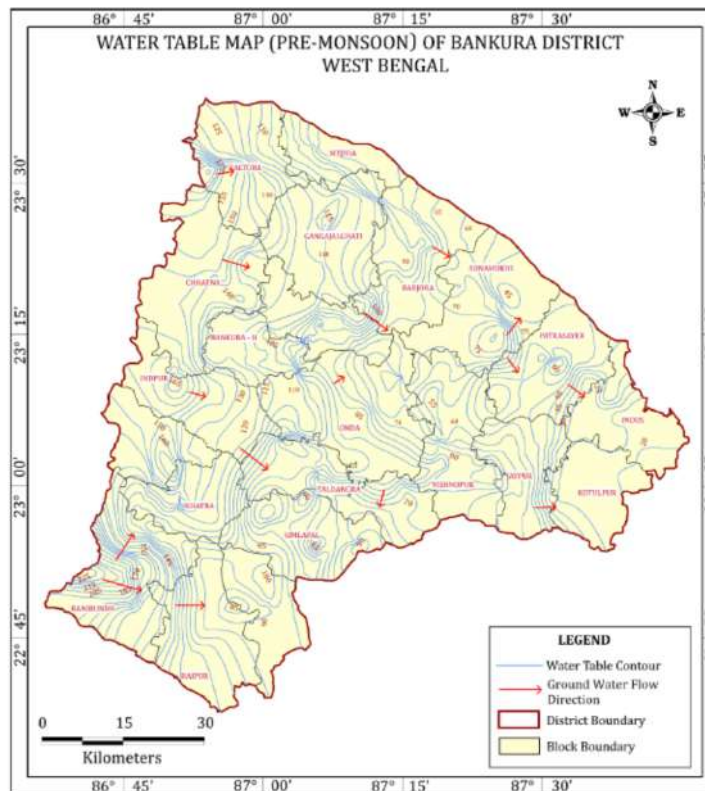


Figure 4-16: Pre-monsoon depth of water level (Bankura District)

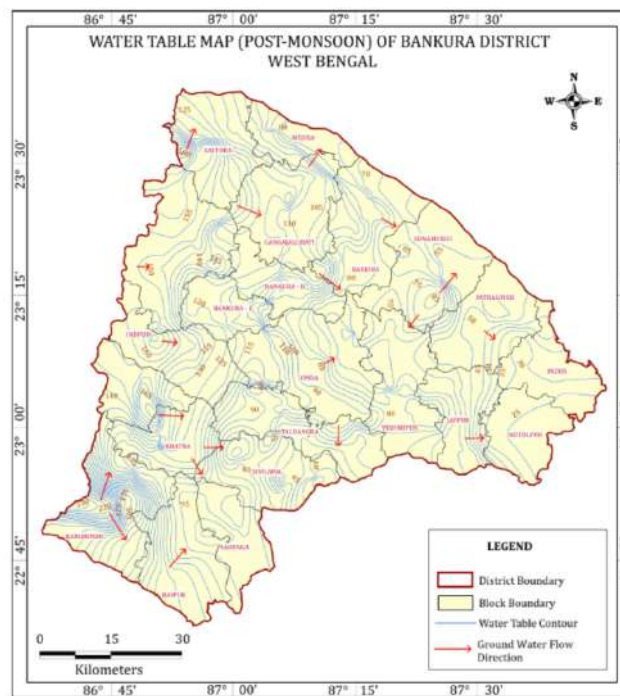


Figure 4-17: Post-monsoon depth of water level (Bankura District)

4.3 WATER ENVIRONMENT

Water quality assessment is one of the essential components of EIA study. Such assessment helps in evaluating the existing health of water body and suggesting appropriate mitigation measures to minimize the potential impact from development projects. Water quality of ground water has been studied in order to assess proposed water-uses in construction, drinking, cooling and horticulture purpose.

4.3.1 STREAMS/CANALS/NALAS/WATER BODIES AND BRIDGES CROSSINGS THE PROPOSED ALIGNMENT

Table 4-7: List of water bodies crossing the project alignments

S.No.	Name of Type of water bodies
1	Parga Nadi
2	Patloi Nadi
3	Silai Nadi (Bishnupur Branch Canal)
4	Disty No 11
5	Jaipanda Nadi
6	Purundar Nadi
7	Silai Nadi
8	Ghatal Branch Canal
9	Sinkri Nadi
10	Rupnarayan River
11	Mundeshwari River
12	Damodar Kata River
13	Damodar River

4.3.2 GROUND WATER QUALITY

8 no. of Samples of ground water were collected from existing hand pumps, open wells and Tube-wells and analysed for parameters necessary to determine water quality (based on IS: 10500 criteria) and those which are relevant from the point of view of environmental impact of the proposed highway project in **March 2024 to May 2024**.

The locations of the Water sampling have been presented in **Table 4-8 and Figure 4-18**.

Table 4-8: Ground water monitoring locations

S.No.	Sample Code	Location	Chainage	Latitude	Longitude
1.	GW 1	Guridih	377+900	23°28'58.68"N	86° 3'15.72"E
2.	GW 2	Ramamoti	394+300	23°26'7.24"N	86°12'14.68"E
3.	GW 3	Haritard	435+900	23°16'39.97"N	86°34'17.93"E
4.	GW 4	Mauladanga	476+300	23° 5'18.94"N	86°54'12.52"E
5.	GW 5	Karakanali	499+100	22°59'0.56"N	87° 5'21.66"E
6.	GW 6	Maheshpur	537+200	22°49'31.36"N	87°29'21.65"E
7.	GW 7	Konnagar	576+500	22°39'41.79"N	87°44'8.36"E
8.	GW 8	Chandrapur	611+816	22°28'8.86"N	87°59'19.59"E

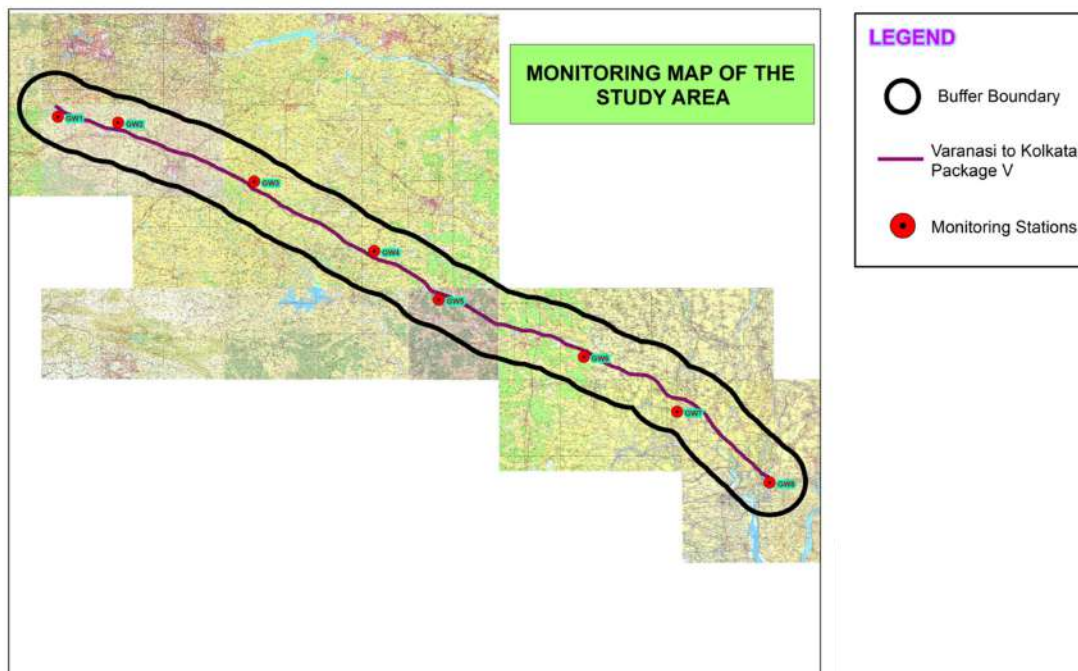


Figure 4-18: Ground water monitoring Locations

4.3.2.1 GROUND WATER QUALITY ALONG THE PROJECT ALIGNMENT

The analysis results for the ground water samples and surface water samples are given in below. The analyzed results are compared with the Acceptable and permissible limit standards (absence of Alternative source) as per IS: 10500:2012.

Table 4-9: Ground water analysis report

GENERAL PARAMETERS CONCERNING SUBSTANCES UNDESIRABLE IN EXCESSIVE AMOUNTS

			TEST RESULTS												
S. No.	Parameter		Test method	Result								Unit	Acceptable Limit	Permissible Limit	
				Guridih	Rama moti	Hritard	Maula danga	Karaka nali	Ahesh pur	Kon nagar	Handrapur				
				Organoleptic & Physical Parameters											
1.	Colour		IS-3025(P-04)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	azen Unit	5	15	
2.	Odour		IS-3025(P-05)	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	-	Agreeable	Agreeable	
3.	Taste		IS-3025(P-07 & 08)	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	-	Agreeable	-	
4.	Turbidity		IS-3025(P-10)	<1.0	<1.0	<1	<1	<1.0	<1.0	<1	<1	NTU	1	5	
5.	pH value		IS-3025(P-04)	7.74	7.35	7.20	7.55	7.74	7.59	7.47	7.38	-	6.5-8.5	-	
6.	Total Dissolve Solid (TDS)		IS-3025(P-16)	1110	1280	934	1104	1010	936	1082	1126	mg/l	500	2000	
				General Properties											
7.	Aluminum (as Al)		IS:3025 (P- 55)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/l	0.03	0.2	
8.	Total Ammonia		IS:3025 (P- 34)	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	mg/l	0.5	No relaxation	
9.	Barium (as Ba)		IS: 15302	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	mg/l	0.7	No relaxation	
10.	Boron (as B)		IS:3025 (P- 57)	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	mg/l	0.5	2.4	
11.	Calcium(as Ca)		IS:3025 (P- 40)	71.50	85.20	66.80	73.60	54.69	68.97	72.75	65.40	mg/l	75	200	
12.	Chloramines (as Cl2)		IS:3025 (P- 26)	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	mg/l	4.0	No relaxation	

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Chapter 4- Description of Environment

13.	Chloride (as Cl)	IS:3025 (P- 32)	180.60	176.40	154.12	168.0	172.81	123.24	146.39	136.0	mg/l	250	1000
14.	Copper (as Cu)	IS :3025 (P-42)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	mg/l	0.05	1.5
15.	Fluoride(as F)	IS: 3025 (P-60)	1.12	1.10	1.07	1.06	1.06	1.01	1.18	1.02	mg/l	1.0	1.5
16.	Free Residual Chlorine	IS: 3025 (P-26)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/l	0.2	1.0
17.	Iron (as Fe)	IS: 3025(P-53)	0.278	0.254	0.288	0.272	0.274	0.286	0.274	0.221	mg/l	1.0	No relaxation
18.	Magnesium (as mg)	IS: 3025 (P-46)	12.40	18.60	15.08	17.12	20.31	18.01	20.20	15.40	mg/l	30	100
19.	Manganese (as Mn)	Clause 35 of IS 3025	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/l	0.1	0.3
20.	Nitrate (as NO ₃)	IS: 3025 (P- 34)	8.40	9.20	6.50	8.02	8.69	9.37	1.53	1.50	mg/l	45	No relaxation
21.	Selenium (as Se)	IS:3025 (P- 56)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/l	0.01	No relaxation
22.	Silver (as Ag)	AnnexIS: 13428	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	mg/l	0.1	No relaxation
23.	Sulphate (as SO ₄)	IS:3025 (P- 24)	60.0	87.0	76.4	88.4	6.21	7.21	5.48	62.8	mg/l	200	400
24.	Sulphide(as H ₂ S)	IS:3025 (P-29)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	mg/l	0.05	No relaxation
25.	Alkalinity(as Ca CO ₃)	IS:3025 (P- 23)	312.0	302.0	223.0	289.0	281.0	292.0	225.0	286.0	mg/l	200	600
26.	Total Hardness (as CaCO ₃)	IS:3025 (P- 23)	380.0	297.0	216.0	310.0	237.0	287.0	223.0	315.0	mg/l	200	600
27.	Zinc (as Zn)	IS:3025 (P- 49)	0.255	0.216	0.255	0.245	0.262	0.234	0.272	0.211	mg/l	5	15
Parameters Concerning Toxic Substances													
28.	Cadmium (as Cd)	IS-3025(P-41)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/l	0.003	No relaxation
29.	Lead (as Pb)	IS-3025(P-47)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/l	0.01	No relaxation
30.	Mercury (as Hg)	IS-3025(P-48)	<0.001	<0.001	<0.001	<0.001	0.001	0.001	0.001	<0.001	mg/l	0.001	No relaxation
31.	Molybdenum (Mo)	IS-3025(P-2)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	mg/l	0.07	No relaxation

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Chapter 4- Description of Environment

32.	Nickel (as Ni)	Annex L of IS-13428	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/l	0.02	No relaxation
33.	Arsenic (as As)	IS-3025(P-37)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/l	0.01	No relaxation
34.	Total Chromium (as Cr)	Annex J of IS-13428	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	mg/l	0.05	No relaxation
MICROBIOLOGICAL PARAMETERS													
35.	<i>Escherichia coli</i>	IS-15185	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent/100ml	
36.	<i>Coliform Bacteria</i>	IS-15185	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent/100ml	

4.3.3 SURFACE WATER QUALITY:

6 no. samples of surface water were collected from rivers and available local surface water body like ponds, lakes etc. of samples were analysed for parameters necessary to determine water quality in March 2024 to May 2024.

Table 4-10: Surface water locations

S.No.	Sample Code	Location	Chainage	Latitude	Longitude
1.	SW 1	River	377+500	23°29'9.96"N	86° 3'4.44"E
2.	SW 2	Kangsabati River	434+900	23°17'0.84"N	86°33'46.30"E
3.	SW 3	Silabati River	452+200	23°12'1.57"N	86°42'13.10"E
4.	SW 4	Shilabati Canal	473+500	23° 5'58.88"N	86°52'41.18"E
5.	SW 5	Joyponda River	505+100	22°57'39.69"N	87° 8'32.16"E
6.	SW 6	Dwarkeshwar River	578+700	22°41'6.87"N	87°46'22.40"E

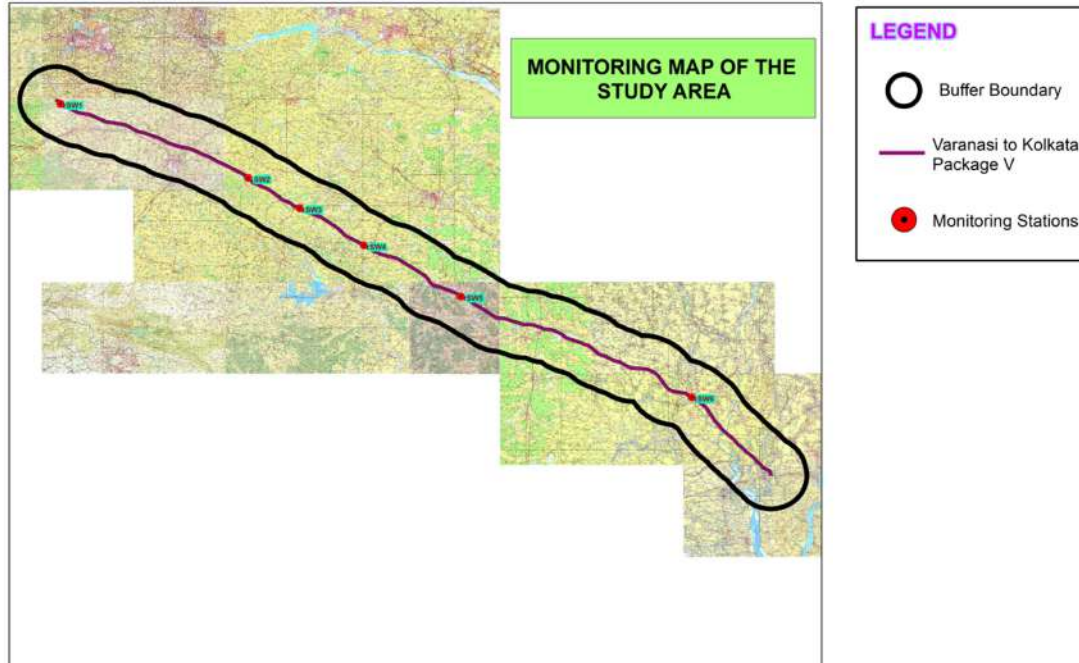


Figure 4-19: Surface water monitoring Locations

4.3.3.1 SURFACE WATER QUALITY ALONG THE PROJECT ALIGNMENT

The analysis results for the Surface water samples and surface water samples are given in Table below. The analyzed results are compared with the Acceptable and permissible limit standards (absence of Alternative source) as per IS: 10500:2012.

Table 4-11: Surface water analysis report

TEST RESULTS									
No	Parameter	Test Method	Units	River	Kangsabati River	Silabati River	Shilabati Canal	Joyponda River	Dwarkeshwar River
1.	pH (at 25 ⁰ C)	IS :3025(Part-11)	---	7.38	7.41	7.32	7.56	7.74	7.47
2.	Temperature	IS:3025(Part-9)	⁰ C	21.0	22.0	18.0	23.0	20.0	23.0
3.	Turbidity	IS:3025(Part-10)	NTU	3.2	3.6	4.2	2.8	6.8	4.8
4.	Electric Conductivity @25 ⁰ C	IS:3025(Part-14)	μS/cm	356	380	480	336	461	502
5.	Sulphate (SO ₄)	IS:3025(Part-24)	mg/l	23.0	24.0	3.60	28.0	25.0	24.0
6.	Nitrate (NO ₃)	IS:3025(Part-34)	mg/l	2.80	6.21	2.86	3.12	4.95	2.8
7.	Total Hardness (as CaCO ₃)	IS:3025(Part-21)	mg/l	176.0	220.0	150	185.0	154.0	126.0
8.	Chloride (as Cl)	IS:3025(Part-32)	mg/l	18.2	68.2	36.0	74.2	56.2	41.0
9.	Fluoride (as F)	APHA 4500F	mg/l	0.27	0.41	0.25	0.34	0.23	0.28
10.	COD (as O ₂)	APHA-5220 B	mg/l	22.0	46.0	16.0	28.0	36.0	34.0
11.	Iron (as Fe)	IS:3025(Part-53)	mg/l	0.26	0.202	0.14	0.23	0.21	0.16
12.	Dissolve Oxygen	IS-3025(Part-	mg/l	7.5	4.8	6.8	6.8	6.8	6.7

		38)							
13.	Total Dissolved Solid	IS:3025(Part-16)	mg/l	280	394.0	294	310	280	298
14.	BOD (3 days at 27°C)	IS:3025 (Part-44)	mg/l	7.6	7.80	2.8	8.1	7.2	7.5
15.	Calcium (as Ca)	IS:3025(Part-40)	mg/l	48.8	62.50	36.50	57.2	46.8	42.0
16.	Magnesium (as Mg)	IS:3025(Part-46)	mg/l	12.6	15.42	14.21	14.8	12.53	12.8
17.	Arsenic (as As)	IS:3025(Part-37)	mg/l	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
18.	Lead (as Pb)	IS:3025(Part-47)	mg/l	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
19.	Copper (as Cu)	IS:3025(Part-42)	mg/l	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)
20.	Zinc (as Zn)	IS:3025(Part-49)	mg/l	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
21.	Manganese (as Mn)	IS:3025(Part-59)	mg/l	BDL (<0.10)	BDL (<0.10)	BDL (<0.10)	BDL (<0.10)	BDL (<0.10)	BDL (<0.10)
22.	Total Chromium (as Cr)	IS:3025(Part-52)	mg/l	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)
23.	Sodium (as Na)	IS:3025(Part-45)	mg/l	23.5	89.0	47.0	26.0	36.1	23.0
24.	Potassium (as K)	IS:3025(Part-45)	mg/l	1.80	4.21	1.88	1.97	1.02	2.2
25.	Total Alkalinity (as CaCO ₃)	IS:3025(Part-23)	mg/l	156	198	145	182	147	138
26.	Phosphate (as P)	IS:3025(Part-31)	mg/l	0.25	0.34	0.20	0.26	0.24	0.21
27.	Nitrite (as NO ₂)	IS:3025(Part-34)	mg/l	0.19	0.22	0.08	0.24	0.18	0.16

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Chapter 4- Description of Environment

28.	Total Suspended Solid	IS:3025(Part-17)	mg/l	9.8	25.0	12.6	10.4	12.0	14.0
29.	Faecal Coliform	IS-1622	MPN/100 ml	1.2×10^3	0.76×10^3	1.0×10^3	0.98×10^3	1.8×10^3	1.2×10^3
30.	Total Coliform	IS-1622	MPN/100 ml	1.5×10^3	0.82×10^3	1.2×10^3	1.1×10^3	2.4×10^3	2.0×10^3

4.3.3.2 SAMPLING FREQUENCY

Parameters for analysis of water quality were selected based on the utility of the particular source of water as per CPCB guidance. Surface water quality was monitored for parameters as per Methods of Monitoring & Analysis published by CPCB and it was rated according to the CPCB Water Quality Criteria against A, B, C, D & E class of water. Water samples were collected as Grab water sample from sampling location for complete physico-chemical and bacteriological tests respectively. The samples were analysed as per standard procedure / method given in IS: 10500.

The surface water quality is compared with CPCB water quality criteria mentioned in **Table 4-12** below:

Table 4-12: Water Quality Criteria as per Central Pollution Control Board

Designated-Best-Use	Class of water	Criteria
Drinking Water Source without conventional treatment but after disinfection	A	Total Coliforms Organism MPN/100ml shall be 50 or less pH between 6.5 and 8.5 Dissolved Oxygen 6mg/l or more Biochemical Oxygen Demand 5 days 20°C 2mg/l or less
Outdoor bathing (Organized)	B	Total Coliforms Organism MPN/100ml shall be 500 or less; pH between 6.5 and 8.5; Dissolved Oxygen 5mg/l or more Biochemical Oxygen Demand 5 days 20°C 3mg/l or less
Drinking water source after conventional treatment and disinfection	C	Total Coliforms Organism MPN/100ml shall be 5000 or less; pH between 6 to 9; Dissolved Oxygen 4mg/l or more Biochemical Oxygen Demand 5 days 20°C 3mg/l or less
Propagation of Wild life and Fisheries	D	pH between 6.5 to 8.5 Dissolved Oxygen 4mg/l or more

		Free Ammonia (as N) 1.2 mg/l or less
Irrigation, Industrial Cooling, Controlled Waste disposal	E	pH between 6.0 to 8.5 Electrical Conductivity at 25°C micro mhos/cm Max.2250 Sodium absorption Ratio Max. 26 Boron Max. 2mg/l
	Below-E	Not Meeting A, B, C, D & E Criteria

4.4 AIR ENVIRONMENT

Meteorology is the key to understand the air quality. The essential relationship between meteorology and atmospheric dispersion involves the wind in the broadest sense. Wind fluctuations over a very wide range of time, accomplish dispersion and strongly influence other processes associated with them.

A meteorological station was set up at the proposed premises. Micro Meteorological station location is shown **Table 4-13** and **Figure 4-20**.

Table 4-13: Micro Meteorological station location

S. No.	Notation	Location	Chainage	Lat	Long
1	MM	Purulia	Near Ch 414+600 of by pass road	23°20'1.52"N	86°21'21.19"E



Figure 1-20: Micro Meteorological station location

Meteorological data was generated during the pre-monsoon monitoring period March 2024 to May 2024. Schedule of Monitoring and Sampling is given in **Table 4-14** and Summarized Project site Meteorological Data for pre-Monsoon is given in **Table 4-15**. Wind rose diagram generated as per the study of meteorological data is shown in **Figure 4-21**.

The following parameters were recorded at hourly intervals continuously during monitoring period, except rainfall which was recorded on daily basis.

- Wind speed
- Wind Direction
- Air Temperature
- Micro-Meteorological
- Temp
- Humidity & rainfall

Table 4-14: Schedule of Monitoring and Sampling

Attributes	MARCH								APRIL								MAY							
AAQ1/ANL1	03	08	10	15	17	22	24	30	03	04	09	12	16	19	23	26	03	08	10	14	17	21	24	28
AAQ2/ANL2	03	08	10	15	17	22	24	30	03	04	10	13	16	19	23	27	03	07	10	14	17	21	24	28
AAQ3/ANL3	03	08	10	15	17	22	24	30	04	06	11	12	18	19	23	28	03	07	10	14	17	21	24	28
AAQ4/ANL4	06	12	18	19	25	26	29	31	02	06	09	12	16	20	24	26	04	08	11	15	18	22	25	29
AAQ5/ANL5	06	12	18	19	25	26	29	31	03	06	10	13	17	20	24	27	04	08	11	15	18	22	25	29
AAQ6/ANL6	04	08	10	15	17	22	24	30	04	06	11	12	18	19	23	28	03	07	10	14	17	21	24	28
AAQ7/ANL7	05	02	06	09	12	16	20	24	26	12	18	19	25	26	29	30	04	08	11	15	18	22	25	29
AAQ8/ANL8	07	03	04	10	13	16	19	23	27	12	18	19	25	26	29	30	04	08	11	15	18	22	25	29
AAQ9/ANL9	06	08	10	15	17	22	24	30	04	06	11	12	18	19	23	28	03	07	10	14	17	21	24	28
AAQ10/ANL10	04	08	12	18	19	24	26	29	05	08	15	17	18	22	25	30	03	04	10	13	16	19	23	27
Micro-Meteorological Temp, Wind direction and speed, humidity, rainfall	All days																							

Month	Wind Speed (km/h)		Temperature (°C)			Rainfall (mm)	
	Max	Avg	Max	Min	Avg	Avg.	o. of Days
MARCH 2024	13.6	9.1	37	21	28	0.6	0
APRIL 2024	16.2	10.3	43	25	33	4.6	2
MAY 2024	19.7	129	39	27	32	73.5	16



The ambient air quality has been monitored in the impact area as per MoEF & CC guidelines. The study area represents rural environment mostly.

4.4.1.1 SELECTION CRITERIA FOR MONITORING LOCATION

The baseline status of the ambient air quality has been assessed through a scientifically designed ambient air quality network. The design of monitoring network in the air quality surveillance Programme has been based on the following consideration.

- Meteorological parameters including wind direction
- Topography of the study area
- Representative of regional background air quality for obtaining baseline status
- Representative of likely impact areas.

AAQM locations were selected in downwind, upwind as well as crosswind direction of the proposed construction covering core and buffer zones. The details of the monitoring stations locations are given in **Table 4-16** and shown in map as **Figure 4-22**.

Ambient air quality monitoring was carried out twice a week with a frequency of 24 hours for three month during the study period. The common air pollutant namely Particulate Matter-10 (PM₁₀) & PM_{2.5}, Sulphur-dioxide (SO₂) and Oxides of Nitrogen (NO₂) has been measured through a planned field monitoring.

The baseline values of the air pollutants of concern are presented in Tables below statistical parameters like minimum, maximum, average and 98th percentiles have been computed from the observed field data for all sampling stations and are given **Table 4-17 to 4-24**. These are compared with the standards prescribed by Central Pollution Control Board (CPCB) for industrial, residential and rural zone.

Table 4-16: Air Monitoring Locations

S.No.	Sample Code	Location	Chainage	Latitude	Longitude
1.	AAQ 1	Kamlapur	376+800	23°29'12.01"N	86° 2'36.63"E
2.	AAQ 2	Ramamoti	394+300	23°26'7.24"N	86°12'14.68"E
3.	AAQ 3	Bongabari	414+500	23°21'43.98"N	86°23'6.74"E
4.	AAQ 4	Haritard	435+900	23°16'39.97"N	6°34'17.93"E
5.	AAQ 5	Bhangabandh	456+000	23°11'11.75"N	86°44'16.98"E
6.	AAQ 6	Mauladanga	476+300	23° 5'18.94"N	86°54'12.52"E
7.	AAQ 7	Bhedua	496+800	22°59'35.91"N	87° 4'13.21"E
8.	AAQ 8	Kaniari	517+200	22°54'39.23"N	87°14'49.52"E
9.	AAQ 9	Maheshpur	537+200	22°49'31.36"N	87°29'21.65"E
10.	AAQ 10	Khadinan	611+300	22°28'29.10"N	87°58'35.94"E

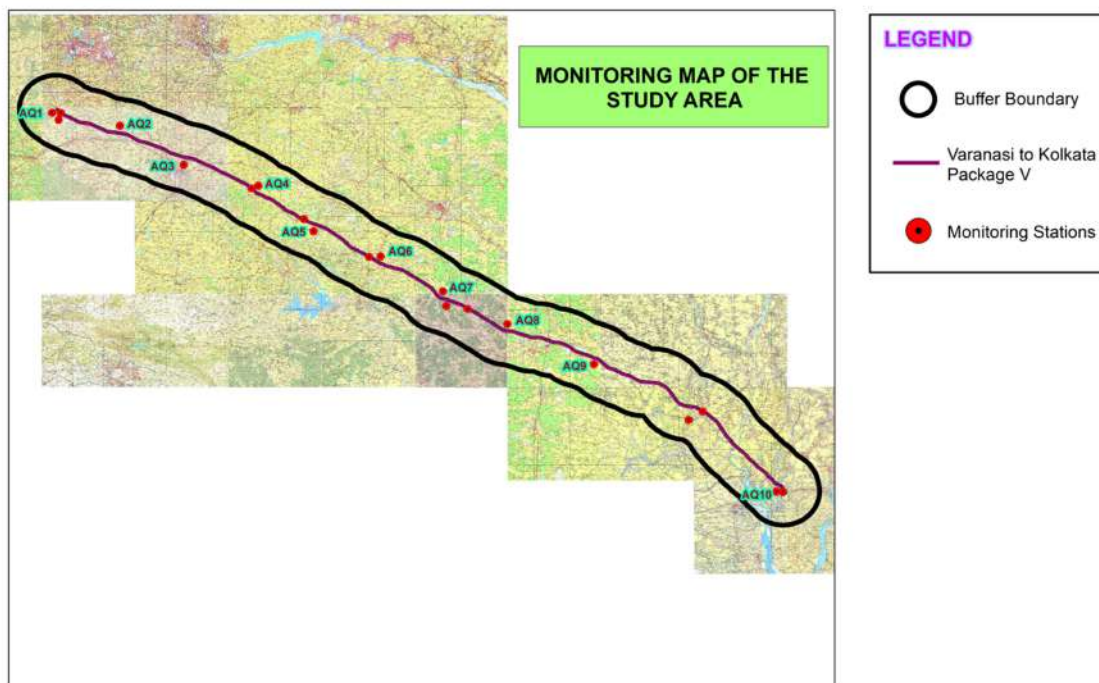


Figure 4-22: Air Monitoring Locations

4.4.1.2 AIR QUALITY ALONG THE PROJECT ALIGNMENT

Air Quality Monitoring results are presented in below Tables. The results are compared with the standards prescribed by Central Pollution Control Board (CPCB) for “Rural, Residential and other areas”.

Table 4-17: Ambient Air Quality for the location AAQ1

No.	Monitoring Date	PM10	PM2.5	SO ₂	NO ₂	CO
		5182(Part-23)	5182(Part-24)	5182(Part-2)	5182(Part-6)	5182(Part-10)
1	01.03.2024	77.82	36.53	9.65	13.54	0.65
2	04.03. 2024	70.14	37.56	10.35	12.48	1.36
3	09.03. 2024	73.61	36.54	9.63	10.42	0.96
4	11.03. 2024	77.17	31.78	12.48	13.63	0.75
5	16.03. 2024	70.74	34.51	10.65	12.79	0.95
6	18.3. 2024	68.8	37.81	9.60	15.56	1.47
7	23.03.2024	73.95	40.52	12.85	14.46	0.89
8	26.03.2024	77.4	41.9	11.21	12.50	0.69
9	01.04.2024	74.68	38.96	9.63	10.68	1.10
10	02.04.2024	77.62	35.69	10.69	15.63	1.66
11	06.04.2024	73.77	45.53	11.3	16.39	0.39
12	11.04.2024	69.69	41.52	12.69	15.53	1.66

13	15.04.2024	77.31	46.91	9.66	10.74	1.59
14	18.04.2024	80.18	39.88	10.68	12.68	0.47
15	22.04.2024	75.92	38.65	9.67	15.72	0.58
16	27.04.2024	81.82	44.76	12.54	14.66	0.69
17	02.05.2024	77.34	39.07	9.70	12.58	0.87
18	04.05.2024	80.34	34.52	9.72	10.55	1.47
19	09.05.2024	75.02	41.27	9.58	12.45	1.69
20	13.05.2024	72.84	48.84	10.67	15.86	0.96
21	20.05.2024	85.75	49.47	10.62	14.72	0.87
22	23.05.2024	78.96	39.97	11.24	12.52	1.63
23	27.05.2024	76.64	38.61	10.63	13.51	1.11
24	30.05.2024	69.94	42.75	9.62	12.73	0.89
Min		68.80	31.78	9.58	10.42	0.39
Max		85.75	49.47	12.85	16.39	1.69
Avg.		75.73	40.15	10.63	13.43	1.06
98 percentile		83.94	49.18	12.78	16.15	1.68
AAQS, For 24 hourly monitoring (except CO for Eight hour)		100 µg/m³	60 µg/m³	80 µg/m³	80 µg/m³	2 mg/m³

Table 4-18: Ambient Air Quality for the location AAQ2

No.	Monitoring Date	PM10	PM2.5	SO ₂	NO ₂	CO
		:5182(Part-23)	:5182(Part-24)	:5182(Part-2)	:5182(Part-6)	5182(Part-10)
1	01.03.2024	59.36	29.80	8.63	10.52	1.06
2	04.03.2024	71.45	29.77	12.69	16.36	1.05
3	09.03.2024	59.30	29.78	11.70	16.78	1.25
4	11.03.2024	78.45	38.14	8.45	10.63	1.45
5	16.03.2024	75.36	30.25	10.47	11.47	1.36
6	18.3.2024	78.42	29.86	11.72	16.72	1.78
7	23.03.2024	59.38	39.75	8.96	10.48	1.68
8	26.03.2024	71.00	29.53	11.73	16.72	1.52
9	01.04.2024	75.14	35.91	10.73	11.69	0.89
10	02.04.2024	72.15	32.02	8.59	11.47	0.78
11	06.04.2024	59.45	29.76	10.59	11.42	0.96
12	11.04.2024	73.69	39.64	11.70	16.76	0.56
13	15.04.2024	74.52	33.78	8.57	15.94	1.63
14	18.04.2024	71.56	30.22	9.86	16.37	1.48
15	22.04.2024	77.85	35.81	9.68	16.58	0.68
16	27.04.2024	79.62	39.85	8.25	15.91	1.75
17	02.05.2024	74.15	35.85	10.53	15.69	0.96
18	04.05.2024	79.95	26.47	9.47	16.74	1.47
19	09.05.2024	59.30	30.30	8.63	11.85	0.53
20	13.05.2024	65.38	39.58	10.42	15.83	1.47
21	20.05.2024	72.14	29.87	11.84	11.35	1.44
22	23.05.2024	60.23	29.94	12.77	15.91	0.89
23	27.05.2024	76.25	29.86	11.76	15.77	0.47
24	30.05.2024	71.41	29.73	11.55	15.67	1.67
Min		59.30	26.47	8.25	10.48	0.47

Max	79.95	39.85	12.77	16.78	1.78
Avg.	70.44	32.73	10.39	14.36	1.20
98 percentile	79.80	39.80	12.73	16.77	1.77
NAAQS, For 24 hourly monitoring (except CO for Eight hour)	100 µg/m³	60 µg/m³	80 µg/m³	80 µg/m³	2 mg/m³

Table 4-19: Ambient Air Quality for the location AAQ3

No.	Monitoring Date	PM10	PM2.5	SO₂	NO₂	CO
		5182(Part-23)	5182(Part-24)	5182(Part-2)	5182(Part-6)	5182(Part-10)
1	01.03.2024	73.54	26.73	8.62	12.96	1.22
2	04.03.2024	67.27	27.77	11.78	11.06	1.28
3	09.03.2024	73.28	26.01	12.28	15.28	1.47
4	11.03.2024	65.31	29.54	8.45	10.86	1.65
5	16.03.2024	67.19	27.96	11.79	13.85	1.66
6	18.3.2024	65.05	30.91	10.33	11.32	1.24
7	23.03.2024	73.41	31.9	8.52	14.63	0.35
8	26.03.2024	77.35	28.75	8.18	15.29	1.24
9	01.04.2024	72.57	32.41	10.47	12.45	1.18
10	02.04.2024	71.44	26.99	8.63	10.57	1.38
11	06.04.2024	65.89	33.54	10.23	11.24	0.52
12	11.04.2024	75.48	31.27	8.23	11.52	0.43
13	15.04.2024	77.87	36.93	8.48	14.63	0.59
14	18.04.2024	80.42	35.94	12.08	15.42	1.56
15	22.04.2024	70.13	31.24	8.18	10.66	1.4
16	27.04.2024	74.74	29.16	8.65	14.57	0.63
17	02.05.2024	71.23	33.45	10.42	11.47	0.53
18	04.05.2024	74.88	27.93	8.17	13.45	0.57
19	09.05.2024	70.42	32.66	8.75	12.53	1.47
20	13.05.2024	75.34	30.09	8.19	10.74	0.65
21	20.05.2024	72.2	28.41	11.97	14.25	1.68
22	23.05.2024	69.94	28.38	10.42	13.52	0.48
23	27.05.2024	72.4	29.14	12.02	13.65	1.7
24	30.05.2024	76.23	30.87	8.16	15.47	0.66
Min		65.05	26.01	8.16	10.57	0.35
Max		80.42	36.93	12.28	15.47	1.70
Avg.		72.23	30.33	9.71	12.97	1.06
98 percentile		79.25	36.47	12.19	15.45	1.69
NAAQS, For 24 hourly monitoring (except CO for Eight hour)		100 µg/m³	60 µg/m³	80 µg/m³	80 µg/m³	2 mg/m³

Table 4-20: Ambient Air Quality for the location AAQ4

No.	Monitoring Date	PM10	PM2.5	SO ₂	NO ₂	CO
		5182(Part-23)	5182(Part-24)	5182(Part-2)	5182(Part-6)	5182(Part-10)
1	02.03.2024	71.56	30.62	10.56	10.98	1.24
2	05.03.2024	80.64	42.85	9.75	10.98	0.86
3	10.03.2024	58.47	29.56	12.86	12.02	1.57
4	12.03.2024	80.65	43.65	10.36	11.12	1.48
5	15.03.2024	55.46	27.45	10.11	13.97	0.96
6	19.3.2024	53.42	27.05	13.14	10.99	1.72
7	24.03.2024	81.75	37.85	10.49	11.00	0.75
8	25.03.2024	74.58	44.58	10.31	11.14	1.38
9	04.04.2024	56.32	28.79	9.81	12.16	1.19
10	08.04.2024	82.59	31.78	10.21	14.03	0.96
11	12.04.2024	76.66	34.74	12.47	11.07	0.44
12	14.04.2024	65.85	44.63	10.65	15.4	0.86
13	19.04.2024	59.37	30.62	9.87	11.11	0.47
14	20.04.2024	84.56	34.52	10.24	13.08	0.58
15	23.04.2024	76.42	44.15	12.85	12.07	1.52
16	25.04.2024	65.35	34.21	13.05	11.10	1.48
17	03.05.2024	79.42	33.58	10.33	14.12	0.86
18	03.05.2024	82.42	38.42	10.59	11.01	1.36
19	10.05.2024	62.63	32.58	12.45	10.98	1.19
20	11.05.2024	53.56	40.25	9.93	10.97	0.86
21	18.05.2024	78.15	33.57	10.11	11.16	1.06
22	19.05.2024	81.63	35.96	9.83	11.14	1.08
23	25.05.2024	53.54	27.12	12.63	11.12	1.53
24	26.05.2024	53.4	27.04	9.74	10.96	0.56
Min		53.40	27.04	9.74	10.96	0.44
Max		84.56	44.63	13.14	15.40	1.72
Avg.		69.52	34.82	10.93	11.82	1.08
98 percentile		83.65	44.61	13.10	14.81	1.65
NAAQS, For 24 hourly monitoring (except CO for Eight hour)		100 µg/m³	60 µg/m³	80 µg/m³	80 µg/m³	2 mg/m³

Table 4-21: Ambient Air Quality for the location AAQ5

S. No.	Monitoring	PM10	PM2.5	SO ₂	NO ₂	CO
	Date	5182(Part-23)	5182(Part-24)	5182(Part-2)	5182(Part-6)	5182(Part-10)
1	02.03.2024	62.78	30.54	12.47	11.73	0.55
2	05.03.2024	58.27	40.22	9.78	11.66	1.63
3	10.03.2024	59.30	30.61	12.18	11.99	1.47
4	12.03.2024	60.61	29.49	11.72	12.36	0.84
5	15.03.2024	65.43	30.50	9.49	11.78	1.47
6	19.3.2024	58.64	32.63	11.73	12.16	1.58
7	24.03.2024	80.21	40.19	12.94	14.03	0.96
8	25.03.2024	58.56	30.67	9.67	10.42	1.24
9	04.04.2024	60.72	32.53	12.69	13.98	1.66
10	08.04.2024	80.24	29.46	11.70	11.89	0.87
11	12.04.2024	74.39	28.53	9.58	13.08	1.32
12	14.04.2024	61.62	30.49	12.96	10.35	1.44
13	19.04.2024	75.21	40.58	12.47	16.46	0.86
14	20.04.2024	79.66	31.73	9.63	15.88	1.75
15	23.04.2024	69.37	33.76	12.94	11.65	1.48
16	25.04.2024	66.39	29.64	12.29	16.23	0.33
17	03.05.2024	80.36	40.35	9.75	11.74	1.47
18	03.05.2024	67.43	30.52	11.32	14.67	1.75
19	10.05.2024	60.42	29.67	10.33	15.81	1.38
20	11.05.2024	80.32	28.66	9.85	13.78	1.69
21	18.05.2024	74.29	40.12	11.73	10.24	1.58
22	19.05.2024	63.33	30.31	12.63	14.32	0.98
23	25.05.2024	80.07	28.43	10.12	11.63	1.18
24	26.05.2024	60.53	31.84	9.63	13.98	0.96
Min		58.27	28.43	9.49	10.24	0.33
Max		80.36	40.58	12.96	16.46	1.75
Avg.		68.26	32.56	11.23	13.05	1.27
98 percentile		80.34	40.47	12.95	16.36	1.75
NAAQS, For 24 hourly monitoring (except CO for Eight hour)		100 µg/m³	60 µg/m³	80 µg/m³	80 µg/m³	2 mg/m³

Table 4-22: Ambient Air Quality for the location AAQ6

No.	Monitoring Date	PM10	PM2.5	SO ₂	NO ₂	CO
		5182(Part-23)	5182(Part-24)	5182(Part-2)	5182(Part-6)	5182(Part-10)
1	02.03.2024	70.60	33.52	7.31	12.11	0.64
2	05.03.2024	72.58	31.90	7.18	12.86	0.67
3	10.03.2024	69.73	33.21	8.02	11.90	0.65
4	12.03.2024	68.69	32.41	7.30	12.02	0.65
5	15.03.2024	65.35	33.34	7.21	12.03	0.64
6	19.3.2024	67.64	31.13	7.25	11.76	0.67
7	24.03.2024	64.23	29.40	7.16	12.55	0.66
8	25.03.2024	63.25	32.71	7.13	12.07	0.65
9	04.04.2024	64.17	30.74	6.43	12.10	0.67
10	08.04.2024	69.60	29.79	7.26	11.92	0.64
11	12.04.2024	63.87	32.27	7.13	11.83	0.63
12	14.04.2024	64.94	30.60	7.03	11.89	0.62
13	19.04.2024	61.55	29.30	6.80	11.76	0.65
14	20.04.2024	62.66	28.37	8.00	12.13	0.64
15	23.04.2024	64.77	32.21	6.95	12.14	0.67
16	25.04.2024	57.11	30.75	7.19	11.81	0.66
17	03.05.2024	62.45	30.36	7.14	12.08	0.65
18	03.05.2024	61.31	26.28	7.07	11.94	0.64
19	10.05.2024	55.10	28.79	6.26	11.84	0.65
20	11.05.2024	56.95	28.48	7.12	11.70	0.67
21	18.05.2024	53.09	29.99	6.35	12.50	0.66
22	19.05.2024	56.36	26.04	7.18	11.81	0.64
23	25.05.2024	52.79	27.88	6.20	11.67	0.67
24	26.05.2024	54.35	25.15	7.14	11.90	0.68
Min		52.79	25.15	6.20	11.67	0.62
Max		72.58	33.52	8.02	12.86	0.68
Avg.		62.64	30.13	7.08	12.03	0.65
98 percentile		71.67	33.43	8.01	12.72	0.67
NAAQS, For 24 hourly monitoring except CO for Eight hour)		100 µg/m³	60 µg/m³	80 µg/m³	80 µg/m³	2 mg/m³

Table 4-23: Ambient Air Quality for the location AAQ7

No.	Monitoring Date	PM10	PM2.5	SO ₂	NO ₂	CO
		5182(Part-23)	5182(Part-24)	5182(Part-2)	5182(Part-6)	5182(Part-10)
1	03.03.2024	63.93	33.04	9.17	16.68	0.98
2	04.03.2024	65.11	31.77	9.26	17.77	0.86
3	08.03.2024	63.94	31.93	8.78	17.18	0.89
4	12.03.2024	62.56	30.13	8.77	16.65	0.84
5	14.03.2024	62.91	31.64	7.81	16.73	0.98
6	18.3.2024	60.44	30.76	7.74	16.40	0.97
7	22.03.2024	61.48	34.40	9.28	18.33	0.87
8	23.03.2024	62.97	32.88	9.24	18.36	0.83
9	05.04.2024	62.35	36.74	9.14	16.71	0.86
10	06.04.2024	64.88	28.87	9.03	17.72	0.88
11	13.04.2024	60.78	28.25	7.62	17.25	0.94
12	16.04.2024	66.85	37.64	9.33	17.46	0.91
13	21.04.2024	70.00	36.15	9.31	17.61	0.85
14	22.04.2024	66.17	33.18	9.27	18.39	0.89
15	26.04.2024	64.60	33.56	9.17	16.82	0.92
16	28.04.2024	62.35	33.06	8.32	17.24	1.01
17	05.05.2024	49.26	34.43	8.39	16.27	0.87
18	07.05.2024	51.51	33.87	7.99	16.14	0.99
19	13.05.2024	49.37	31.76	8.08	16.15	0.97
20	14.05.2024	54.05	33.87	8.18	16.36	0.95
21	20.05.2024	59.14	29.67	7.47	16.03	0.86
22	21.05.2024	59.32	28.20	8.08	16.46	0.87
23	30.05.2024	59.91	32.91	9.15	16.90	1.00
24	31.05.2024	57.05	31.13	8.21	16.59	0.99
Min		49.26	28.20	7.47	16.03	0.83
Max		70.00	37.64	9.33	18.39	1.01
Avg.		60.78	32.52	8.60	17.02	0.92
98 percentile		68.55	37.22	9.32	18.38	1.01
NAAQS, For 24 hourly monitoring except CO for Eight hour)		100 µg/m³	60 µg/m³	80 µg/m³	80 µg/m³	2 mg/m³

Table 4-24: Ambient Air Quality for the location AAQ8

No.	Monitoring Date	PM10	PM2.5	SO ₂	NO ₂	CO
		5182(Part-23)	5182(Part-24)	5182(Part-2)	5182(Part-6)	5182(Part-10)
1	03.03.2024	76.65	40.06	8.58	12.05	0.40
2	04.03.2024	58.05	28.10	9.21	11.10	0.39
3	08.03.2024	64.61	39.12	8.57	9.27	0.19
4	12.03.2024	70.33	30.07	11.10	12.13	0.60
5	14.03.2024	76.84	32.58	9.47	11.38	0.49
6	18.3.2024	61.83	37.95	8.54	13.84	0.49
7	22.03.2024	62.70	31.51	11.43	12.86	0.40
8	23.03.2024	76.67	29.40	9.97	11.12	0.39
9	05.04.2024	69.30	28.39	8.57	9.50	0.49
10	06.04.2024	79.94	41.69	9.51	13.91	0.49
11	13.04.2024	65.66	28.39	10.05	14.58	0.50
12	16.04.2024	75.66	28.90	11.29	13.82	0.39
13	21.04.2024	79.44	32.06	8.59	9.55	0.18
14	22.04.2024	68.41	36.93	9.50	11.28	0.49
15	26.04.2024	56.07	28.38	8.60	13.99	0.40
16	28.04.2024	75.91	31.41	11.16	13.04	0.41
17	05.05.2024	79.63	28.04	8.63	11.19	0.19
18	07.05.2024	51.85	28.93	8.65	9.38	0.40
19	13.05.2024	72.93	38.77	8.52	11.08	0.49
20	14.05.2024	75.55	32.64	9.49	14.11	0.39
21	20.05.2024	61.83	28.22	9.45	13.10	0.40
22	21.05.2024	62.70	27.98	10.00	11.14	0.49
23	30.05.2024	66.44	29.30	9.46	12.02	0.61
24	31.05.2024	54.23	26.33	8.56	11.32	0.49
Min		51.85	26.33	8.52	9.27	0.18
Max		79.94	41.69	11.43	14.58	0.61
Avg.		68.47	31.88	9.45	11.95	0.42
98 percentile		79.80	40.94	11.37	14.36	0.61
NAAQS, For 24 hourly monitoring except CO for Eight hour)		100 µg/m ³	60 µg/m ³	80 µg/m ³	80 µg/m ³	2 mg/m ³

Table 4-25: Ambient Air Quality for the location AAQ9

No.	Monitoring Date	PM10	PM2.5	SO ₂	NO ₂	CO
		5182(Part-23)	5182(Part-24)	5182(Part-2)	5182(Part-6)	5182(Part-10)
1	03.03.2024	55.20	27.41	7.68	9.36	0.59
2	04.03.2024	66.44	27.38	11.29	14.56	0.72
3	08.03.2024	55.14	27.39	10.41	14.93	0.42
4	12.03.2024	72.95	35.08	7.52	9.46	0.25
5	14.03.2024	70.08	27.83	9.31	10.20	0.59
6	18.3.2024	72.93	27.47	10.43	14.88	0.26
7	22.03.2024	55.22	36.57	7.97	9.32	0.42

8	23.03.2024	66.03	27.16	10.43	14.88	0.59
9	05.04.2024	69.88	33.03	9.54	10.40	0.25
10	06.04.2024	67.09	29.45	7.64	10.20	0.52
11	13.04.2024	55.28	27.37	9.42	10.16	0.34
12	16.04.2024	68.53	36.46	10.4	14.91	0.46
13	21.04.2024	69.30	31.07	7.62	14.18	0.63
14	22.04.2024	66.55	27.80	8.77	14.56	0.33
15	26.04.2024	72.40	32.94	8.61	14.75	0.45
16	28.04.2024	74.04	36.66	7.34	14.15	0.55
17	05.05.2024	68.95	32.98	9.37	13.96	0.30
18	07.05.2024	74.35	24.35	8.42	14.89	0.48
19	13.05.2024	55.14	27.87	7.68	10.54	0.61
20	14.05.2024	60.80	36.41	9.27	14.08	0.37
21	20.05.2024	67.09	27.48	10.53	10.10	0.41
22	21.05.2024	56.01	27.54	11.36	14.15	0.57
23	30.05.2024	70.91	27.47	10.46	14.03	0.33
24	31.05.2024	66.41	27.35	10.27	13.94	0.42
Min		55.14	24.35	7.34	9.32	0.25
Max		74.35	36.66	11.36	14.93	0.72
Avg.		65.70	30.11	9.24	12.77	0.45
98 percentile		74.21	36.62	11.33	14.92	0.68
NAAQS, For 24 hourly monitoring (except CO for Eight hour)		100 µg/m³	60 µg/m³	80 µg/m³	80 µg/m³	2 mg/m³

Table 4-26: Ambient Air Quality for the location AAQ10

No.	Monitoring Date	PM10	PM2.5	SO ₂	NO ₂	CO
		5182(Part-23)	5182(Part-24)	5182(Part-2)	5182(Part-6)	5182(Part-10)
1	03.03.2024	58.58	33.65	7.67	11.53	0.49
2	04.03.2024	56.33	23.59	10.48	9.84	0.65
3	08.03.2024	48.49	32.86	10.92	13.59	0.52
4	12.03.2024	57.01	31.98	7.52	9.66	0.48
5	14.03.2024	56.73	22.56	10.49	12.32	0.65
6	18.3.2024	51.01	31.13	9.19	10.07	0.59
7	22.03.2024	46.72	24.23	7.58	13.02	0.51
8	23.03.2024	56.78	30.37	7.28	13.60	0.34
9	05.04.2024	52.37	33.30	9.31	11.08	0.78
10	06.04.2024	56.71	28.53	7.68	9.40	0.38
11	13.04.2024	57.05	26.14	9.10	10.00	0.41
12	16.04.2024	54.43	34.74	7.32	10.25	0.48
13	21.04.2024	63.65	34.82	7.54	13.02	0.30
14	22.04.2024	59.03	31.39	10.75	13.72	0.49
15	26.04.2024	61.82	33.50	7.28	9.48	0.44
16	28.04.2024	51.73	26.99	7.69	12.96	0.33
17	05.05.2024	59.13	34.14	9.27	10.20	0.60
18	07.05.2024	58.45	28.46	7.27	11.97	0.49
19	13.05.2024	51.34	33.78	7.78	11.15	0.54

20	14.05.2024	56.49	24.33	7.28	9.55	0.34
21	20.05.2024	57.01	28.54	10.65	12.68	0.42
22	21.05.2024	51.61	28.39	9.27	12.03	0.66
23	30.05.2024	56.82	28.59	10.69	12.14	0.28
24	31.05.2024	56.29	28.23	7.26	13.76	0.39
Min		46.72	22.56	7.26	9.4	0.28
Max		63.65	34.82	10.92	13.76	0.78
Avg.		55.65	29.76	8.64	11.54	0.48
98 percentile		62.81	34.78	10.84	13.74	0.72
NAAQS, For 24 hourly monitoring except CO for Eight hour)		100 µg/m³	60 µg/m³	80 µg/m³	80 µg/m³	2 mg/m³

4.4.1.3 ANALYSIS OF RESULTS

A. Particulate Matters (Pm₁₀ & Pm_{2.5})

PM10 and PM2.5 were monitored using a Respirable Dust sampler (RDS) and PM2.5 Sampler. A pre-conditioned and weighted glass fibre filter paper is used for PM10 and PTFE filter paper is used for RDS/PM2.5 samplers. A known quantity of the air was sucked through the filter paper in a prescribed sampling time. The flow was noted from the manometer. The multiplication of time with rate gave the total quantity of air passed through the filter paper. After sampling, the filter paper was removed, conditioned and weighed finally for getting the concentrations in ambient air.

The minimum and maximum level of PM 2.5 recorded within the study area was in the range of 22.56 µg/m³ (at AAQ10- khadinam -CH 611+300) to 49.47 µg/m³ (at AAQ1-. kamalpur - 376+800). The minimum and maximum level of PM 10 recorded within the study area in the range of 46.72 µg/m³ (at AAQ10-khadinam -611+300) to 85.75 µg/m³ (at AAQ1-kamalpur -376.800). The 24 hourly average values of PM2.5 & PM10 were compared with the National Ambient Air Quality Standards (NAAQS) and found that all sampling stations recorded in the study area are within the applicable limits i.e., 60 µg/m³ for PM2.5 and 100 µg/m³ PM10.

B. Sulphur Di-Oxides (SO₂)

A known quantity of the air was bubbled through impingers containing tetrachloromercurate. SO₂ formed a disulfiltomercurate complex, which gave a pinkish blue color with p-rosaniline and formaldehyde solution. The intensity of color produced was proportional to concentration of Sulphur dioxide. The measurement was made by using spectrophotometer at the wavelength of 560 nm.

The minimum and maximum concentration of SO₂ recorded within the study area was 6.20 µg/m³ (AAQ6-.Maula danga -476+300) to 13.14 µg/m³ (AAQ4-hantard -435+900). The 24 hourly average values of SO₂ were compared with the National Ambient Air Quality Standards (NAAQS)

and it was found that all sampling stations recorded values are below the applicable limits 80 µg/m³ for rural areas.

C. Nitrogen Di-Oxides (NO_x)

A known quantity of air was passed through impingers containing sodium hydroxide-sodium arsenite solution. The estimation of NO_x was done calorimetrically using hydrogen peroxide, sulphanilamide, NEDA, etc. The intensity of the color was measured at 540 nm using a spectrophotometer.

The minimum and maximum level of NO₂ recorded within the study area was in the range of was 9.4 µg/m³ (AAQ10-khadinam -CH 611+300) to 18.39 µg/m³. (AAQ7-Bhedua -496+800). The 24 hourly average values of NO₂ were compared with the National Ambient Air Quality Standards (NAAQS) and it was found that all sampling stations recorded values are below the applicable limits 80 µg/m³ for rural areas.

D. Carbon MonoOxide (CO)

NDIR based samplers are used to monitor the carbon monoxide levels. The minimum and maximum level of CO recorded within the study area was in the range of was 0.18 mg/m³ (AAQ8- Kaniari- 517+200) to 1.78 mg/m³. (AAQ2- Ramamoti -394+300).

4.4.1.4 INSTRUMENT USED FOR SAMPLING

Respirable Dust Samplers APM-250 of Lata Envirotech Services make were installed for monitoring Suspended Particulate Matter (SPM), Respirable fraction (<10 microns) and gaseous pollutants like SO₂ and NO_x whereas the concentration Particulate matter 2.5 was monitored by installing Envirotech made APM 50MFC particulate matter sampler.

4.4.1.5 TECHNIQUES USED FOR AMBIENT AIR QUALITY MONITORING

The techniques used for Ambient Air Quality monitoring have been presented in **Table 4-25**.

Table 4-27: Techniques used for Ambient Air Quality Monitoring

Parameter	Technique	Technical Protocol
Suspended Particulate Matter	Respirable Dust Sampler (Gravimetric method)	IS-5182 (Part-IV)
Respirable Particulate Matter	Respirable Dust Sampler (Gravimetric method)	IS-5182 (Part-IV)
PM 2.5	PM 2.5 APM 550 Fine Particle Sampler	
Sulphur Dioxide	West and Gaeke	IS-5182 (Part-II)
Oxides of Nitrogen	Jacob and Hochheiser	IS-5182 (Part-IV)
CO	Non – dispersive Infrared	IS-5182 (Part-IV)

	(NDIR) Spectroscopy	

4.5 NOISE ENVIRONMENT

Noise can be defined as any sound that is undesirable because it interferes with speech and hearing, and is intense enough to damage hearing or is otherwise annoying. Noise impacts can be of concern during construction and operational phases of the project. Factors those are important in determining noise levels include distance from the noise source, natural or manmade barriers between the source and the receptors, whether conditions, etc.

4.5.1 NOISE STANDARDS

The Ambient Noise Quality Standards with respect to noise have been stipulated by Govt. of India vide Gazette Notification dt. 14.02.2000. **Table 4-26** describes the Ambient Noise Standards.

Table 4-28: Ambient Noise Standards

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

**Silence zone is defined as an area up to 100 meters around such premises as hospitals, educational institutions and courts. The silence zones are to be declared by the competent authority;*

4.5.2 NOISE MONITORING LOCATIONS

An assessment of baseline noise quality was undertaken to (a) establish the status of exposure of the major sensitive receptors, and (b) to identify the noise pollution levels along the alignment. The noise monitoring was done following CPCB protocol of Noise Monitoring. The details of the Noise level monitoring locations have been presented in **Table 4-27** and **Figure 4-23**.

Table 4-29: Noise level Monitoring Locations

S.No.	Sample Code	Location	Chainage	Latitude	Longitude
1.	ANL 1	Kamlapur	376+800	23°29'12.01"N	86° 2'36.63"E
2.	ANL 2	Ramamoti	394+300	23°26'7.24"N	86°12'14.68"E
3.	ANL 3	Bongabari	414+500	23°21'43.98"N	86°23'6.74"E
4.	ANL 4	Haritard	435+900	23°16'39.97"N	86°34'17.93"E

5.	ANL 5	Bhangabandh	456+000	23°11'11.75"N	86°44'16.98"E
6.	ANL 6	Mauladanga	476+300	23° 5'18.94"N	86°54'12.52"E
7.	ANL 7	Bhedua	496+800	22°59'35.91"N	87° 4'13.21"E
8.	ANL 8	Kaniari	517+200	22°54'39.23"N	87°14'49.52"E
9.	ANL 9	Maheshpur	537+200	22°49'31.36"N	87°29'21.65"E
10.	ANL 10	Khadinan	611+300	22°28'29.10"N	87°58'35.94"E

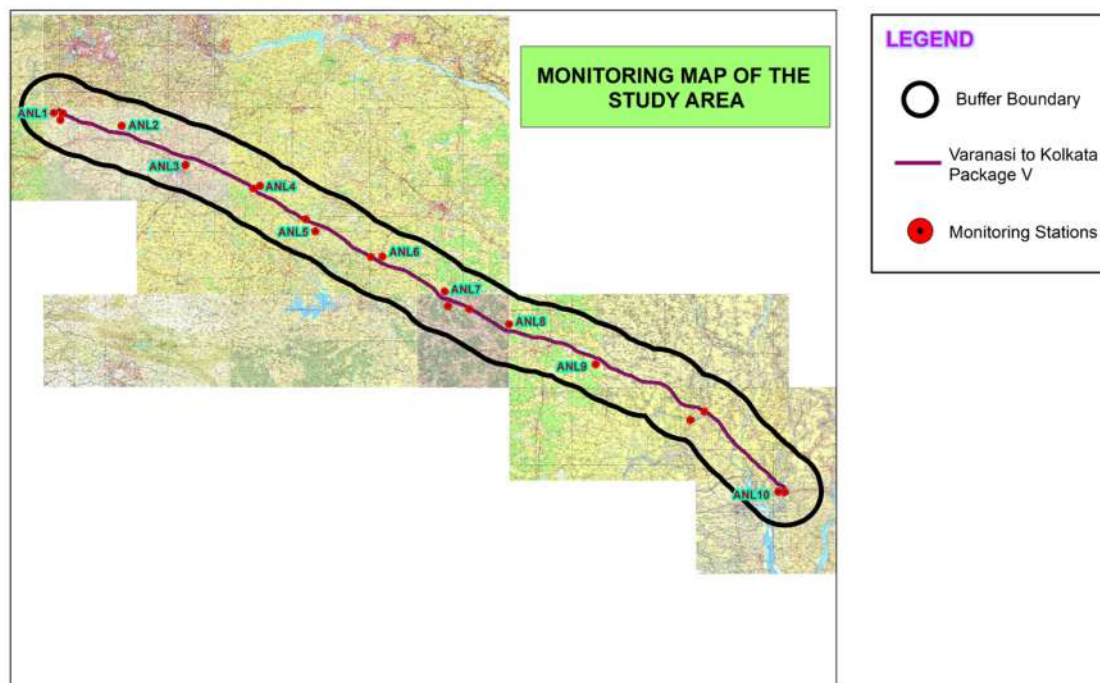


Figure 4-23: Ambient Noise Monitoring Location

4.5.3 NOISE QUALITY ANALYSIS ALONG THE PROPOSED PROJECT

Observations noticed from the monitoring results summarized in **Table 4-28** can be illustrated as:

Table 4-30: Noise quality Analysis report

<u>S. No</u>	<u>Test Parameters</u>	<u>ANL1</u>	<u>ANL2</u>	<u>ANL3</u>	<u>ANL4</u>	<u>ANL5</u>	<u>Units</u>	RESULTS		
								Requirement (as per CPCB Guidelines Limits in		
								<u>dB (A) Leq</u>		
1.	L_{day} (6.0 AM TO 10.0 PM)	58.6	56.2	59.4	56.8	57.4	dB(A)	Category of Area / Zone	Day Time	Night Time
								Industrial Area	75	70
2.	L_{night} (10.0 PM TO 6.0 AM)	41.8	42.6	44.2	43.5	43.8	dB(A)	Commercial Area	65	55
								Residential Area	55	45
								Silence Zone	50	40

<u>S. No</u>	<u>Test Parameters</u>	<u>ANL6</u>	<u>ANL7</u>	<u>ANL8</u>	<u>ANL9</u>	<u>ANL10</u>	<u>Units</u>	RESULTS		
								Requirement (as per CPCB Guidelines Limits in		
								<u>dB (A) Leq</u>		
1.	L_{day} (6.0 AM TO 10.0 PM)	56.8	58.6	53.5	52.4	53.8	dB(A)	Category of Area / Zone	Day Time	Night Time
								Industrial Area	75	70
2.	L_{night} (10.0 PM TO 6.0 AM)	42.1	40.2	45.6	42.8	41.6	dB(A)	Commercial Area	65	55
								Residential Area	55	45
								Silence Zone	50	40

4.5.4 INTERPRETATION OF RESULTS

The measured value for Leq-day & Leq-night has been found well within the prescribed limit.

4.6 SOCIAL ENVIRONMENT

4.6.1 INTRODUCTION

Ministry of Road Transport and Highways, Government of India, has decided to improve the efficiency of freight movement in India. National Highways Authority of India (NHAI) has been entrusted for preparation of DPR to improve the road networks in the state of Uttar Pradesh, Bihar, and Jharkhand&West Bengal.

The proposed highway starts at from Km 387.200 (near Kamalpur village, Jharkhand/WB Border) to Km 622.000 NH-16, near Uluberia, Howrah District, West Bengal in the state West Bengal.

4.6.2 NATURE FOR THE PROJET

The proposed Greenfield Highway project is for the Development of 4/6 Lane, which falls under item no. 7(f) i.e. Highways as per the EIA notification, September 14, 2006 (as amended time to time), it is to be treated as Category A, and needs to obtain the prior Environmental Clearance from MoEF & CC, New Delhi.

4.6.2.1 NEED OF THE PROJECT

The proposed access controlled project with new alignment has been envisaged through an area which shall have the advantage of simultaneous development as well as shall result in a shorter distance to travel. The junctions with existing road will be planned in the form of interchanges and flyover to ensure uninterrupted flow of traffic.

The proposed road would act as the prime artery for the economic flow to this region. It will enhance economic development, provide employment opportunities to locals, strengthen tourist development, ensure road safety, and provide better transportation facilities and other facilities such as way side amenities. Vehicle operating cost will also be reduced due to improved road quality.

4.6.3 DEMOGRAPHY & SOCIO-ECONOMIC FEATURES

4.6.3.1 DEMOGRAPHY

Demography is one of the important indicators of environmental health of an area. It includes population, sex ratio, number of households, literacy, population density, etc. In order to assess the Demographic & Socio-economic features of the area, Census data 2011, for the concerned 5 Districts named Hugli, Bankura, Puruliya, Haora&Paschim Medinipur of West Bengal state respectively was compiled and placed in the form of tabulation and graphical representation.

4.6.3.2 DEMOGRAPHY OF THE CONCERNED DISTRICT

❖ District Hugli, West Bengal:

As per the census records 2011, the total population of Hugli district was recorded as 55,19,145 out of which 33,90,646 reside in rural areas and 21,28,499 are from urban areas. The decadal growth rate of total population of the district was observed as 9.5% followed by 1.1% in rural part and 26.1% in the urban part of the district. Population density of the district was observed as 1,753 per sq. km, followed by 1202 persons per sq. km and 6469 persons per sq. km in rural and urban part of the district.

The sex ratio of the district was observed as 961 females per 1000 males followed by 968 & 950 females per 1000 males in rural and urban part respectively. The Work Participation Rate for the district Hugli was observed as 39.0% followed by 40.5% and 36.6 for rural and urban part of the district respectively. The literacy rate for the district was also observed as 81.8% followed by 87.0 and 76.4% in males and females respectively. Scheduled Castes and Scheduled Tribes make up 24.35% and 4.15% of the population respectively.

Majority of the population of the district belong to Hindu Community with a population share of 82.9% followed by Muslims as 15.8%.

❖ District Bankura, West Bengal:

As per the census records 2011, the Bankura district has a population of 3,596,674, roughly equal to the nation of Lithuania or the US state of Connecticut. This gives it a ranking of 80th in India (out of a total of 739). The district has a population density of 523 inhabitants per square kilometre (1,350/sq. mi). Its population growth rate over the decade 2001-11 was 12.64%. Bankura has a sex ratio of 954 females for every 1000 males and a literacy rate of 70.95%. 8.33% of the population lives in urban areas. Scheduled Castes and Scheduled Tribes made up 32.65% and 10.25% of the population respectively.

Hinduism is the predominant religion, and makes up nearly the entire population in urban areas. Islam is almost entirely to be found in rural areas, as are tribal religions. Muslims are most concentrated in the east of the district bordering Bardhaman and Hooghly districts, while tribal religions are largely in the south west, and form significant minorities in Ranibundh (39.44%) and Raipur (27.66%) CD blocks.

According to the 2011 census, 90.68% of the population spoke Bengali and 7.96% Santali as their first language.

❖ District puruliya, West Bengal:

As per the census records 2011, the total population of Puruliya district has a population of 2,930,115, roughly equal to the nation of Jamaica or the US state of Arkansas. This gives it a ranking of 129th in India (out of a total of 640). The district has a population density of 468 inhabitants per sq. km (1,210/sq.

mi). Its population growth rate over the decade 2001-11 was 15.43%. Puruliya has a sex ratio of 955 females for every 1000 males and a literacy rate of 65.38%. 12.74% of the population lives in urban areas. Scheduled Castes and Scheduled Tribes make up 19.37% and 18.45% respectively.

The literacy rates of male and female are 74.18% and 37.15% of the total population. According to the 2011 census, 80.56% of the population spoke Bengali, 11.17% Santali, 5.04% Kurmali and 1.93% Hindi as their first language.

❖ *District Haora, West Bengal:*

As per the census records 2011, the total population of Howrah district has a population of 4,850,029, roughly equal to the nation of Singapore or the US state of Alabama. This gives it a ranking of 23rd in India (out of a total of 640). The district has a population density of 3,306 inhabitants per square kilometre (8,560/sq. mi). Its population growth rate over the decade 2001-11 was 13.31%. 63.38% of the population lives in urban areas. Haora has a sex ratio of 935 females for every 1000 males and a literacy rate of 83.85%. 63.38% of the population lives in urban areas. Scheduled Castes and Scheduled Tribes make up 14.82% and 0.31% of the population respectively.

Total area in Howrah District is 1467 km². Total population is 4,273,099 as per census 2001 records. 57.91% of the population live in Howrah Sadar subdivision and rest 42.09% live in Uluberia subdivision. Population Density: 2913 per km².

Hindus are the majority population. Muslims, unlike the rest of Bengal, are more concentrated in urban areas than Hindus. Muslims are a significant minority in Panchla (46.62%), Uluberia I (43.92%), Uluberia II (39.36%) and Bagnan I (36.74%) blocks and make up a significant minority (44.79%) in Uluberia city.

According to the 2011 census, 84.99% of the population spoke Bengali, 10.92% Hindi and 2.86% Urdu as their first language. Hindi and Urdu are mainly spoken in urban areas.

❖ *District Paschim Medinipur, West Bengal:*

As per the census records 2011, the total population of Paschim Medinipur district has a population of 5,913,457, roughly equal to the nation of Eritrea or the US state of Missouri. This gives it a ranking of 14th in India (out of a total of 640). The district has a population density of 636 inhabitants per square kilometre (1,650/sq. mi). Its population growth rate over the decade 2001-11 was 14.44%. Paschim Medinipur has a sex ratio of 960 females for every 1000 males, and a literacy rate of 79.04%.

After bifurcation the district had a population of 4,776,909, of which 655,250 (13.72%) live in urban areas. The divided district has a sex ratio of 963 females per 1000 males. Scheduled Castes and Scheduled Tribes make up 892,763 (18.69%) and 546,167 (11.43%) of the population respectively.

The undivided Paschim Medinipur district is inhabited by 880,015 Scheduled Tribes, primary by 12 tribes i.e., Santal (535,441), Bhumij (97,453), Munda (67,069), Lodha/Kheria (51,772), Kora (29,115), Savar (18,169), Ho (14,656), Baiga (12,845), Mahali (12,487), Oraon (2,670), Kharwar (1,579), Bedia (1,038). Similarly, among the 1,128,269 Schedule Castes, the prominent castes are Bagdi (370,604), Lohar (78,505), Namasudra (76,953), Jalia Kaibartta (60,589), Dhoba (49,175), Hari (47,928), Bauri (45,201), Mal (35,382), Dom (33,140), Chamar/Mochi/Ruidas (31,589), Bhuiya (31,260), Rajbanshi (25,275), Pan (22,442), Sunri (19,842), Keot (19,721), Kandra (18,473), Rajwar (15,569), Mahar (13,916), Kadar (13,524), Khaira (11,899), Pod/Poundra (11,116), Bhogta (9,300), Karenga/Koranga (7,954), Tiyyar (7,590), Patni (4,701), Kotal (3,347), Kaora (2,718), Mallah (2,443), Khatik (2,332) and the remaining are minor tribes and castes share less than 1000 population in the district.

At the time of the 2011 census, 87.15% spoke Bengali, 6.29% Santali, 2.49% Hindi and 0.93% Telugu as their first language. Other languages spoken in the district include Odia, Urdu, Kurmali, Mundari and Koda.

4.6.3.3 METHODOLOGY

In order to assess the Demographic & Socio-economic features along with the 1.0km distance based on field surveys and public consultations undertaken during the baseline field study period and Census records 2011, for the concerned 5 districts namely Hugli, Bankura, Puruliya, Haora & Paschim Medinipur of West Bengal state respectively was compiled and placed in the form of tabulation and graphical representation. Entire study area is observed predominantly rural and partly urban.

4.6.4 PURPOSE OF THE STUDY

Socio-economic study was conducted to establish the baseline demographic features and impacts due to proposed new highway project, as construction of any major project invariably leads to Socio-economic changes. The construction of the project could lead to unplanned and haphazard development of slums of various size and description with little or rudimentary.

4.6.5 DESCRIPTION OF SOCIAL ENVIRONMENT

As per the Census Records of India 2011, the 1.0km study zone along with the alignment has a total of 308 villages and 7 towns of 5 main districts namely Hugli (15 Villages), Bankura (84 villages), Puruliya (100 Villages & 01 Town) & Haora (12 Villages & 5 Towns) and Paschim Medinipur (97 villages & 01 Town) of West Bengal state respectively. All revenue villages/towns are mainly under 18 tehsils namely,

Khanakul – I and Khanakul – II of Hugly District, Indpur, Taldangra, & Simlapal of Bankura district, Jaipur, Purulia – II, Hura, Purulia – I, Pancha, Jhalda – I & Jhalda – II of Puruliya district, Amta – II & Bagnan – I of Haora district, Garbeta – I, Chandrakona – I & Chandrakona – II, Ghatal and Area not under any Sub-district under Paschim Medinipur district in West Bengal state respectively.

There are mainly 7 major towns named Jaypur (CT) of Hugly district, Karia (CT), Paschim Bainan (CT), Bangalpur (CT), Chandrapur (CT) & Khadinan (CT) of Haora district and Kharar (M)/10 Wards of Paschim Medinipur district were found in the 1.0km study zone of the proposed project alignment.

There are 20 other towns named Arambagh, Bankura, Bishnupur, Khatra, Purulia, Jaypur, Jhalda, Uluberia, Bagnan, Karia, Paschim Bainan, Bangalpur, Chandrapur, Khadinan, Chandrakona, C.K. Town, Ramjibanpur, Khirpai, Kharar and Ghatal, falling under all 5 concerned districts respectively, which are available for the study area villages in the range of <5km, 5-10km and >10km.

Details of the affected villages covered in the 1.0km study zone along with the project alignment are shown in Table 31 and given as follows;

Table 4-31: Concerned District and Tehsil with 1.0 km Study Zone

No.	State Code	State Name	District Code	District Name	District Code	District /Tehsil Name	State Code	Name of the Village
1	19	West Bengal	338	Hugli	02354	Khanakul - I	325821	Paschim Thakurani Chak
2	19	West Bengal	338	Hugli	02354	Khanakul - I	325822	bbha Thakurani Chak
3	19	West Bengal	338	Hugli	02355	Khanakul - II	325903	Ramchandrapur
4	19	West Bengal	338	Hugli	02355	Khanakul - II	325904	Kaknan
5	19	West Bengal	338	Hugli	02355	Khanakul - II	325905	Dhanyaghari
6	19	West Bengal	338	Hugli	02355	Khanakul - II	325906	Ghoradaha
7	19	West Bengal	338	Hugli	02355	Khanakul - II	325907	Jagatpur
8	19	West Bengal	338	Hugli	02355	Khanakul - II	325908	Bar Nandanpur
9	19	West Bengal	338	Hugli	02355	Khanakul - II	325909	Radhakrishnapur
10	19	West Bengal	338	Hugli	02355	Khanakul - II	325911	Nandanpur
11	19	West Bengal	338	Hugli	02355	Khanakul - II	325912	Banhijli
12	19	West Bengal	338	Hugli	02355	Khanakul - II	325913	Chand Kundu
13	19	West Bengal	338	Hugli	02355	Khanakul - II	325914	Dhaldanga

		Bengal						
14	19	West Bengal	338	Hugli	02355	Khanakul - II	325915	Marakhana
15	19	West Bengal	338	Hugli	02355	Khanakul - II	325926	Hanua
16	19	West Bengal	339	Bankura	02360	Indpur	326657	Dubrajpur
17	19	West Bengal	339	Bankura	02360	Indpur	326675	Natherdanga
18	19	West Bengal	339	Bankura	02360	Indpur	326691	Gottarya
19	19	West Bengal	339	Bankura	02360	Indpur	326692	Kelera
20	19	West Bengal	339	Bankura	02360	Indpur	326693	Maitydubrajpur
21	19	West Bengal	339	Bankura	02360	Indpur	326694	Salanpur
22	19	West Bengal	339	Bankura	02360	Indpur	326695	Gandlugar
23	19	West Bengal	339	Bankura	02360	Indpur	326696	Padulara
24	19	West Bengal	339	Bankura	02360	Indpur	326697	Bhalukbasa
25	19	st Bengal	339	Bankura	02360	Indpur	326699	Khatgram
26	19	st Bengal	339	Bankura	02360	Indpur	326700	Bamni
27	19	st Bengal	339	Bankura	02360	Indpur	326703	Dakshin Kamalpur
28	19	st Bengal	339	Bankura	02360	Indpur	326704	Shibrampur
29	19	st Bengal	339	Bankura	02360	Indpur	326705	Chandra
30	19	st Bengal	339	Bankura	02360	Indpur	326706	Bhutama
31	19	st Bengal	339	Bankura	02360	Indpur	326707	Phulkusma
32	19	st Bengal	339	Bankura	02360	Indpur	326711	Jugibad
33	19	st Bengal	339	Bankura	02360	Indpur	326712	Nekrakonda
34	19	st Bengal	339	Bankura	02360	Indpur	326713	Dakshin Pairachali
35	19	st Bengal	339	Bankura	02360	Indpur	326714	Kaliapathar
36	19	st Bengal	339	Bankura	02360	Indpur	326732	Bandeuli
37	19	st Bengal	339	Bankura	02360	Indpur	326733	Mayurnachna
38	19	st Bengal	339	Bankura	02360	Indpur	326734	Kadamdeuli
39	19	st Bengal	339	Bankura	02360	Indpur	326735	Bisharbera
40	19	st Bengal	339	Bankura	02360	Indpur	326738	Banshidihi
41	19	st Bengal	339	Bankura	02360	Indpur	326739	Kharakanali
42	19	st Bengal	339	Bankura	02360	Indpur	326740	Nishchintapur
43	19	st Bengal	339	Bankura	02360	Indpur	326741	Jiarda
44	19	st Bengal	339	Bankura	02360	Indpur	326743	Erodihi
45	19	st Bengal	339	Bankura	02360	Indpur	326744	Tunamara
46	19	st Bengal	339	Bankura	02360	Indpur	326745	Chakaltasahar
47	19	st Bengal	339	Bankura	02360	Indpur	326746	Panchpukhuria
48	19	st Bengal	339	Bankura	02360	Indpur	326791	Bankata
49	19	st Bengal	339	Bankura	02360	Indpur	326792	Botkula
50	19	st Bengal	339	Bankura	02360	Indpur	326793	Goaladanga
51	19	st Bengal	339	Bankura	02360	Indpur	326794	Jugda

52	19	st Bengal	339	Bankura	02360	Indpur	326795	Mauladanga
53	19	st Bengal	339	Bankura	02360	Indpur	326796	Gobindapur
54	19	st Bengal	339	Bankura	02360	Indpur	326797	Uparkechanda
55	19	st Bengal	339	Bankura	02360	Indpur	326800	Harishchandrapur
56	19	st Bengal	339	Bankura	02360	Indpur	326803	Nayada
57	19	st Bengal	339	Bankura	02360	Indpur	326804	Upargeryakula
58	19	st Bengal	339	Bankura	02360	Indpur	326805	Shalkap
59	19	st Bengal	339	Bankura	02360	Indpur	326806	Ramchandrapur
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61	19	st Bengal	339	Bankura	02360	Indpur	326852	Chhatapur
62	19	st Bengal	339	Bankura	02360	Indpur	326853	Nischintapur
63	19	st Bengal	339	Bankura	02360	Indpur	326854	Binodpur
64	19	st Bengal	339	Bankura	02360	Indpur	326855	Kurusthalia
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66	19	st Bengal	339	Bankura	02371	Taldangra	328617	Mahada
67	19	st Bengal	339	Bankura	02371	Taldangra	328618	Kadamara
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69	19	st Bengal	339	Bankura	02371	Taldangra	328620	Chak Nutangram
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71	19	st Bengal	339	Bankura	02371	Taldangra	328622	Paryardang
72	19	st Bengal	339	Bankura	02371	Taldangra	328650	Narattampur
73	19	st Bengal	339	Bankura	02371	Taldangra	328653	Taltala
74	19	st Bengal	339	Bankura	02371	Taldangra	328654	Dhengashimul
75	19	st Bengal	339	Bankura	02371	Taldangra	328656	Nachna
76	19	st Bengal	339	Bankura	02371	Taldangra	328661	Bhutamamaheshpur
77	19	st Bengal	339	Bankura	02371	Taldangra	328662	Harulia
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81	19	st Bengal	339	Bankura	02371	Taldangra	328701	Banskopa
82	19	st Bengal	339	Bankura	02371	Taldangra	328702	Kanaipur
83	19	st Bengal	339	Bankura	02371	Taldangra	328703	Radhanagar
84	19	st Bengal	339	Bankura	02371	Taldangra	328705	Panchmura
85	19	st Bengal	339	Bankura	02371	Taldangra	328710	Lalbandh
86	19	st Bengal	339	Bankura	02371	Taldangra	328711	Deulbhira
87	19	st Bengal	339	Bankura	02371	Taldangra	328712	Bhetuadanga
88	19	st Bengal	339	Bankura	02371	Taldangra	328713	Jambedia
89	19	st Bengal	339	Bankura	02371	Taldangra	328735	Murakati
90	19	st Bengal	339	Bankura	02371	Taldangra	328736	Kaniari
91	19	st Bengal	339	Bankura	02372	Simlapal	328865	Karakanali
92	19	st Bengal	339	Bankura	02372	Simlapal	328869	Balarampur
93	19	st Bengal	339	Bankura	02372	Simlapal	328870	Masatkhal
94	19	st Bengal	339	Bankura	02372	Simlapal	328930	Shyam Pur
95	19	st Bengal	339	Bankura	02372	Simlapal	328931	Pachaparar
96	19	st Bengal	339	Bankura	02372	Simlapal	328933	Barakhulia
97	19	st Bengal	339	Bankura	02372	Simlapal	328934	Keotdhara
98	19	st Bengal	339	Bankura	02372	Simlapal	328935	Balaram Pur
99	19	st Bengal	339	Bankura	02372	Simlapal	328936	Siuli
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101	19	st Bengal	340	Puruliya	02378	Jaipur	329838	Hathimuri
102	19	st Bengal	340	Puruliya	02378	Jaipur	329839	Silphor
103	19	st Bengal	340	Puruliya	02378	Jaipur	329841	Hargara
104	19	st Bengal	340	Puruliya	02378	Jaipur	329842	Hoangda
105	19	st Bengal	340	Puruliya	02378	Jaipur	329843	Dhabani
106	19	st Bengal	340	Puruliya	02378	Jaipur	329844	Nutandi
107	19	st Bengal	340	Puruliya	02378	Jaipur	329850	Balibhasa
108	19	st Bengal	340	Puruliya	02378	Jaipur	329851	Durama
109	19	st Bengal	340	Puruliya	02378	Jaipur	329857	Baragram
110	19	st Bengal	340	Puruliya	02378	Jaipur	329858	Phuljhariya
111	19	st Bengal	340	Puruliya	02378	Jaipur	329859	Ramamoti
112	19	st Bengal	340	Puruliya	02378	Jaipur	329860	Chaitandi
113	19	st Bengal	340	Puruliya	02378	Jaipur	329861	Kusumtikri
114	19	st Bengal	340	Puruliya	02378	Jaipur	329862	Agharpur
115	19	st Bengal	340	Puruliya	02378	Jaipur	329863	Gunja
116	19	st Bengal	340	Puruliya	02378	Jaipur	329896	Jaypur (CT)
117	19	st Bengal	340	Puruliya	02379	Purulia - II	329897	Ghongha
118	19	st Bengal	340	Puruliya	02379	Purulia - II	329905	Hatuara
119	19	st Bengal	340	Puruliya	02379	Purulia - II	329906	Bongabari
120	19	st Bengal	340	Puruliya	02379	Purulia - II	329908	Manipur
121	19	st Bengal	340	Puruliya	02379	Purulia - II	329909	Chargali
122	19	st Bengal	340	Puruliya	02379	Purulia - II	329910	Sihuli
123	19	st Bengal	340	Puruliya	02379	Purulia - II	329924	Dumdumi
124	19	st Bengal	340	Puruliya	02379	Purulia - II	329965	Podlara
125	19	st Bengal	340	Puruliya	02379	Purulia - II	329977	Bhangra
126	19	st Bengal	340	Puruliya	02379	Purulia - II	329980	Jhupra
127	19	st Bengal	340	Puruliya	02379	Purulia - II	329981	Dhurahi
128	19	st Bengal	340	Puruliya	02379	Purulia - II	329982	Gengra
129	19	st Bengal	340	Puruliya	02379	Purulia - II	329983	Latuliya
130	19	st Bengal	340	Puruliya	02379	Purulia - II	329984	Singhbazar
131	19	st Bengal	340	Puruliya	02379	Purulia - II	329985	Karcha
132	19	st Bengal	340	Puruliya	02379	Purulia - II	329986	Sandradi
133	19	st Bengal	340	Puruliya	02379	Purulia - II	329987	Kathaldiha
134	19	st Bengal	340	Puruliya	02379	Purulia - II	329988	Sidpur
135	19	st Bengal	340	Puruliya	02379	Purulia - II	329990	Chanchra
136	19	st Bengal	340	Puruliya	02379	Purulia - II	329992	Karcha
137	19	st Bengal	340	Puruliya	02379	Purulia - II	329993	Chhota Chanchra
138	19	st Bengal	340	Puruliya	02379	Purulia - II	329994	Chirumacha
139	19	st Bengal	340	Puruliya	02379	Purulia - II	329997	Haramjanga
140	19	st Bengal	340	Puruliya	02386	Hura	330830	Jojodi
141	19	st Bengal	340	Puruliya	02386	Hura	330832	Panchudi
142	19	st Bengal	340	Puruliya	02386	Hura	330844	Dumkadi
143	19	st Bengal	340	Puruliya	02386	Hura	330845	Nadiha
144	19	st Bengal	340	Puruliya	02386	Hura	330847	Hulung
145	19	st Bengal	340	Puruliya	02386	Hura	330848	Kulabahal
146	19	st Bengal	340	Puruliya	02386	Hura	330850	Sijumakhna
147	19	st Bengal	340	Puruliya	02386	Hura	330852	Arjjunjora
148	19	st Bengal	340	Puruliya	02386	Hura	330855	Keshargarh
149	19	st Bengal	340	Puruliya	02386	Hura	330856	Chorgali

150	19	st Bengal	340	Puruliya	02386	Hura	330857	Hatikundar
151	19	st Bengal	340	Puruliya	02386	Hura	330858	Amlatara
152	19	st Bengal	340	Puruliya	02386	Hura	330859	Kajali
153	19	st Bengal	340	Puruliya	02386	Hura	330860	Bariarpur
154	19	st Bengal	340	Puruliya	02386	Hura	330861	Chatumatar
155	19	st Bengal	340	Puruliya	02386	Hura	330868	Sarchakalta
156	19	st Bengal	340	Puruliya	02386	Hura	330869	Baragram
157	19	st Bengal	340	Puruliya	02386	Hura	330870	Chak Gopalpur
158	19	st Bengal	340	Puruliya	02386	Hura	330871	Rangamatya
159	19	st Bengal	340	Puruliya	02387	Purulia - I	330918	Golbera
160	19	st Bengal	340	Puruliya	02387	Purulia - I	330919	Rudra
161	19	st Bengal	340	Puruliya	02387	Purulia - I	330933	Gangudi
162	19	st Bengal	340	Puruliya	02387	Purulia - I	330934	Kalidasdi
163	19	st Bengal	340	Puruliya	02387	Purulia - I	330935	Shyamdasdi Alias Shyampur
164	19	st Bengal	340	Puruliya	02387	Purulia - I	330936	Gondhudi
165	19	st Bengal	340	Puruliya	02387	Purulia - I	330937	Kanali
166	19	st Bengal	340	Puruliya	02387	Purulia - I	330939	Khojda
167	19	st Bengal	340	Puruliya	02387	Purulia - I	330941	Bhuinadi
168	19	st Bengal	340	Puruliya	02387	Purulia - I	330942	Sibdi
169	19	st Bengal	340	Puruliya	02387	Purulia - I	330943	Hulka
170	19	st Bengal	340	Puruliya	02387	Purulia - I	330944	ultanr Alias Nadiara
171	19	st Bengal	340	Puruliya	02387	Purulia - I	330975	Mahalitora
172	19	st Bengal	340	Puruliya	02387	Purulia - I	330976	Nadiyara
173	19	st Bengal	340	Puruliya	02388	Puncha	331041	Lapara
174	19	st Bengal	340	Puruliya	02388	Puncha	331042	Damodarpur
175	19	st Bengal	340	Puruliya	02388	Puncha	331043	Bhatadi
176	19	st Bengal	340	Puruliya	02388	Puncha	331060	Bagda
177	19	st Bengal	340	Puruliya	02388	Puncha	331062	Haridi
178	19	st Bengal	340	Puruliya	02388	Puncha	331063	Chakia
179	19	st Bengal	340	Puruliya	02388	Puncha	331064	Kanara
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182	19	st Bengal	340	Puruliya	02388	Puncha	331067	Shyampur
183	19	st Bengal	340	Puruliya	02388	Puncha	331068	Kundhurka
184	19	st Bengal	340	Puruliya	02388	Puncha	331069	Bankanali
185	19	st Bengal	340	Puruliya	02388	Puncha	331088	Kendbani
186	19	st Bengal	340	Puruliya	02388	Puncha	331089	Laharia
187	19	st Bengal	340	Puruliya	02388	Puncha	331090	Poradi
188	19	st Bengal	340	Puruliya	02388	Puncha	331091	Simakanali
189	19	st Bengal	340	Puruliya	02388	Puncha	331093	Debgram
190	19	st Bengal	340	Puruliya	02388	Puncha	331094	Bhagaband
191	19	st Bengal	340	Puruliya	02390	Jhalda - I	331265	Guridi
192	19	st Bengal	340	Puruliya	02391	Jhalda - II	331430	Sulung Lahar
193	19	st Bengal	340	Puruliya	02391	Jhalda - II	331431	Karche
194	19	st Bengal	340	Puruliya	02391	Jhalda - II	331435	Chitmu
195	19	st Bengal	340	Puruliya	02391	Jhalda - II	331436	Sarjumhatu
196	19	st Bengal	340	Puruliya	02391	Jhalda - II	331437	Damrughutu
197	19	st Bengal	340	Puruliya	02391	Jhalda - II	331438	Bara Metyala

198	19	st Bengal	340	Puruliya	02391	Jhalda - II	331441	Damra
199	19	st Bengal	340	Puruliya	02391	Jhalda - II	331442	Amra
200	19	West Bengal	340	Puruliya	02391	Jhalda - II	331443	Tatayara
201	19	West Bengal	341	Haora	02399	Amta - II	332566	Uttar Bhatora
202	19	West Bengal	341	Haora	02399	Amta - II	332573	Solbaga
203	19	West Bengal	341	Haora	02399	Amta - II	332576	Nignan
204	19	West Bengal	341	Haora	02399	Amta - II	332578	Fatik Beria
205	19	West Bengal	341	Haora	02399	Amta - II	332579	Hio
206	19	West Bengal	341	Haora	02399	Amta - II	332580	Dakshin Khalna
207	19	West Bengal	341	Haora	02399	Amta - II	332585	Khari Geria
208	19	West Bengal	341	Haora	02399	Amta - II	332586	Kasmali
209	19	West Bengal	341	Haora	02408	Bagnan - I	333024	Kulepairi
210	19	West Bengal	341	Haora	02408	Bagnan - I	333025	Purbba Bainan
211	19	West Bengal	341	Haora	02408	Bagnan - I	333038	Joka
212	19	West Bengal	341	Haora	02408	Bagnan - I	333052	Ulanpara
213	19	West Bengal	341	Haora	02399	Bagnan - I	333061	Karia (CT)
214	19	West Bengal	341	Haora	02408	Bagnan - I	333062	Paschim Bainan (CT)
215	19	West Bengal	341	Haora	02408	Bagnan - I	333065	Bangalpur (CT)
216	19	West Bengal	341	Haora	02408	Bagnan - I	333066	Chandrapur (CT)
217	19	West Bengal	341	Haora	02408	Bagnan - I	333067	Khadinan (CT)
218	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	336778	Bhandirban
219	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	336779	Kukurajuri
220	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	336780	Khaerbani
221	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	336783	Benachapra
222	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	336832	Til Bhandara
223	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	336834	Bara Nohari

224	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	336874	Raghunathpur
225	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	336875	Rayda
226	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	336877	Chhatakonda
227	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	336878	Ausabandi
228	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	336890	Ramchak
229	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	336891	Kasua
230	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	336893	Agra
231	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	336894	Meghula
232	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	336913	Barabhandar Khanda
233	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	336914	Saldangra
234	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	336921	Golahat
235	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	336923	Moldanga
236	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	336924	Hingisol
237	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	336925	Baratalbeta
238	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	336938	Patpur
239	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	336939	Tasargeria
240	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	336940	Bajrakha Bankati
241	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	336941	Kankrasol
242	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	336980	Sanpdaha
243	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	336981	Garanga
244	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	336982	Dakshin Konda
245	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	336983	Darji
246	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	336985	Mangalapota
247	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	336986	Bandarbani
248	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	336987	Kashidanga

249	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	337000	Pathar Teria
250	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	337002	Madanhari
251	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	337004	Dhanyachhara
252	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	337006	Kumardubi
253	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	337007	Baharabuni
254	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	337008	Murabani
255	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	337009	Khayrapara
256	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	337011	Gamar Kushi
257	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	337012	Kadambandhi
258	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	337013	Chandabila
259	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	337014	Anandanagar
260	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	337138	Birajpur
261	19	West Bengal	344	Paschim Medinipur	02444	Garbeta - I	337139	Ghoramara
262	19	West Bengal	344	Paschim Medinipur	02446	Chandrakona - I	337407	Paramanandapur
263	19	West Bengal	344	Paschim Medinipur	02446	Chandrakona - I	337409	Dogerya Ramchak
264	19	West Bengal	344	Paschim Medinipur	02446	Chandrakona - I	337410	Rejna
265	19	West Bengal	344	Paschim Medinipur	02446	Chandrakona - I	337412	Kochgerya Ramchak
266	19	West Bengal	344	Paschim Medinipur	02446	Chandrakona - I	337416	Jara
267	19	West Bengal	344	Paschim Medinipur	02446	Chandrakona - I	337418	Dogerya Dharmmapur
268	19	West Bengal	344	Paschim Medinipur	02446	Chandrakona - I	337419	Ghola
269	19	West Bengal	344	Paschim Medinipur	02446	Chandrakona - I	337420	Narayanpur
270	19	West Bengal	344	Paschim Medinipur	02446	Chandrakona - I	337433	Madhabpur
271	19	West Bengal	344	Paschim Medinipur	02446	Chandrakona - I	337440	Beurgram
272	19	West Bengal	344	Paschim Medinipur	02446	Chandrakona - I	337441	Agra
273	19	West Bengal	344	Paschim Medinipur	02446	Chandrakona - I	337442	Purshuri

274	19	West Bengal	344	Paschim Medinipur	02446	Chandrakona - I	337443	Betagram
275	19	West Bengal	344	Paschim Medinipur	02446	Chandrakona - I	337446	Shyamkuri
276	19	West Bengal	344	Paschim Medinipur	02446	Chandrakona - I	337450	Kankabati
277	19	West Bengal	344	Paschim Medinipur	02446	Chandrakona - I	337452	Hajra
278	19	West Bengal	344	Paschim Medinipur	02446	Chandrakona - I	337453	Amdhere
279	19	West Bengal	344	Paschim Medinipur	02446	Chandrakona - I	337454	Goyalsini
280	19	West Bengal	344	Paschim Medinipur	02446	Chandrakona - I	337455	Belgerya
281	19	West Bengal	344	Paschim Medinipur	02446	Chandrakona - I	337457	Arjungerya
282	19	West Bengal	344	Paschim Medinipur	02446	Chandrakona - I	337458	Kashanda
283	19	West Bengal	344	Paschim Medinipur	02446	Chandrakona - I	337459	Andhare
284	19	West Bengal	344	Paschim Medinipur	02446	Chandrakona - I	337460	Gohaldanga
285	19	West Bengal	344	Paschim Medinipur	02447	Chandrakona - II	337518	Nishchintapur
286	19	West Bengal	344	Paschim Medinipur	02447	Chandrakona - II	337519	Ishangar
287	19	West Bengal	344	Paschim Medinipur	02447	Chandrakona - II	337520	Kunarpur
288	19	West Bengal	344	Paschim Medinipur	02447	Chandrakona - II	337521	Deulbere
289	19	West Bengal	344	Paschim Medinipur	02447	Chandrakona - II	337522	Maheshpur
290	19	West Bengal	344	Paschim Medinipur	02447	Chandrakona - II	337523	Murakata
291	19	West Bengal	344	Paschim Medinipur	02447	Chandrakona - II	337524	Khandanga
292	19	West Bengal	344	Paschim Medinipur	02447	Chandrakona - II	337528	Kshirati
293	19	West Bengal	344	Paschim Medinipur	02447	Chandrakona - II	337529	Bhairabpur
294	19	West Bengal	344	Paschim Medinipur	02447	Chandrakona - II	337546	Ghoshkira
295	19	West Bengal	344	Paschim Medinipur	02447	Chandrakona - II	337547	Shirsa
296	19	West Bengal	344	Paschim Medinipur	02447	Chandrakona - II	337549	Khursi
297	19	West Bengal	344	Paschim Medinipur	02447	Chandrakona - II	337550	Kalla
298	19	West Bengal	344	Paschim Medinipur	02447	Chandrakona - II	337593	Simla

299	19	West Bengal	344	Paschim Medinipur	02447	Chandrakona - II	337594	Dhaikhanda
300	19	West Bengal	344	Paschim Medinipur	02447	Chandrakona - II	337596	Langalbhangra
301	19	West Bengal	344	Paschim Medinipur	02448	Ghatal	337657	Gobindapur
302	19	West Bengal	344	Paschim Medinipur	02448	Ghatal	337663	Mansukha
303	19	West Bengal	344	Paschim Medinipur	02448	Ghatal	337664	Daulatchak
304	19	West Bengal	344	Paschim Medinipur	02448	Ghatal	337665	Chaulisinghapur (P)
305	19	West Bengal	344	Paschim Medinipur	02448	Ghatal	337666	Gangaprasad
306	19	West Bengal	344	Paschim Medinipur	02448	Ghatal	337667	Shrirampur (P)
307	19	West Bengal	344	Paschim Medinipur	02448	Ghatal	337668	Lalkundu
308	19	West Bengal	344	Paschim Medinipur	02448	Ghatal	337669	Brindabanchak
309	19	West Bengal	344	Paschim Medinipur	02448	Ghatal	337670	Ajodhyakundu
310	19	West Bengal	344	Paschim Medinipur	02448	Ghatal	337675	Jadupur
311	19	West Bengal	344	Paschim Medinipur	02448	Ghatal	337676	Krishnabati
312	19	West Bengal	344	Paschim Medinipur	02448	Ghatal	337677	Kamdebpur
313	19	West Bengal	344	Paschim Medinipur	02448	Ghatal	337687	Gopinathpur
314	19	West Bengal	344	Paschim Medinipur	02448	Ghatal	337695	Shyamsundarpur
315	20	West Bengal	344	Paschim Medinipur	99999	Area not under any Sub-district	801753	harar (M)/10 Wards
<i>Source-Census of India, 2011</i>								

4.6.5.1 POPULATION DISTRIBUTION WITH IN 1.0 KM STUDY ZONE

As per the Census Records 2011, the total population of 1.0 km study zone was recorded as 481639 persons of 315 villages/towns falling mainly under 05 districts namely Hugli, Bankura, Puruliya, Haora and Paschim Medinipur of West Bengal state respectively.

Total number of 'Households' was observed as 98919 in the 1.0 km study zone along with the alignment of 236.400 km. Male-female wise total population was recorded as 246031 males (51.0%) and 235608 females (49.0%) respectively. Scheduled Caste ('SC') population was observed as 123774 persons consisting of 62870 males (50.8%) and 60904 females (49.2%) in the 1.0 km study zone. Scheduled Tribes

(‘ST’) population was observed as 32478 persons consisting of 16215 males (50.0%) and 16263 females (50.0%) in the 1.0 km study zone.

The child population of the study area is recorded as 61500, which accounts as 12.8% to the total population (481639 Persons) and comprising of 31556 (51.3%)males&29944(48.7%) females respectively.

Rural and Urban population distribution is shown.

Table 4-32:Village-wise Population Distributions (1.0 km Study Zone)

Name of the Village/Town	No of Households	Total Population			Child Population (0-6 Years)		
		Persons	Male	Female	Persons	Male	Female
1. District Hugli, W.B.							
Paschim Thakurani Chak	1203	5514	2837	2677	579	288	291
Purbba Thakurani Chak	1578	7076	3578	3498	768	406	362
Ramchandrapur	1084	5299	2708	2591	787	413	374
Kaknan	1324	5833	2984	2849	686	390	296
Dhanyaghari	1336	5482	2663	2819	517	275	242
Ghoradaha	1566	6707	3369	3338	705	376	329
Jagatpur	1641	7142	3517	3625	811	435	376
Bar Nandanpur	1136	4763	2362	2401	512	258	254
Radhakrishnapur	707	3305	1681	1624	357	183	174
Nandanpur	1811	7778	3935	3843	792	390	402
Banhijli	756	3298	1618	1680	383	183	200
Chand Kundu	656	2884	1449	1435	304	164	140
Dhaldanga	560	2972	1560	1412	380	202	178
Marakhana	1151	5526	2819	2707	703	365	338
Hanua	695	3407	1759	1648	407	222	185
2. District Bankura, W.B.							
Dubrajpur	133	757	388	369	73	36	37
Natherdanga	270	1462	755	707	157	83	74
Gottarya	219	1148	602	546	139	74	65
Kelera	75	412	211	201	53	32	21
Maitydubrajpur	138	759	377	382	70	31	39
Salanpur	141	712	371	341	106	65	41
Gandlугara	94	428	203	225	42	21	21
Padulara	297	1560	790	770	254	136	118
Bhalukbasa	52	228	111	117	21	7	14
Khatgram	179	892	462	430	85	43	42
Bamni	137	695	360	335	83	45	38
Dakshin Kamalpur	52	243	125	118	32	16	16
Shibrampur	Uninhabited Village						
Chandra	93	434	219	215	53	31	22
Bhutama	132	752	374	378	121	63	58
Phulkusma	312	1569	825	744	183	100	83

Jugibad	Uninhabited Village						
Nekrakonda	81	421	217	204	54	25	29
Dakshin Pairachali	211	1170	608	562	153	76	77
Kaliapathar	119	544	261	283	69	29	40
Bandeuli	248	1283	647	636	159	89	70
Mayurnachna	Uninhabited Village						
Kadamdeuli	239	1038	545	493	100	57	43
Bisharbera	Uninhabited Village						
Banshidihi	289	1523	780	743	186	87	99
Kharakanali	51	224	115	109	32	17	15
Nishchintapur	37	172	86	86	19	11	8
Jiarda	250	1128	619	509	146	80	66
Erodihi	188	785	431	354	66	35	31
Tunamara	39	168	95	73	19	11	8
Chakaltasahar	101	378	195	183	28	14	14
Panchpukhuria	196	854	422	432	105	51	54
Bankata	171	904	478	426	104	57	47
Botkula	86	398	209	189	59	33	26
Goaladanga	238	1153	596	557	197	104	93
Jugda	4	20	10	10	3	1	2
Mauladanga	127	671	333	338	80	43	37
Gobindapur	212	1036	531	505	149	79	70
Uparkechanda	319	1683	877	806	213	104	109
Harishchandrapur	33	158	89	69	12	5	7
Nayada	128	688	359	329	70	35	35
Upargeryakula	62	324	158	166	36	19	17
Shalkap	183	1004	495	509	146	75	71
Ramchandrapur	210	974	489	485	116	57	59
Jugibaid	118	652	345	307	74	42	32
Chhatapur	182	899	487	412	119	63	56
Nischintapur	90	459	242	217	59	35	24
Binodpur	24	134	69	65	12	5	7
Kurusthalia	86	408	199	209	47	22	25
Surbhaga Band	88	426	227	199	45	26	19
Mahada	294	1214	618	596	114	53	61
Kadamara	162	758	383	375	62	31	31
Painada Modarpur	35	152	82	70	15	10	5
Chak Nutangram	137	614	304	310	82	44	38
Raghunathpur	104	557	274	283	81	39	42
Paryardang	342	1712	871	841	190	100	90
Narattampur	472	2245	1162	1083	236	117	119
Taltala	73	301	153	148	34	18	16
Dhengashimul	261	1232	624	608	135	68	67
Nachna	69	340	177	163	47	28	19
Bhutamamaheshpur	107	568	280	288	75	33	42
Harulia	187	894	441	453	104	49	55

Khatbanda	115	618	308	310	44	20	24
Harakona	283	1290	641	649	168	78	90
Bhedua	79	349	170	179	30	14	16
Banskopa	467	2160	1118	1042	241	126	115
Kanaipur	59	310	162	148	38	16	22
Radhanagar	134	665	332	333	57	22	35
Panchmura	797	3719	1854	1865	425	195	230
Lalbandh	244	1337	674	663	278	132	146
Deulbhira	133	669	333	336	78	37	41
Bhetuadanga	119	615	318	297	66	31	35
Jambedia	78	430	228	202	49	23	26
Murakati	240	1190	628	562	118	65	53
Kaniari	537	2610	1285	1325	326	159	167
Karakanali	260	1307	655	652	170	90	80
Balarampur	111	578	307	271	60	30	30
Masatkhal	86	479	239	240	56	32	24
Shyam Pur	38	171	90	81	31	23	8
Pachaparar	17	80	38	42	8	3	5
Barakhulia	36	149	72	77	28	18	10
Keotdhara	56	270	135	135	39	19	20
Balaram Pur	129	671	351	320	72	33	39
Siuli	63	299	147	152	45	20	25
3. District Puruliya, W.B.							
Panrga	145	854	444	410	148	79	69
Hathimuri	238	1361	668	693	262	132	130
Silphor	Uninhabited Village						
Hargara	228	1287	662	625	170	77	93
Hoangda	353	2074	1072	1002	335	174	161
Dhabani	147	729	370	359	125	61	64
Nutandi	340	1886	949	937	400	200	200
Balibhasa	128	743	395	348	110	62	48
Durama	112	686	358	328	101	49	52
Baragram	503	2811	1462	1349	418	215	203
Phuljhariya	2	18	10	8	2	1	1
Ramamoti	193	1018	540	478	145	76	69
Chaitandi	236	1105	588	517	165	87	78
Kusumtikri	171	1060	563	497	155	89	66
Agharpur	205	1287	674	613	175	97	78
Gunja	315	1850	966	884	255	142	113
Ghongha	656	3803	2001	1802	536	277	259
Hatuara	388	2353	1221	1132	395	218	177
Bongabari	762	4215	2082	2133	500	245	255
Manipur	112	710	345	365	110	54	56
Chargali	385	2259	1134	1125	416	211	205
Sihuli	821	4551	2297	2254	1003	502	501
Dumdumi	659	3768	1913	1855	587	307	280

Podlara	428	2594	1358	1236	434	227	207
Bhangra	531	2824	1460	1364	357	182	175
Jhupra	Uninhabited Village						
Dhurahi	196	1108	568	540	135	71	64
Gengra	409	2181	1151	1030	306	169	137
Latuliya	129	741	360	381	121	53	68
Singhbazar	333	1580	830	750	232	122	110
Karcha	299	1530	795	735	203	101	102
Sandradi	120	606	300	306	81	47	34
Kathaldiha	Uninhabited Village						
Sidpur	229	1299	664	635	174	83	91
Chanchra	253	1432	728	704	219	113	106
Karcha	102	471	233	238	42	18	24
Chhota Chanchra	97	485	260	225	70	41	29
Chirumacha	314	1615	822	793	196	98	98
Haramjanga	247	1357	694	663	190	101	89
Jojudi	266	1401	713	688	203	98	105
Panchudi	21	108	51	57	15	4	11
Dumkadi	240	1177	600	577	161	83	78
Nadiha	269	1397	680	717	188	95	93
Hulung	165	843	422	421	86	36	50
Kulabahar	247	1356	709	647	218	116	102
Sijumakhna	266	1331	661	670	173	88	85
Arjjunjora	193	1132	606	526	129	62	67
Keshargarh	937	4626	2340	2286	607	304	303
Chorgali	123	547	269	278	46	29	17
Hatikundar	367	2125	1051	1074	317	179	138
Amlatara	258	1262	643	619	129	66	63
Kajali	93	572	298	274	95	47	48
Bariarpur	255	1309	665	644	185	103	82
Chatumatar	343	1842	957	885	225	118	107
Sarchakalta	165	809	389	420	98	46	52
Baragram	626	3060	1564	1496	392	211	181
Chak Gopalpur	50	242	125	117	41	15	26
Rangamatya	179	883	459	424	117	68	49
Golbera	273	1634	848	786	230	124	106
Rudra	533	2659	1372	1287	373	204	169
Gangudi	Uninhabited Village						
Kalidasdi	64	352	184	168	36	22	14
Shyamdasdi Alias Shyampur	186	1024	528	496	110	54	56
Gondhudi	184	1030	517	513	156	69	87
Kanali	199	1129	595	534	159	91	68
Khojda	137	635	323	312	104	42	62
Bhuinadi	158	871	424	447	131	57	74
Sibdi	230	1214	596	618	209	97	112
Hulka	272	1447	713	734	197	96	101

Kultanr Alias Nadiara	81	521	265	256	77	43	34
Mahalitora	193	1272	771	501	159	80	79
Nadiyara	551	2912	1503	1409	444	238	206
Lapara	723	3267	1661	1606	466	234	232
Damodarpur	457	2303	1134	1169	345	164	181
Bhatadi	1	5	4	1	0	0	0
Bagda	527	2370	1195	1175	265	128	137
Haridi	77	348	180	168	44	21	23
Chakia	130	514	255	259	79	36	43
Kanara	377	1836	936	900	254	121	133
Kanchannagar	32	148	77	71	11	5	6
Niasa	Uninhabited Village						
Shyampur	83	416	212	204	41	27	14
Kundhurka	215	1121	587	534	135	68	67
Bankanali	Uninhabited Village						
Kendbani	67	405	205	200	67	35	32
Laharia	402	1883	989	894	203	115	88
Poradi	364	1659	857	802	152	74	78
Simakanali	176	829	425	404	110	55	55
Debgram	149	709	354	355	92	43	49
Bhagaband	293	1497	755	742	200	103	97
Guridi	71	415	201	214	64	24	40
Sulung Lahar	66	337	178	159	41	27	14
Karche	284	1448	739	709	200	108	92
Chitmu	750	3893	2035	1858	582	268	314
Sarjumhatu	188	1042	521	521	191	92	99
Damrughutu	228	1284	666	618	246	125	121
Bara Metyala	327	1724	906	818	236	123	113
Damra	41	244	124	120	28	18	10
Amra	106	556	262	294	103	49	54
Tatayara	987	5863	2984	2879	1065	560	505
4. District Haora, W.B.							
Uttar Bhatora	1128	5370	2779	2591	654	336	318
Solbaga	605	2802	1416	1386	402	192	210
Nignan	364	1870	963	907	281	154	127
Fatik Beria	148	629	336	293	90	48	42
Hio	360	1727	902	825	200	102	98
Dakshin Khalna	1219	5701	2871	2830	750	374	376
Khari Geria	522	2318	1225	1093	390	230	160
Kasmali	1019	4662	2415	2247	661	337	324
Kulepairi	Uninhabited Village						
Purbba Bainan	937	4746	2429	2317	557	299	258
Joka	859	4137	2124	2013	518	262	256
Ulanpara	1793	8369	4349	4020	1112	578	534
5. District Paschim Medinipur							
Bhandirban	53	243	126	117	24	10	14

Kukurajuri	Uninhabited Village						
Khaerbani	130	614	299	315	73	32	41
Benachapra	365	2079	1034	1045	300	144	156
Til Bhandara	Uninhabited Village						
Bara Nohari	307	1474	737	737	208	99	109
Raghunathpur	239	1054	524	530	118	60	58
Rayda	12	69	39	30	9	5	4
Chhatakonda	54	248	124	124	36	15	21
Ausabandi	263	1210	617	593	143	72	71
Ramchak	Uninhabited Village						
Kasua	61	291	154	137	39	26	13
Agra	207	1042	531	511	111	55	56
Meghula	81	394	203	191	31	15	16
Barabhandar Khanda	Uninhabited Village						
Saldangra	128	615	304	311	54	26	28
Golahat	73	323	168	155	37	17	20
Moldanga	119	528	264	264	41	21	20
Hingisol	7	32	14	18	1	0	1
Baratalbeta	19	92	39	53	20	9	11
Patpur	145	645	334	311	48	21	27
Tasargeria	64	287	156	131	30	12	18
Bajrakha Bankati	5	29	17	12	5	3	2
Kankrasol	137	586	285	301	63	24	39
Sanpdaha	188	814	428	386	101	55	46
Garanga	246	1179	578	601	149	70	79
Dakshin Konda	Uninhabited Village						
Darji	63	317	157	160	39	16	23
Mangalapota	488	2638	1388	1250	374	200	174
Bandarbani	4	18	11	7	1	1	0
Kashidanga	51	264	137	127	29	20	9
Pathar Teria	263	1359	709	650	176	106	70
Madanhari	528	2831	1448	1383	411	234	177
Dhanyachhara	86	543	275	268	91	37	54
Kumardubi	110	478	250	228	75	41	34
Baharabuni	Uninhabited Village						
Murabani	Uninhabited Village						
Khayrapara	Uninhabited Village						
Gamar Kushi	Uninhabited Village						
Kadambandhi	Uninhabited Village						
Chandabila	21	148	67	81	19	5	14
Anandanagar	32	176	84	92	28	14	14
Birajpur	247	1174	585	589	156	67	89
Ghoramara	150	717	361	356	92	42	50
Paramanandapur	212	904	470	434	78	43	35
Dogerya Ramchak	Uninhabited Village						
Rejna	278	1169	585	584	109	48	61

Kochgerya Ramchak	176	766	407	359	66	33	33
Jara	1550	6569	3351	3218	631	337	294
Tegerya Dharmmapur	13	93	53	40	13	7	6
Ghola	139	586	284	302	55	25	30
Narayanpur	219	948	494	454	93	47	46
Madhabpur	794	3667	1867	1800	406	208	198
Beurgram	458	1984	1017	967	221	116	105
Agra	218	997	478	519	112	52	60
Purshuri	610	2550	1291	1259	315	158	157
Betagram	200	852	439	413	76	48	28
Shyamkuri	50	248	125	123	22	11	11
Kankabati	411	1871	983	888	224	119	105
Hajra	103	467	239	228	40	22	18
Amdhere	85	416	225	191	49	24	25
Goyalsini	260	1134	589	545	112	48	64
Belgerya	108	504	281	223	44	16	28
Arjungerya	71	370	193	177	49	25	24
Kashanda	487	2198	1137	1061	269	139	130
Andhare	156	859	432	427	123	59	64
Gohaldanga	98	490	245	245	48	18	30
Nishchintapur	126	614	306	308	60	29	31
Ishangar	56	288	148	140	25	10	15
Kunarpur	71	332	176	156	31	21	10
Deulbere	181	764	384	380	100	57	43
Maheshpur	549	2771	1455	1316	471	221	250
Murakata	888	4411	2242	2169	752	376	376
Khandanga	356	1964	1025	939	340	188	152
Kshirati	225	1037	529	508	112	55	57
Bhairabpur	595	2720	1376	1344	352	172	180
Ghoshkira	34	150	89	61	6	5	1
Shirsa	89	390	214	176	39	23	16
Khursi	253	1261	624	637	169	67	102
Kalla	389	1990	1022	968	306	158	148
Simla	208	883	464	419	92	48	44
Dhaikhanda	215	981	502	479	158	73	85
Langalbhanga	Uninhabited Village						
Gobindapur	312	1420	725	695	123	65	58
Mansukha	1842	8583	4440	4143	958	529	429
Daulatchak	708	3287	1714	1573	419	216	203
Chaulisinghapur (P)	123	615	321	294	72	37	35
Gangaprasad	284	1382	712	670	218	112	106
Shrirampur (P)	589	2764	1380	1384	305	160	145
Lalkundu	28	129	58	71	17	7	10
Brindabanchak	Uninhabited Village						
Ajodhyakundu	Uninhabited Village						
Jadupur	261	1194	608	586	129	68	61

Krishnabati	60	289	150	139	34	24	10
Kamdebpur	147	753	373	380	97	45	52
Gopinathpur	151	710	356	354	91	53	38
Shyamsundarpur	580	2797	1451	1346	331	166	165
TOTAL (1.0km)	86209	21321	15185	06136	54454	27959	26495

Source-Census of India, 2011

Table 4-33:Village-wise SC & STPopulation Distribution (1.0 km Study Zone)

Name of the Village/Town	Total Population	Scheduled Castes			Scheduled Tribes		
		Persons	Males	Females	Persons	Males	Females
1. District Hugli, W.B.							
Paschim Thakurani Chak	5514	209	116	93	0	0	0
Purbba Thakurani Chak	7076	979	499	480	0	0	0
Ramchandrapur	5299	3205	1641	1564	0	0	0
Kaknan	5833	1830	910	920	0	0	0
Dhanyaghari	5482	943	449	494	1	1	0
Ghoradaha	6707	1056	529	527	0	0	0
Jagatpur	7142	2693	1306	1387	2	0	2
Bar Nandanpur	4763	1619	819	800	0	0	0
Radhakrishnapur	3305	448	229	219	0	0	0
Nandanpur	7778	963	501	462	6	4	2
Banhijli	3298	366	182	184	0	0	0
Chand Kundu	2884	636	299	337	0	0	0
Dhaldanga	2972	973	500	473	0	0	0
Marakhana	5526	1187	620	567	0	0	0
Hanua	3407	1508	765	743	0	0	0
2. District Bankura, W.B.							
Dubrajpur	757	90	44	46	0	0	0
Natherdanga	1462	530	270	260	0	0	0
Gottarya	1148	353	184	169	116	64	52
Kelera	412	10	5	5	0	0	0
Maitydubrajpur	759	134	64	70	0	0	0
Salanpur	712	472	242	230	44	24	20
Gandlugar	428	0	0	0	414	197	217
Padulara	1560	319	162	157	228	112	116
Bhalukbasa	228	0	0	0	227	110	117
Khatgram	892	231	117	114	0	0	0
Bamni	695	84	48	36	369	188	181
Dakshin Kamalpur	243	9	5	4	219	112	107
Shibrampur	Uninhabited Village						
Chandra	434	220	110	110	211	107	104
Bhutama	752	201	101	100	0	0	0
Phulkusma	1569	555	281	274	5	3	2
Jugibad	Uninhabited Village						
Nekrakonda	421	0	0	0	189	95	94
Dakshin Pairachali	1170	537	276	261	268	139	129
Kaliapathar	544	350	169	181	115	52	63

Bandeuli	1283	148	83	65	760	375	385
Mayurnachna	Uninhabited Village						
Kadamdeuli	1038	414	213	201	235	131	104
Bisharbera	Uninhabited Village						
Banshidihi	1523	263	143	120	0	0	0
Kharakanali	224	224	115	109	0	0	0
Nishchintapur	172	91	47	44	24	11	13
Jiarda	1128	254	134	120	191	110	81
Erodihi	785	386	208	178	1	0	1
Tunamara	168	87	48	39	0	0	0
Chakaltasahar	378	377	195	182	1	0	1
Panchpukhuria	854	648	316	332	39	20	19
Bankata	904	403	214	189	0	0	0
Botkula	398	98	55	43	29	16	13
Goaladanga	1153	489	240	249	90	46	44
Jugda	20	15	7	8	0	0	0
Mauladanga	671	266	127	139	0	0	0
Gobindapur	1036	635	320	315	0	0	0
Uparkechanda	1683	582	285	297	0	0	0
Harishchandrapur	158	0	0	0	0	0	0
Nayada	688	249	130	119	0	0	0
Upargeryakula	324	7	3	4	0	0	0
Shalkap	1004	556	278	278	0	0	0
Ramchandrapur	974	816	416	400	68	27	41
Jugibaid	652	131	65	66	0	0	0
Chhatapur	899	331	172	159	148	82	66
Nischintapur	459	0	0	0	360	188	172
Binodpur	134	0	0	0	5	2	3
Kurusthalia	408	0	0	0	406	197	209
Surbhaga Band	426	0	0	0	0	0	0
Mahada	1214	522	258	264	0	0	0
Kadamara	758	233	122	111	521	259	262
Painada Modarpur	152	0	0	0	152	82	70
Chak Nutangram	614	51	29	22	563	275	288
Raghunathpur	557	77	41	36	298	144	154
Paryardang	1712	537	265	272	139	63	76
Narattampur	2245	501	256	245	513	251	262
Taltala	301	0	0	0	300	153	147
Dhengashimul	1232	503	251	252	479	256	223
Nachna	340	336	176	160	0	0	0
Bhutamamaheshpur	568	76	37	39	56	29	27
Harulia	894	523	250	273	106	55	51
Khatbanda	618	221	113	108	0	0	0
Harakona	1290	825	418	407	230	111	119
Bhedua	349	42	22	20	0	0	0
Banskopa	2160	904	461	443	394	202	192

Kanaipur	310	86	45	41	61	34	27
Radhanagar	665	173	85	88	0	0	0
Panchmura	3719	1302	641	661	21	8	13
Lalbandh	1337	0	0	0	0	0	0
Deulbhira	669	79	36	43	6	4	2
Bhetuadanga	615	239	120	119	0	0	0
Jambedia	430	41	19	22	0	0	0
Murakati	1190	2	1	1	85	41	44
Kaniari	2610	696	336	360	1169	562	607
Karakanali	1307	113	56	57	187	93	94
Balarampur	578	82	38	44	110	53	57
Masatkhal	479	0	0	0	0	0	0
Shyam Pur	171	156	82	74	0	0	0
Pachaparar	80	0	0	0	80	38	42
Barakhulia	149	0	0	0	149	72	77
Keotdhara	270	0	0	0	269	135	134
Balaram Pur	671	207	102	105	3	2	1
Siuli	299	190	97	93	9	3	6
3. District Puruliya, W.B.							
Panrga	854	32	13	19	99	56	43
Hathimuri	1361	283	139	144	0	0	0
Silphor	Uninhabited Village						
Hargara	1287	0	0	0	0	0	0
Hoangda	2074	404	210	194	0	0	0
Dhabani	729	0	0	0	33	18	15
Nutandi	1886	1302	634	668	9	6	3
Balibhasa	743	0	0	0	0	0	0
Durama	686	111	58	53	0	0	0
Baragram	2811	518	266	252	24	10	14
Phuljhariya	18	0	0	0	0	0	0
Ramamoti	1018	379	212	167	127	65	62
Chaitandi	1105	43	22	21	30	18	12
Kusumtikri	1060	76	39	37	0	0	0
Agharpur	1287	19	8	11	67	36	31
Gunja	1850	248	123	125	28	16	12
Jaypur (CT)	10259	2650	1327	1323	379	180	199
Ghongha	3803	1525	796	729	33	16	17
Hatuara	2353	82	42	40	254	132	122
Bongabari	4215	721	370	351	122	53	69
Manipur	710	0	0	0	46	22	24
Chargali	2259	328	161	167	0	0	0
Sihuli	4551	378	191	187	0	0	0
Dumdumi	3768	1031	538	493	0	0	0
Podlara	2594	1061	548	513	10	7	3
Bhangra	2824	668	342	326	0	0	0
Jhupra	Uninhabited Village						

Dhurahi	1108	11	7	4	0	0	0
Gengra	2181	1083	562	521	49	30	19
Latuliya	741	26	17	9	42	20	22
Singhbazar	1580	1028	540	488	0	0	0
Karcha	1530	1137	585	552	0	0	0
Sandradi	606	579	285	294	0	0	0
Kathaldiha	Uninhabited Village						
Sidpur	1299	766	387	379	1	0	1
Chanchra	1432	547	278	269	0	0	0
Karcha	471	172	85	87	0	0	0
Chhota Chanchra	485	485	260	225	0	0	0
Chirumacha	1615	290	146	144	56	32	24
Haramjanga	1357	362	174	188	82	38	44
Jojodi	1401	329	172	157	0	0	0
Panchudi	108	0	0	0	0	0	0
Dumkadi	1177	306	159	147	653	321	332
Nadiha	1397	54	29	25	226	116	110
Hulung	843	150	71	79	120	58	62
Kulabahal	1356	26	13	13	430	222	208
Sijumakhna	1331	84	47	37	305	141	164
Arjjunjora	1132	351	183	168	0	0	0
Keshargarh	4626	1817	926	891	1327	651	676
Chorgali	547	0	0	0	544	267	277
Hatikundar	2125	90	47	43	1771	860	911
Amlatara	1262	61	30	31	75	31	44
Kajali	572	0	0	0	140	80	60
Bariarpur	1309	258	130	128	585	295	290
Chatumatar	1842	326	176	150	211	122	89
Sarchakalta	809	18	8	10	4	3	1
Baragram	3060	863	432	431	97	45	52
Chak Gopalpur	242	83	45	38	0	0	0
Rangamatya	883	3	3	0	574	289	285
Golbera	1634	1	0	1	66	35	31
Rudra	2659	368	190	178	24	9	15
Gangudi	Uninhabited Village						
Kalidasdi	352	0	0	0	14	8	6
Shyamdasdi Alias Shyampur	1024	84	42	42	67	38	29
Gondhudi	1030	43	20	23	0	0	0
Kanali	1129	121	65	56	0	0	0
Khojda	635	0	0	0	0	0	0
Bhuinadi	871	78	39	39	0	0	0
Sibdi	1214	192	97	95	44	21	23
Hulka	1447	266	125	141	25	11	14
Kultanr Alias Nadiara	521	123	60	63	0	0	0
Mahalitora	1272	19	16	3	15	13	2
Nadiyara	2912	1251	649	602	139	74	65

Lapara	3267	435	223	212	758	385	373
Damodarpur	2303	289	142	147	487	228	259
Bhatadi	5	0	0	0	0	0	0
Bagda	2370	616	295	321	254	129	125
Haridi	348	0	0	0	348	180	168
Chakia	514	0	0	0	510	252	258
Kanara	1836	312	148	164	387	185	202
Kanchannagar	148	0	0	0	46	24	22
Niasa	Uninhabited Village						
Shyampur	416	0	0	0	78	36	42
Kundhurka	1121	13	7	6	317	173	144
Bankanali	Uninhabited Village						
Kendbani	405	80	43	37	164	80	84
Laharia	1883	504	273	231	378	187	191
Poradi	1659	93	46	47	26	11	15
Simakanali	829	58	34	24	134	61	73
Debgram	709	169	84	85	0	0	0
Bhagaband	1497	215	106	109	737	368	369
Guridi	415	52	29	23	1	1	0
Sulung Lahar	337	279	151	128	58	27	31
Karche	1448	151	76	75	1278	652	626
Chitmu	3893	254	137	117	690	342	348
Sarjumhatu	1042	1	0	1	5	2	3
Damrughutu	1284	0	0	0	1268	657	611
Bara Metyala	1724	849	460	389	536	272	264
Damra	244	0	0	0	0	0	0
Amra	556	0	0	0	106	46	60
Tatayara	5863	306	159	147	686	353	333
4. District Haora, W.B.							
Uttar Bhatara	5370	2766	1407	1359	1	0	1
Solbaga	2802	2706	1368	1338	5	2	3
Nignan	1870	921	476	445	0	0	0
Fatik Beria	629	615	327	288	1	1	0
Hio	1727	392	202	190	0	0	0
Dakshin Khalna	5701	648	339	309	1	0	1
Khari Geria	2318	2281	1202	1079	1	0	1
Kasmali	4662	3789	1974	1815	5	4	1
Kulepairi	Uninhabited Village						
Purbba Bainan	4746	637	332	305	63	28	35
Joka	4137	21	9	12	0	0	0
Ulanpara	8369	1192	605	587	0	0	0
Karia (CT)	4737	1433	739	694	0	0	0
Paschim Bainan (CT)	12405	2494	1257	1237	5	2	3
Bangalpur (CT)	6760	1005	506	499	1	0	1
Chandrapur (CT)	4742	793	401	392	0	0	0
Khadinan (CT)	9297	1065	553	512	7	3	4

5. District Paschim Medinipur, W.B.							
Bhandirban	243	44	22	22	102	51	51
Kukurajuri							
Khaerbani	614	165	79	86	178	86	92
Benachapra	2079	0	0	0	281	134	147
Til Bhandara	Uninhabited Village						
Bara Nohari	1474	820	414	406	0	0	0
Raghunathpur	1054	534	256	278	0	0	0
Rayda	69	0	0	0	0	0	0
Chhatakonda	248	0	0	0	0	0	0
Ausabandi	1210	0	0	0	474	239	235
Ramchak	Uninhabited Village						
Kasua	291	286	151	135	0	0	0
Agra	1042	492	235	257	0	0	0
Meghula	394	220	111	109	0	0	0
Barabhandar Khanda	Uninhabited Village						
Saldangra	615	162	77	85	0	0	0
Golahat	323	114	60	54	0	0	0
Moldanga	528	0	0	0	0	0	0
Hingisol	32	0	0	0	0	0	0
Baratalbeta	92	92	39	53	0	0	0
Patpur	645	10	4	6	0	0	0
Tasargeria	287	0	0	0	0	0	0
Bajrakha Bankati	29	0	0	0	0	0	0
Kankrasol	586	0	0	0	3	2	1
Sanpdaha	814	333	174	159	0	0	0
Garanga	1179	489	223	266	38	24	14
Dakshin Konda	Uninhabited Village						
Darji	317	19	10	9	0	0	0
Mangalapota	2638	522	269	253	7	5	2
Bandarbani	18	3	2	1	0	0	0
Kashidanga	264	206	107	99	7	4	3
Pathar Teria	1359	532	287	245	58	28	30
Madanhari	2831	12	6	6	0	0	0
Dhanyachhara	543	0	0	0	0	0	0
Kumardubi	478	98	47	51	0	0	0
Baharabuni	Uninhabited Village						
Murabani	Uninhabited Village						
Khayrapara	Uninhabited Village						
Gamar Kushi	Uninhabited Village						
Kadambandhi	Uninhabited Village						
Chandabila	148	0	0	0	139	62	77
Anandanagar	176	0	0	0	169	79	90
Birajpur	1174	405	204	201	30	13	17
Ghoramara	717	38	14	24	350	174	176
Paramanandapur	904	151	70	81	1	0	1

Dogerya Ramchak	Uninhabited Village						
Rejna	1169	324	159	165	129	60	69
Kochgerya Ramchak	766	254	137	117	0	0	0
Jara	6569	2434	1245	1189	430	219	211
Tegerya Dharmmapur	93	93	53	40	0	0	0
Ghola	586	5	3	2	0	0	0
Narayanpur	948	413	215	198	71	39	32
Madhabpur	3667	1410	700	710	224	112	112
Beurgram	1984	955	483	472	20	9	11
Agra	997	341	150	191	18	7	11
Purshuri	2550	1189	592	597	39	18	21
Betagram	852	164	88	76	7	4	3
Shyamkuri	248	0	0	0	0	0	0
Kankabati	1871	1008	536	472	1	0	1
Hajra	467	179	93	86	13	5	8
Amdhere	416	0	0	0	0	0	0
Goyalsini	1134	307	153	154	159	76	83
Belgerya	504	400	221	179	0	0	0
Arjungerya	370	0	0	0	0	0	0
Kashanda	2198	47	29	18	0	0	0
Andhare	859	63	33	30	159	78	81
Gohaldanga	490	14	7	7	0	0	0
Nishchintapur	614	0	0	0	0	0	0
Ishangar	288	0	0	0	0	0	0
Kunarpur	332	96	51	45	0	0	0
Deulbere	764	570	282	288	6	4	2
Maheshpur	2771	131	62	69	0	0	0
Murakata	4411	557	283	274	22	10	12
Khandanga	1964	0	0	0	0	0	0
Kshirati	1037	328	173	155	0	0	0
Bhairabpur	2720	1785	884	901	12	6	6
Ghoshkira	150	0	0	0	0	0	0
Shirsa	390	0	0	0	0	0	0
Khursi	1261	161	75	86	0	0	0
Kalla	1990	0	0	0	0	0	0
Simla	883	193	96	97	1	1	0
Dhaikhanda	981	124	59	65	19	6	13
Langalbhangra	Uninhabited Village						
Gobindapur	1420	470	237	233	75	32	43
Mansukha	8583	2126	1079	1047	2	1	1
Daulatchak	3287	1436	735	701	4	3	1
Chaulisinghapur (P)	615	159	78	81	0	0	0
Gangaprasad	1382	1367	704	663	4	1	3
Shrirampur (P)	2764	172	87	85	1	0	1
Lalkundu	129	129	58	71	0	0	0
Brindabanchak	Uninhabited Village						

Ajodhyakundu	Uninhabited Village						
Jadupur	1194	667	337	330	52	30	22
Krishnabati	289	207	108	99	0	0	0
Kamdebpur	753	317	157	160	6	2	4
Gopinathpur	710	291	152	139	32	15	17
Shyamsundarpur	2797	1249	625	624	0	0	0
Kharar (M)/10 Wards	12118	3851	1927	1924	175	82	93
TOTAL (1.0km)	481639	23774	2870	60904	32478	6215	16263

Source-Census of India, 2011

4.6.5.2 SEX RATIO

The 'Sex Ratio' of the study area is a numeric relationship between females and males of an area and bears paramount importance in the present day scenario where the un-ethnic pre-determination of sex and killing of female foetus during pregnancy is practiced by unscrupulous medical practitioners against the rule of the law of the country. It is evident that by contrast the practice of female foeticide is not prevalent in the study area.

The 'Sex Ratio' was observed as 961, 957, 957, 939 & 966(Average 956) females per 1000 males in all the concerned districts named Hugli, Bankura, Puruliya, Haora and Paschim Medinipur respectively in West Bengal state. The same was recorded as 958 females for every 1000 males in the study area. The child (0-6 Yrs age) sex ratio of the study zone was observed as 949 female children per 1000 male children.

The village wise male-female population distribution for the study area is depicted and shown by graphical representation in Table & Figure below.

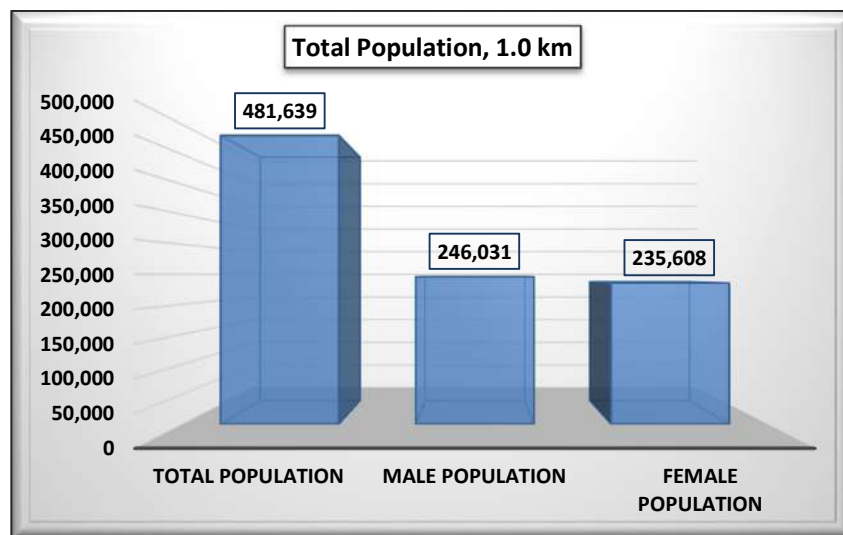


Figure 4-24: Male-Female wise Population Distribution

4.6.5.3 SCHEDULED CASTE & SCHEDULED TRIBE POPULATION

On the basis of the village wise SC & ST population distribution of the study area during 2011, the 'Scheduled Castes' population was observed as 123774 persons consisting of 62870 males and 60904 females respectively in the study area which accounts as 25.7% to the total population (481639 persons) of the study area. 'Scheduled Tribes' population was observed as 32478 persons consisting of 16215 males and 16263 females respectively in the study area which accounts as 6.7% to the total population (481639 persons) of the study area. It implies that the rest 67.7% to the total population belongs to the General category.

Male-female wise distribution of 'SC' & 'ST' population in the study area is graphically shown in Figure 4-25 & 4-26.

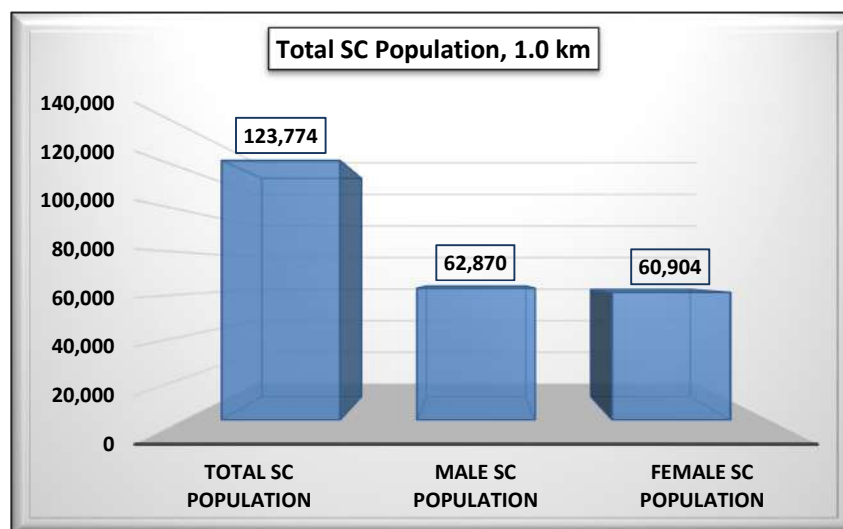


Figure 4-25: Scheduled Caste Population in the Study Area

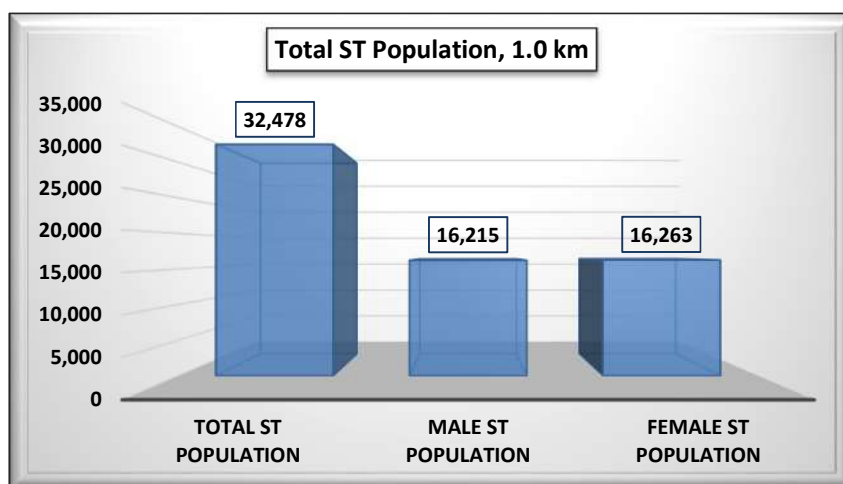


Figure 4-26: Scheduled Tribes Population in the Study Area

4.6.5.4 LITERACY RATE

Literacy level is quantifiable indicator to assess the development status of an area or region. Male-Female wise literates and illiterate's population is represented in below table. Total literate's population was recorded as 309124 persons (64.2%) in the study area. below table reveals that Male-Female wise literates are observed as 177955 & 131169 persons respectively, implies that the 'Literacy Rate' is recorded as 64.2% with male-female wise percentages being 37.0% & 27.2% respectively. The total illiterate's population was recorded as 172515 persons (35.8%) in the study area. Male-Female wise illiterates were 68076 (14.0%) and 104439 (21.7%) respectively.

The Male-Female wise graphical representation of literates & illiterate's population in study area villages/town is shown in Figure 4-27 and table 4-37.

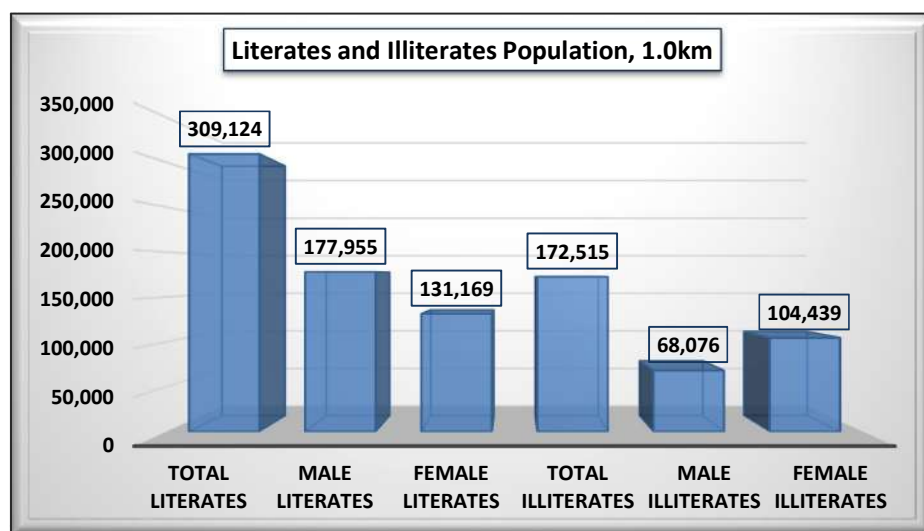


Figure 4-27: Male-Female wise Distribution of Literates & Illiterates

Table 4-34 Male-Female wise Literates and Illiterates

Name of the Village/Town	Total Population	Literates			Illiterates		
		Persons	Males	Females	Persons	Males	Females
1. District Hugli, W.B.							
Paschim Thakurani Chak	5514	4330	2408	1922	1184	429	755
Purbba Thakurani Chak	7076	5214	2882	2332	1862	696	1166
Ramchandrapur	5299	3157	1773	1384	2142	935	1207
Kaknan	5833	4089	2264	1825	1744	720	1024
Dhanyaghari	5482	4056	2130	1926	1426	533	893
Ghoradaha	6707	4954	2699	2255	1753	670	1083
Jagatpur	7142	4840	2600	2240	2302	917	1385
Bar Nandanpur	4763	3260	1775	1485	1503	587	916
Radhakrishnapur	3305	2414	1343	1071	891	338	553

Nandanpur	7778	5909	3268	2641	1869	667	1202
Banhijli	3298	2387	1297	1090	911	321	590
Chand Kundu	2884	1967	1107	860	917	342	575
Dhaldanga	2972	2206	1251	955	766	309	457
Marakhana	5526	3957	2167	1790	1569	652	917
Hanua	3407	2301	1322	979	1106	437	669
2. District Bankura, W.B.							
Dubrajpur	757	511	321	190	246	67	179
Natherdanga	1462	942	578	364	520	177	343
Gottarya	1148	684	424	260	464	178	286
Kelera	412	288	162	126	124	49	75
Maitydubrajpur	759	496	298	198	263	79	184
Salanpur	712	304	202	102	408	169	239
Gandluga	428	248	148	100	180	55	125
Padulara	1560	764	499	265	796	291	505
Bhalukbasa	228	146	89	57	82	22	60
Khatgram	892	599	369	230	293	93	200
Bamni	695	422	260	162	273	100	173
Dakshin Kamalpur	243	136	89	47	107	36	71
Shibrampur	Uninhabited Village						
Chandra	434	247	150	97	187	69	118
Bhutama	752	343	221	122	409	153	256
Phulkusma	1569	984	594	390	585	231	354
Jugibad	Uninhabited Village						
Nekrakonda	421	240	156	84	181	61	120
Dakshin Pairachali	1170	664	447	217	506	161	345
Kaliapathar	544	281	166	115	263	95	168
Bandeuli	1283	803	499	304	480	148	332
Mayurnachna	Uninhabited Village						
Kadamdeuli	1038	613	394	219	425	151	274
Bisharbera	Uninhabited Village						
Banshidihi	1523	1030	598	432	493	182	311
Kharakanali	224	89	61	28	135	54	81
Nishchintapur	172	89	50	39	83	36	47
Jiarda	1128	758	460	298	370	159	211
Erodihi	785	428	276	152	357	155	202
Tunamara	168	95	58	37	73	37	36
Chakaltasahar	378	314	179	135	64	16	48
Panchpukhuria	854	474	277	197	380	145	235
Bankata	904	556	353	203	348	125	223
Botkula	398	253	150	103	145	59	86
Goaladanga	1153	402	281	121	751	315	436
Jugda	20	6	4	2	14	6	8
Mauladanga	671	411	236	175	260	97	163
Gobindapur	1036	523	323	200	513	208	305
Uparkechanda	1683	1124	675	449	559	202	357

Harishchandrapur	158	146	84	62	12	5	7
Nayada	688	484	281	203	204	78	126
Upargeryakula	324	244	132	112	80	26	54
Shalkap	1004	587	318	269	417	177	240
Ramchandrapur	974	522	313	209	452	176	276
Jugibaid	652	398	237	161	254	108	146
Chhatapur	899	491	323	168	408	164	244
Nischintapur	459	270	168	102	189	74	115
Binodpur	134	114	63	51	20	6	14
Kurusthalia	408	268	157	111	140	42	98
Surbhaga Band	426	287	178	109	139	49	90
Mahada	1214	798	466	332	416	152	264
Kadamara	758	407	271	136	351	112	239
Painada Modarpur	152	89	57	32	63	25	38
Chak Nutangram	614	284	174	110	330	130	200
Raghunathpur	557	341	193	148	216	81	135
Paryardang	1712	1077	637	440	635	234	401
Narattampur	2245	1422	850	572	823	312	511
Taltala	301	164	108	56	137	45	92
Dhengashimul	1232	734	442	292	498	182	316
Nachna	340	157	103	54	183	74	109
Bhutamamaheshpur	568	323	188	135	245	92	153
Harulia	894	512	294	218	382	147	235
Khatbanda	618	463	256	207	155	52	103
Harakona	1290	691	416	275	599	225	374
Bhedua	349	281	150	131	68	20	48
Banskopa	2160	1275	754	521	885	364	521
Kanaipur	310	228	130	98	82	32	50
Radhanagar	665	488	275	213	177	57	120
Panchmura	3719	2525	1408	1117	1194	446	748
Lalbandh	1337	671	404	267	666	270	396
Deulbhira	669	519	281	238	150	52	98
Bhetuadanga	615	453	259	194	162	59	103
Jambedia	430	320	185	135	110	43	67
Murakati	1190	865	502	363	325	126	199
Kaniari	2610	1454	828	626	1156	457	699
Karakanali	1307	772	436	336	535	219	316
Balarampur	578	379	232	147	199	75	124
Masatkhal	479	345	183	162	134	56	78
Shyam Pur	171	70	40	30	101	50	51
Pachaparar	80	49	28	21	31	10	21
Barakhulia	149	68	32	36	81	40	41
Keotdhara	270	133	79	54	137	56	81
Balaram Pur	671	501	294	207	170	57	113
Siuli	299	170	98	72	129	49	80

3. District Puruliya, W.B.

Panrga	854	474	311	163	380	133	247
Hathimuri	1361	434	291	143	927	377	550
Silphor	Uninhabited Village						
Hargara	1287	635	420	215	652	242	410
Hoangda	2074	969	667	302	1105	405	700
Dhabani	729	204	156	48	525	214	311
Nutandi	1886	654	454	200	1232	495	737
Balibhasa	743	490	309	181	253	86	167
Durama	686	385	249	136	301	109	192
Baragram	2811	1759	1066	693	1052	396	656
Phuljhariya	18	11	8	3	7	2	5
Ramamoti	1018	615	409	206	403	131	272
Chaitandi	1105	721	448	273	384	140	244
Kusumtikri	1060	571	374	197	489	189	300
Agharpur	1287	845	523	322	442	151	291
Gunja	1850	1122	713	409	728	253	475
Jaypur (CT)	10259	5893	3534	2359	4366	810	2556
Ghongha	3803	2036	1323	713	1767	678	1089
Hatuara	2353	1401	846	555	952	375	577
Bongabari	4215	2559	1503	1056	1656	579	1077
Manipur	710	396	224	172	314	121	193
Chargali	2259	1134	726	408	1125	408	717
Sihuli	4551	1528	1020	508	3023	277	1746
Dumdumi	3768	2121	1316	805	1647	597	1050
Podlara	2594	1333	876	457	1261	482	779
Bhangra	2824	1907	1144	763	917	316	601
Jhupra	Uninhabited Village						
Dhurahi	1108	772	458	314	336	110	226
Gengra	2181	1137	709	428	1044	442	602
Latuliya	741	452	261	191	289	99	190
Singhbazar	1580	884	566	318	696	264	432
Karcha	1530	841	542	299	689	253	436
Sandradi	606	255	164	91	351	136	215
Kathaldiha	Uninhabited Village						
Sidpur	1299	676	435	241	623	229	394
Chanchra	1432	894	531	363	538	197	341
Karcha	471	338	199	139	133	34	99
Chhota Chanchra	485	264	176	88	221	84	137
Chirumacha	1615	1048	641	407	567	181	386
Haramjanga	1357	734	468	266	623	226	397
Jojodi	1401	840	506	334	561	207	354
Panchudi	108	73	44	29	35	7	28
Dumkadi	1177	680	422	258	497	178	319
Nadiha	1397	900	530	370	497	150	347
Hulung	843	558	344	214	285	78	207
Kulabahal	1356	800	481	319	556	228	328

Sijumakhna	1331	861	489	372	470	172	298
Arjjunjora	1132	745	458	287	387	148	239
Keshargarh	4626	2669	1675	994	1957	665	1292
Chorgali	547	302	173	129	245	96	149
Hatikundar	2125	1020	606	414	1105	445	660
Amlatara	1262	882	516	366	380	127	253
Kajali	572	390	239	151	182	59	123
Bariarpur	1309	774	474	300	535	191	344
Chatumatar	1842	1226	744	482	616	213	403
Sarchakalta	809	490	274	216	319	115	204
Baragram	3060	2021	1214	807	1039	350	689
Chak Gopalpur	242	163	101	62	79	24	55
Rangamatya	883	510	311	199	373	148	225
Golbera	1634	894	567	327	740	281	459
Rudra	2659	1496	918	578	1163	454	709
Gangudi	Uninhabited Village						
Kalidasdi	352	219	127	92	133	57	76
Shyamdasdi Alias Shyampur	1024	535	339	196	489	189	300
Gondhudi	1030	623	379	244	407	138	269
Kanali	1129	696	425	271	433	170	263
Khojda	635	389	249	140	246	74	172
Bhuinadi	871	477	296	181	394	128	266
Sibdi	1214	698	406	292	516	190	326
Hulka	1447	805	514	291	642	199	443
Kultanr Alias Nadiara	521	316	191	125	205	74	131
Mahalitora	1272	837	610	227	435	161	274
Nadiyara	2912	1581	995	586	1331	508	823
Lapara	3267	2076	1246	830	1191	415	776
Damodarpur	2303	1231	742	489	1072	392	680
Bhatadi	5	2	2	0	3	2	1
Bagda	2370	1509	882	627	861	313	548
Haridi	348	193	124	69	155	56	99
Chakia	514	244	163	81	270	92	178
Kanara	1836	1029	638	391	807	298	509
Kanchannagar	148	107	66	41	41	11	30
Niasa	Uninhabited Village						
Shyampur	416	255	154	101	161	58	103
Kundhurka	1121	754	465	289	367	122	245
Bankanali	Uninhabited Village						
Kendbani	405	233	146	87	172	59	113
Laharia	1883	1265	780	485	618	209	409
Poradi	1659	1220	738	482	439	119	320
Simakanali	829	499	312	187	330	113	217
Debgram	709	445	258	187	264	96	168
Bhagaband	1497	879	525	354	618	230	388
Guridi	415	242	147	95	173	54	119

Sulung Lahar	337	181	116	65	156	62	94
Karche	1448	615	403	212	833	336	497
Chitmu	3893	1922	1310	612	1971	725	1246
Sarjumhatu	1042	423	312	111	619	209	410
Damrughutu	1284	562	362	200	722	304	418
Bara Metyala	1724	807	546	261	917	360	557
Damra	244	119	74	45	125	50	75
Amra	556	213	132	81	343	130	213
Tatayara	5863	2279	1692	587	3584	292	2292
4. District Haora, W.B.							
Uttar Bhatora	5370	3477	2006	1471	1893	773	1120
Solbaga	2802	1754	1011	743	1048	405	643
Nignan	1870	1367	739	628	503	224	279
Fatik Beria	629	345	221	124	284	115	169
Hio	1727	1330	739	591	397	163	234
Dakshin Khalna	5701	3971	2105	1866	1730	766	964
Khari Geria	2318	1160	694	466	1158	531	627
Kasmali	4662	2953	1696	1257	1709	719	990
Kulepairi	Uninhabited Village						
Purbba Bainan	4746	3684	1929	1755	1062	500	562
Joka	4137	3039	1612	1427	1098	512	586
Ulanpara	8369	6235	3403	2832	2134	946	1188
Karia (CT)	4737	2896	1577	1319	1841	847	994
Paschim Bainan (CT)	12405	8578	4573	4005	3827	753	2074
Bangalpur (CT)	6760	5418	2877	2541	1342	598	744
Chandrapur (CT)	4742	3598	1927	1671	1144	509	635
Khadinan (CT)	9297	6977	3667	3310	2320	1050	1270
5. District Paschim Medinipur, W.B.							
Bhandirban	243	160	94	66	83	32	51
Kukurajuri	Uninhabited Village						
Khaerbani	614	393	217	176	221	82	139
Benachapra	2079	1261	687	574	818	347	471
Til Bhandara	Uninhabited Village						
Bara Nohari	1474	743	430	313	731	307	424
Raghunathpur	1054	717	396	321	337	128	209
Rayda	69	58	33	25	11	6	5
Chhatakonda	248	158	86	72	90	38	52
Ausabandi	1210	552	349	203	658	268	390
Ramchak	Uninhabited Village						
Kasua	291	130	76	54	161	78	83
Agra	1042	629	359	270	413	172	241
Meghula	394	214	124	90	180	79	101
Barabhandar Khanda	Uninhabited Village						
Saldangra	615	487	253	234	128	51	77
Golahat	323	284	150	134	39	18	21
Moldanga	528	420	224	196	108	40	68

Hingisol	32	22	10	12	10	4	6
Baratalbeta	92	31	12	19	61	27	34
Patpur	645	492	273	219	153	61	92
Tasargeria	287	236	136	100	51	20	31
Bajrakha Bankati	29	19	12	7	10	5	5
Kankrasol	586	438	237	201	148	48	100
Sanpdaha	814	580	319	261	234	109	125
Garanga	1179	690	368	322	489	210	279
Dakshin Konda	Uninhabited Village						
Darji	317	244	132	112	73	25	48
Mangalapota	2638	1456	827	629	1182	561	621
Bandarbani	18	15	9	6	3	2	1
Kashidanga	264	170	94	76	94	43	51
Pathar Teria	1359	854	475	379	505	234	271
Madanhari	2831	1330	728	602	1501	720	781
Dhanyachhara	543	294	167	127	249	108	141
Kumardubi	478	158	98	60	320	152	168
Baharabuni	Uninhabited Village						
Murabani	Uninhabited Village						
Khayrapara	Uninhabited Village						
Gamar Kushi	Uninhabited Village						
Kadambandhi	Uninhabited Village						
Chandabila	148	59	35	24	89	32	57
Anandanagar	176	56	25	31	120	59	61
Birajpur	1174	771	443	328	403	142	261
Ghoramara	717	381	236	145	336	125	211
Paramanandapur	904	735	396	339	169	74	95
Dogerya Ramchak	Uninhabited Village						
Rejna	1169	837	455	382	332	130	202
Kochgerya Ramchak	766	621	365	256	145	42	103
Jara	6569	4959	2661	2298	1610	690	920
Tegerya Dharmmapur	93	60	37	23	33	16	17
Ghola	586	503	247	256	83	37	46
Narayanpur	948	666	386	280	282	108	174
Madhabpur	3667	2375	1301	1074	1292	566	726
Beurgram	1984	1343	745	598	641	272	369
Agra	997	754	382	372	243	96	147
Purshuri	2550	1578	878	700	972	413	559
Betagram	852	661	359	302	191	80	111
Shyamkuri	248	216	111	105	32	14	18
Kankabati	1871	1291	735	556	580	248	332
Hajra	467	373	211	162	94	28	66
Amdhere	416	280	161	119	136	64	72
Goyalsini	1134	725	419	306	409	170	239
Belgerya	504	332	213	119	172	68	104
Arjungerya	370	248	147	101	122	46	76
Kashanda	2198	1508	853	655	690	284	406

Andhare	859	553	303	250	306	129	177
Gohaldanga	490	435	223	212	55	22	33
Nishchintapur	614	536	272	264	78	34	44
Ishangar	288	250	135	115	38	13	25
Kunarpur	332	252	140	112	80	36	44
Deulbere	764	385	220	165	379	164	215
Maheshpur	2771	1679	995	684	1092	460	632
Murakata	4411	2350	1294	1056	2061	948	1113
Khandanga	1964	1133	628	505	831	397	434
Kshirati	1037	785	435	350	252	94	158
Bhairabpur	2720	1500	854	646	1220	522	698
Ghoshkira	150	141	84	57	9	5	4
Shirsa	390	322	184	138	68	30	38
Khursi	1261	848	458	390	413	166	247
Kalla	1990	1241	688	553	749	334	415
Simla	883	693	389	304	190	75	115
Dhaikhanda	981	514	287	227	467	215	252
Langalbhangra	Uninhabited Village						
Gobindapur	1420	1162	613	549	258	112	146
Mansukha	8583	6545	3666	2879	2038	774	1264
Daulatchak	3287	2178	1282	896	1109	432	677
Chaulisinghapur (P)	615	425	251	174	190	70	120
Gangaprasad	1382	837	509	328	545	203	342
Shrirampur (P)	2764	2127	1143	984	637	237	400
Lalkundu	129	89	45	44	40	13	27
Brindabanchak	Uninhabited Village						
Ajodhyakundu	Uninhabited Village						
Jadupur	1194	878	477	401	316	131	185
Krishnabati	289	190	103	87	99	47	52
Kamdebpur	753	478	249	229	275	124	151
Gopinathpur	710	537	286	251	173	70	103
Shyamsundarpur	2797	1935	1097	838	862	354	508
Kharar (M)/10 Wards	12118	9364	5041	4323	2754	083	1671
TOTAL (1.0km)	481639	09124	77955	31169	72515	8076	04439
<i>Source-Census of India, 2011</i>							

4.6.5.5 ECONOMY OF THE DISTRICT

1. District Hugli

Hooghly is one of the most economically developed districts in West Bengal. It is the main jute cultivation, jute industry, and jute trade hub in the state. The jute mills are along the banks of the river Hooghly in Tribeni, Bhadreswar, Champdani and Sreerampur. There are a number of industrial complexes including one of the largest car manufacturing plants in India, the Hindustan Motors plant in Uttarpara. It was also home to the Singur Tata Nano controversy. Hindustan Motors plant was closed in 2014. Bandel Thermal power plant and Tribeni tissue plant (ITC) are running smoothly.

2. District Bankura

Bankura is economically underdeveloped and is mostly dependent on agriculture. Almost 70% of the district's income is generated through agriculture where 80% of the farmers are small & marginal in nature. Bankura is one of the most draught prone district of West Bengal. However due to protective irrigation system, land reforms and use of high fertile & hybrid crops the economic condition of the district has improved. Also, cottage and small-scale industries, such as Stone-crushing, Weaving, Oilseed-crushing, handicraft units like Dokra, Terra-cotta, Baluchari Sari play a key economic role in district.

In 2006, the Ministry of Panchayati Raj named Bankura one of the country's 250 most backward districts (out of a total of 640). It is one of the nineteen districts in West Bengal currently receiving funds from the Backward Regions Grant Fund Programme (BRGF).

3. District Puruliya

The economy of the Puruliya district is mainly driven by the industrial & Agricultural sector and tourism. Among these, the industrial sector is the backbone of the economy of the district.

From 2001, with the new industrial policies of government of West Bengal, this district has attracted investments in steel, cement and power sectors. The district has large scale industries like Santaldih Thermal Power Station at Santaldih, Pumped Storage Project at Baghmundi, ACC Damodar Cement Factory at Madhukunda. The Puruliya Pumped Storage Project of West Bengal State Electricity Distribution Company Ltd. consists of 4 units with a capacity of 224 MW each, which generates 900 MW of electricity. DVC is involved with a thermal power plant in Raghunathpur sub-division with a capacity of 2400 MW. It has investments in steel and cement sectors. The manufacturing sector specially the sponge iron sector got an investment of 306.17 crores, which is comparable to the economically developed districts of West Bengal.

Among small scale industries, the lac industry and sericulture industry is another major source of income of this district. Puruliya produces 90% of the lac produced in West Bengal. Lac is cultivated in all the blocks of Puruliya and about 70,000 people are associated with this industry. Sericulture industry is supported by the ample amount of caterpillar larvae as raw materials.

Tourism is another source of income for this district. Forests, Hillocks, Rivulets, Streams, Wild Life, Flora & Fauna has tremendous scope to be explored by the tourist. The prominent of the district like Ajodhya Hills, Matha, Murguma Dam and Kuilapal Forests, Jaychandi Pahar, Panchakote Raj, Duarsini Hills and Forests attract quite a good number of visitors to Puruliya every year. Due to the rough weather and soil, Puruliya lags behind in agricultural arena from the other districts of West Bengal. However, cultivation of silk and lac are the main agricultural products. In 2006 the Ministry of Panchayati Raj named Puruliya one of the country's 250 most backward districts (out of a total of 640). It is one of

the eleven districts in West Bengal that has received funds from the Backward Regions Grant Fund programme (BRGF).

4. District Haora

In West Bengal the Howrah district is very much popular mainly for its developed economy as well as heritage of British India. Here this article is mainly dealing with the changes, occurring in different economic sectors of Howrah district in recent years and the effects of such changes on its economy. Various cartographic techniques and calculation have been employed to analyze the trend in economic sectors and its impact on district economy. From the study it is observed that the district has no strong base in primary sector. Mainly the industrial sector dominated the economy up to 1993 but after that the dominance shifted towards service sector and huge number of employment generated from 1993 to till now through it. Here it is found that such alteration provides a positive outcome to the district economy as well as state economy. Due to colossal contribution of secondary and tertiary sector, Howrah achieves 2nd and 3rd position in case of GDDP and NDDP respectively among the districts of West Bengal during 2004-05 to 2012-13 and also helps to increase the growth rate of Per Capita Income (19.27% per year) of the district in last few years. Though it has good economic background, has been facing some challenges like – low work participation rate, shortage of cultivable land, less improvement of agricultural allied activities, low female work participation in rural areas etc.

5. District Paschim Medinipur

In 2006 the Ministry of Panchayati Raj named Paschim Medinipur one of the country's 250 most backward districts (out of a total of 640). It is one of the eleven districts in West Bengal currently receiving funds from the Backward Regions Grant Fund Programme (BRGF).

4.6.5.6 WORKERS SCENARIO:

'Occupational Pattern' was studied to assess the skills of people in the study area. Occupational pattern helps in identifying major economic activities of the area. In the study area the Main and Marginal Workers population was observed as 117525(24.0%) and 71979(15.0%) respectively of the total population (481639) while the remaining 292135(61.0%) persons were recorded as non-workers. Thus it implies that the semi-skilled and non-skilled work-force required in study area for the project is available in aplenty.

The village wise main and marginal workers population with further classification as casual, agricultural, households and other workers is shown as follows in **Table..4-35**

Table 4-35: Village-wise Occupational Pattern in the Study Area (1.0km Study Zone)

Name of the	MAIN	AIN C	AIN A	AIN H	AIN O	MARG	RG C	RG A	RG H	RG O

Village/Town	ORK_P	L_P	L_P	H_P	T_P	ORK_P	L_P	L_P	H_P	T_P
1. District Hugli, W.B.										
Paschim akurani Chak	1824	677	346	313	488	407	76	211	83	37
Purbba akurani Chak	1852	434	474	281	663	466	53	210	88	115
mchandrapur	887	226	227	138	296	1066	196	732	73	65
Kaknan	1524	455	425	68	576	395	43	69	81	202
Dhanyaghari	1651	493	372	83	703	136	12	32	22	70
Ghoradaha	1893	957	362	117	457	369	63	146	71	89
Jagatpur	1708	376	258	55	1019	865	78	406	37	344
ar Nandanpur	1274	538	116	101	519	754	101	409	15	229
dhakrishnapu r	952	417	142	57	336	320	93	100	8	119
Nandanpur	2158	718	373	192	875	728	51	402	54	221
Banhijli	1123	187	366	23	547	211	9	148	5	49
Chand Kundu	655	115	205	27	308	466	33	310	12	111
Dhaldanga	839	63	243	23	510	341	8	205	11	117
Marakhana	1427	121	145	110	1051	621	61	288	36	236
Hanua	976	140	217	110	509	433	9	288	44	92
2. District Bankura, W.B.										
Dubrajpur	173	96	7	1	69	44	3	32	0	9
Natherdanga	181	117	1	0	63	328	64	252	0	12
Gottarya	238	159	59	1	19	217	3	202	9	3
Kelera	16	3	4	0	9	95	19	41	0	35
aitydubrajpur	85	32	7	5	41	139	73	53	1	12
Salanpur	159	28	126	0	5	219	24	156	21	18
Gandlugar	55	23	22	0	10	174	17	155	0	2
Padulara	167	61	61	2	43	449	89	333	8	19
Bhalukbasa	23	3	17	1	2	98	1	97	0	0
Khatgram	204	61	46	1	96	119	43	54	1	21
Bamni	97	92	2	1	2	226	34	164	27	1
Dakshin Kamalpur	117	22	90	0	5	31	8	23	0	0
Shibrampur	Uninhabited Village									
Chandra	164	48	102	0	14	8	3	4	1	0
Bhutama	13	9	1	0	3	346	36	206	26	78
Phulkusma	321	101	109	0	111	243	26	204	1	12
Jugibad	Uninhabited Village									
Nekrakonda	14	0	2	0	12	144	56	73	0	15
Dakshin Pairachali	39	2	0	2	35	549	105	375	0	69
Kaliapathar	44	12	4	0	28	244	67	130	0	47
Bandeuli	223	91	51	2	79	234	88	119	2	25
Mayurnachna	Uninhabited Village									
Kadamdeuli	223	34	139	15	35	248	13	188	8	39

Bisharbera	Uninhabited Village									
Banshidih	164	77	6	0	81	380	47	263	2	68
Kharakanali	0	0	0	0	0	129	0	129	0	0
Nishchintapur	5	1	0	0	4	76	12	63	0	1
Jiardi	64	30	12	1	21	435	65	361	0	9
Erodihi	97	50	6	5	36	250	15	203	3	29
Tunamara	43	27	13	0	3	30	0	29	0	1
Chakaltasahar	109	60	24	1	24	25	6	8	6	5
anchpukhuria	219	29	151	1	38	206	5	194	4	3
Bankata	184	87	41	1	55	195	6	188	0	1
Botkula	57	16	30	1	10	86	25	48	2	11
Goaladanga	331	69	238	2	22	170	13	155	2	0
Jugda	3	0	2	1	0	6	0	5	0	1
Mauladanga	90	51	21	1	17	165	13	116	2	34
Gobindapur	140	67	27	4	42	316	28	237	14	37
Jparkechanda	594	221	290	1	82	131	28	26	0	77
arishchandrapur	39	23	1	0	15	8	6	0	0	2
Nayada	210	78	73	0	59	5	1	0	0	4
pargeryakula	79	46	3	0	30	28	19	3	0	6
Shalkap	413	77	286	0	50	14	4	7	0	3
mchandrapur	363	136	199	0	28	41	7	33	0	1
Jugibaid	66	31	29	2	4	204	87	76	15	26
Chhatapur	312	128	99	1	84	82	8	65	0	9
Nischintapur	222	27	159	2	34	0	0	0	0	0
Binodpur	36	27	2	0	7	5	4	0	0	1
Kurusthalia	143	0	136	0	7	99	0	99	0	0
arbhaga Band	42	3	30	0	9	101	5	92	3	1
Mahada	114	43	2	0	69	479	50	415	0	14
Kadamara	164	37	110	0	17	310	2	304	3	1
Painada										
Modarpur	29	28	1	0	0	57	2	52	3	0
Chak										
Nutangram	8	2	0	0	6	320	10	309	0	1
Raghunathpur	270	76	173	0	21	1	0	1	0	0
Paryadang	439	208	188	1	42	419	128	278	7	6
Narattampur	520	228	187	8	97	444	71	356	1	16
Taltala	75	4	69	0	2	113	13	99	0	1
Phengashimul	398	125	221	7	45	204	21	158	3	22
Nachna	78	5	70	0	3	19	3	15	0	1
utamamaheshpur	138	59	58	0	21	57	14	36	0	7
Harulia	240	83	136	1	20	181	13	166	0	2
Khatbanda	70	50	6	0	14	77	4	5	2	66
Harakona	77	29	13	0	35	673	12	565	0	96
Bhedua	83	58	0	1	24	50	44	6	0	0

Banskopa	334	169	121	1	43	660	72	574	3	11
Kanaipur	40	24	0	2	14	53	0	53	0	0
Radhanagar	217	130	44	0	43	42	1	40	0	1
Panchmura	1115	64	291	122	638	212	5	102	44	61
Lalbandh	217	35	88	5	89	325	5	84	183	53
Deulbhira	211	119	53	7	32	36	25	3	8	0
Bhetuadanga	201	99	98	0	4	17	2	14	0	1
Jambedia	126	113	7	0	6	73	17	31	0	25
Murakati	313	138	120	3	52	67	9	46	1	11
Kaniari	616	212	374	0	30	498	47	448	0	3
Karakanali	206	133	20	2	51	219	25	189	1	4
Balarampur	177	19	79	13	66	118	6	27	6	79
Masatkhal	128	111	5	0	12	3	1	2	0	0
Shyam Pur	0	0	0	0	0	55	0	54	1	0
Pachaparar	2	0	0	0	2	27	4	23	0	0
Barakhulia	1	1	0	0	0	84	0	83	0	1
Keotdhara	5	1	0	0	4	143	0	140	0	3
Balaram Pur	153	58	45	2	48	142	30	83	6	23
Siuli	48	16	26	0	6	47	0	47	0	0
3. District Puruliya, W.B.										
Panrga	138	19	53	42	24	225	61	21	139	4
Hathimuri	34	2	2	0	30	394	134	4	0	256
Silphor	Uninhabited Village									
Hargara	96	53	3	1	39	379	269	74	5	31
Hoangda	465	219	9	58	179	556	162	336	17	41
Dhabani	70	2	59	0	9	162	57	9	0	96
Nutandi	287	25	62	108	92	489	23	218	189	59
Balibhasa	16	0	0	0	16	343	152	154	8	29
Durama	174	42	10	3	119	59	33	12	3	11
Baragram	396	158	60	9	169	408	146	194	31	37
Phuljhariya	Uninhabited Village									
Ramamoti	284	52	2	1	229	6	0	1	0	5
Chaitandi	73	30	0	0	43	242	45	138	0	59
Kusumtikri	108	83	2	0	23	225	21	190	9	5
Agharpur	440	150	12	45	233	37	4	22	1	10
Gunja	491	302	78	2	109	173	48	112	2	11
Jaypur (CT)	2403	215	17	134	2037	676	9	12	20	635
Ghongha	495	111	73	54	257	880	30	364	36	450
Hatuara	375	93	10	21	251	463	92	110	48	213
Bongabari	1078	244	108	52	674	420	44	94	10	272
Manipur	80	25	3	1	51	303	3	184	10	106
Chargali	287	61	35	12	179	730	78	177	177	298
Sihuli	1109	136	251	20	702	351	22	210	7	112
Dumdumi	723	163	97	16	447	679	91	365	18	205
Podlara	509	139	9	32	329	612	177	280	3	152
Bhangra	636	277	70	34	255	420	96	219	13	92

Jhupra	Uninhabited Village									
Dhurahi	236	91	40	3	102	272	88	166	0	18
Gengra	594	216	96	11	271	466	21	434	0	11
Latuliya	124	57	4	0	63	283	5	11	0	267
Singhbazar	440	3	212	34	191	349	11	313	1	24
Karcha	143	10	23	12	98	383	24	210	55	94
Sandradi	163	11	77	0	75	10	2	8	0	0
Kathaldiha	Uninhabited Village									
Sidpur	217	20	45	8	144	280	18	157	2	103
Chanchra	128	11	20	3	94	482	65	366	3	48
Karcha	26	4	1	0	21	264	12	243	3	6
Chhota Chanchra	13	0	0	0	13	178	7	82	3	86
Chirumacha	258	150	33	9	66	691	16	582	29	64
Haramjanga	329	140	57	7	125	437	171	189	6	71
Jojodi	203	75	72	16	40	457	95	295	20	47
Panchudi	1	0	0	0	1	55	21	32	0	2
Dumkadi	593	289	276	1	27	40	20	20	0	0
Nadiha	246	142	30	0	74	547	206	331	1	9
Hulung	112	70	1	2	39	294	67	163	12	52
Kulabahar	154	74	18	4	58	368	65	257	2	44
Sijumakhna	430	99	305	2	24	73	14	15	0	44
Arjjunjora	190	86	45	0	59	206	26	149	4	27
Keshargarh	846	85	191	61	509	1361	488	585	40	248
Chorgali	125	60	32	26	7	157	54	86	14	3
Hatikundar	819	374	389	2	54	406	50	316	0	40
Amlatara	369	61	247	0	61	346	80	264	1	1
Kajali	113	21	74	0	18	170	1	163	0	6
Bariarpur	583	323	240	0	20	259	80	175	0	4
Chatumatar	379	137	88	21	133	486	142	296	6	42
Sarchakalta	91	45	12	2	32	264	16	185	12	51
Baragram	649	214	60	55	320	469	48	357	12	52
hak Gopalpur	44	6	19	4	15	74	0	72	0	2
Rangamatya	165	94	32	2	37	310	15	288	1	6
Golbera	343	106	199	4	34	402	12	381	4	5
Rudra	414	154	35	7	218	532	105	262	1	164
Gangudi	Uninhabited Village									
Kalidasdi	143	7	119	1	16	94	10	46	8	30
Shyamdasdi										
ias Shyampur	336	24	292	1	19	139	2	48	5	84
Gondhudi	276	173	5	12	86	69	2	0	2	65
Kanali	108	35	25	7	41	388	35	248	13	92
Khojda	184	65	6	0	113	3	0	1	0	2
Bhuinadi	321	177	109	0	35	104	0	44	51	9
Sibdi	191	41	5	0	145	124	12	26	0	86
Hulka	249	71	44	1	133	401	9	189	136	67

Kultanr Alias										
Nadiara	118	49	35	0	34	144	0	144	0	0
Mahalitora	153	10	46	1	96	168	66	77	5	20
Nadiyara	523	162	91	9	261	506	32	386	3	85
Lapara	666	248	173	8	237	1008	103	820	9	76
Damodarpur	673	307	224	7	135	712	230	456	4	22
Bhatadi	0	0	0	0	0	1	0	1	0	0
Bagda	443	119	79	10	235	565	129	340	14	82
Haridi	5	0	1	0	4	183	15	166	1	1
Chakia	259	1	256	0	2	1	0	1	0	0
Kanara	633	226	246	6	155	313	125	137	3	48
Kanchannagar	17	1	0	2	14	53	23	26	0	4
Niasa	Uninhabited Village									
Shyampur	20	0	0	0	20	216	164	51	0	1
Kundhurka	359	182	130	1	46	209	196	1	0	12
Bankanali	Uninhabited Village									
Kendbani	78	67	2	0	9	207	111	95	0	1
Laharia	264	35	98	20	111	747	111	417	180	39
Poradi	261	69	32	2	158	291	57	66	86	82
Simakanali	102	42	22	1	37	319	83	147	4	85
Debgram	145	126	10	1	8	108	28	74	0	6
Bhagaband	357	71	100	0	186	408	120	198	0	90
Guridi	223	141	35	29	18	24	12	4	3	5
Sulung Lahar	2	0	0	0	2	101	5	96	0	0
Karche	369	52	181	3	133	66	1	19	2	44
Chitmu	810	169	187	23	431	397	61	233	6	97
Sarjumhatu	457	2	0	425	30	143	65	11	37	30
Damrughutu	262	88	5	0	169	213	7	191	0	15
Bara Metyala	414	112	207	12	83	306	11	259	1	35
Damra	47	47	0	0	0	1	0	0	0	1
Amra	311	101	21	158	31	1	1	0	0	0
Tatayara	1940	293	88	1103	456	1246	43	123	950	130
4. District Haora, W.B.										
Uttar Bhatora	1387	350	488	75	474	575	42	341	36	156
Solbaga	855	396	225	14	220	173	25	58	17	73
Nignan	461	96	32	123	210	113	9	94	3	7
Fatik Beria	172	17	118	27	10	11	0	3	2	6
Hio	478	56	106	14	302	230	29	136	9	56
Dakshin Khalna	1470	92	197	109	1072	490	34	170	140	146
Khari Geria	552	42	330	134	46	274	10	218	6	40
Kasmali	1032	359	403	60	210	824	104	556	85	79
Kulepairi	Uninhabited Village									
Purbba Bainan	1145	39	262	21	823	343	18	108	47	170
Joka	1175	104	335	70	666	108	4	13	25	66

Ulanpara	1975	219	134	202	1420	1315	77	186	108	944
Karia (CT)	1158	73	307	163	615	280	1	159	28	92
Paschim Bainan (CT)	3199	165	513	352	2169	701	21	267	144	269
Bangalpur (CT)	2113	77	310	63	1663	308	9	49	64	186
Chandrapur (CT)	1507	148	120	171	1068	405	8	93	57	247
Khadinan (CT)	2767	97	144	167	2359	878	14	17	314	533
5. District Paschim Medinipur, W.B.										
	95	32	57	0	6	20	4	12	0	4
Kukurajuri	Uninhabited Village									
Khaerbani	189	74	103	0	12	78	17	54	3	4
Benachapra	647	368	219	4	56	202	6	136	2	58
Til Bhandara	Uninhabited Village									
Bara Nohari	475	58	342	13	62	148	6	134	2	6
Raghunathpur	329	143	183	0	3	269	160	105	0	4
Rayda	24	23	0	0	1	0	0	0	0	0
Chhatakonda	67	46	18	0	3	33	0	24	9	0
Ausabandi	213	70	123	4	16	268	30	144	76	18
Ramchak	Uninhabited Village									
Kasua	0	0	0	0	0	168	0	168	0	0
Agra	400	220	117	0	63	152	6	130	0	16
Meghula	79	69	0	1	9	129	1	125	0	3
Barabhandar Khanda	Uninhabited Village									
Saldangra	174	115	38	1	20	147	87	57	0	3
Golahat	108	54	52	0	2	1	0	1	0	0
Moldanga	160	107	18	1	34	25	12	4	1	8
Hingisol	10	3	3	0	4	2	1	1	0	0
Baratalbeta	17	0	16	0	1	21	0	19	0	2
Patpur	249	170	71	3	5	12	0	11	0	1
Tasargeria	97	93	2	0	2	7	5	0	0	2
Bajrakha Bankati	8	7	0	0	1	0	0	0	0	0
Kankrasol	189	141	18	6	24	44	10	11	0	23
Sanpdaha	256	107	134	1	14	1	0	0	0	1
Garanga	450	118	273	0	59	7	2	0	1	4
akshin Konda	Uninhabited Village									
Darji	86	62	10	4	10	17	10	0	6	1
Mangalapota	509	132	200	21	156	457	19	242	30	166
Bandarbani	5	3	0	0	2	7	0	3	0	4
Kashidanga	25	15	2	0	8	116	3	91	2	20
Pathar Teria	375	166	176	1	32	194	6	145	36	7
Madanhari	506	29	299	12	166	553	6	156	334	57

Dhanyachhara	156	74	64	0	18	20	1	0	0	19
Kumardubi	176	44	129	0	3	11	2	9	0	0
Baharabuni	Uninhabited Village									
Murabani	Uninhabited Village									
Khayrapara	Uninhabited Village									
Gamar Kushi	Uninhabited Village									
Kadambandhi	Uninhabited Village									
Chandabila	41	41	0	0	0	0	0	0	0	0
Anandanagar	54	53	0	0	1	2	0	1	0	1
Birajpur	513	168	310	21	14	4	1	0	3	0
Ghoramara	265	124	108	10	23	119	9	60	4	46
amanandapur	294	166	41	4	83	60	22	31	2	5
Dogerya Ramchak	Uninhabited Village									
Rejna	335	202	109	3	21	181	13	162	1	5
Kochgerya Ramchak	217	135	44	3	35	112	33	58	3	18
Jara	2169	570	895	55	649	660	106	271	35	248
Tegerya Dharmmapur	43	11	32	0	0	0	0	0	0	0
Ghola	180	127	34	0	19	42	6	22	0	14
Narayanpur	310	115	109	3	83	82	9	67	1	5
Madhabpur	974	372	446	15	141	379	115	245	4	15
Beurgram	692	160	334	11	187	58	11	29	1	17
Agra	109	81	0	0	28	199	54	88	28	29
Purshuri	664	150	282	40	192	278	18	218	10	32
Betagram	190	121	38	13	18	113	21	75	12	5
Shyamkuri	88	66	0	0	22	3	0	3	0	0
Kankabati	419	207	167	3	42	234	5	178	11	40
Hajra	76	68	0	0	8	80	3	64	0	13
Amdhere	138	41	30	58	9	7	1	1	0	5
Goyalsini	426	118	214	71	23	11	1	6	0	4
Belgerya	108	80	12	4	12	79	10	46	7	16
Arjungerya	63	54	4	1	4	56	8	42	2	4
Kashanda	574	86	189	27	272	164	4	100	42	18
Andhare	298	145	78	7	68	11	2	9	0	0
Gohaldanga	148	65	5	4	74	27	3	13	1	10
Nishchintapur	251	182	4	8	57	1	1	0	0	0
Ishangar	81	53	4	0	24	0	0	0	0	0
Kunarpur	82	52	16	0	14	35	4	18	0	13
Deulbere	205	61	128	4	12	226	31	140	25	30
Maheshpur	551	192	294	8	57	317	24	262	2	29
Murakata	631	236	314	19	62	1070	84	664	118	204
Khandanga	389	132	214	2	41	172	15	132	7	18
Kshirati	366	84	167	0	115	207	12	41	0	154
Bhairabpur	894	132	651	12	99	389	42	321	5	21

Ghoshkira	43	38	0	1	4	14	4	0	2	8
Shirsa	104	99	0	1	4	63	4	15	33	11
Khursi	354	212	111	1	30	63	6	48	2	7
Kalla	655	500	143	6	6	281	5	249	19	8
Simla	306	195	77	1	33	6	0	3	0	3
Dhaikhanda	151	8	136	3	4	239	1	236	0	2
angalbhangra	Uninhabited Village									
Gobindapur	331	262	17	7	45	124	1	102	4	17
Mansukha	1697	809	223	56	609	1475	212	313	64	886
Daulatchak	830	211	215	106	298	354	83	139	25	107
aulisinghapur (P)	82	56	6	1	19	161	18	62	17	64
Gangaprasad	190	155	1	27	7	349	244	30	63	12
hrirampur (P)	956	226	257	159	314	296	22	203	42	29
Lalkundu	31	15	5	2	9	28	6	3	5	14
rindabanchak	Uninhabited Village									
jodhyakundu	Uninhabited Village									
Jadupur	375	63	211	31	70	46	4	8	5	29
Krishnabati	102	24	37	9	32	2	1	0	0	1
Kamdebpur	254	58	126	0	70	15	1	8	0	6
Gopinathpur	78	41	17	4	16	139	0	139	0	0
amsundarpur	914	269	349	22	274	219	10	30	138	41
narar (M)/10 Wards	3547	242	750	181	2374	863	84	219	178	382
TOTAL (1.0km)	17525	2901	1121	7573	5930	71979	0582	9543	6079	5775
Source- http://www.censusindia.gov.in/2011census/dchb/DCHB.html										
Abbreviations: Educational Facilities: P-Primary School, M-Middle School, SS-Higher Secondary Schools, SSS-Senior Secondary School Medical Facilities: CHC- Community Health Centre, PHC-Primary Health Centre, PHSC-Primary Health Sub-Centre, MCWC-Maternity and Child Welfare Centre, H-Hospital, D- Dispensary, FWC-Family Welfare Centre Drinking Water Facilities: T-Tap Water, W-Well Water, HP-Hand Pump, TW-Tube Well Water, R-River Water, Tk-Tank Water, O-Other Drinking Water Facility Communication and Transport Facilities: PO-Post Office, SPO-Sub-Post Office, PTO- Post & Telegraph Office, Tel. - Telephone Connection, Mob. - Mobile Phone Coverage, BS-Bus Services, RS-Railways Services Approach to Village: PR- Paved Roads, KR-Kuchha Road, FP-Foot Path Power Supply: ED-Power Supply for Domestic use, E Ag.- Power Supply for Agricultural use, EC- Power supply for Commercial use, EA-Electricity for All Purposes										

Distribution of work participation rate of the study area population is shown in **Table 4-34** as follows;

Table 4-36: Distribution of Work Participation Rate in 1.0km Study Area

Occupation Class	Year, 2011
Main Workers	117525 (24.0%)
Male	101657(86.5%)

Female	15868(13.5%)
Marginal Workers	71979(15.0%)
Male	38105(53.0%)
Female	33874 (47.0%)
Non-Workers	292135(61.0%)
Male	106269 (36.4%)
Female	185866(63.6%)
Total Population	243272
<i>Source: Census of India Records, 2011</i>	

Graphical representation of Workers Scenario is given below as **Figure 4-28**.

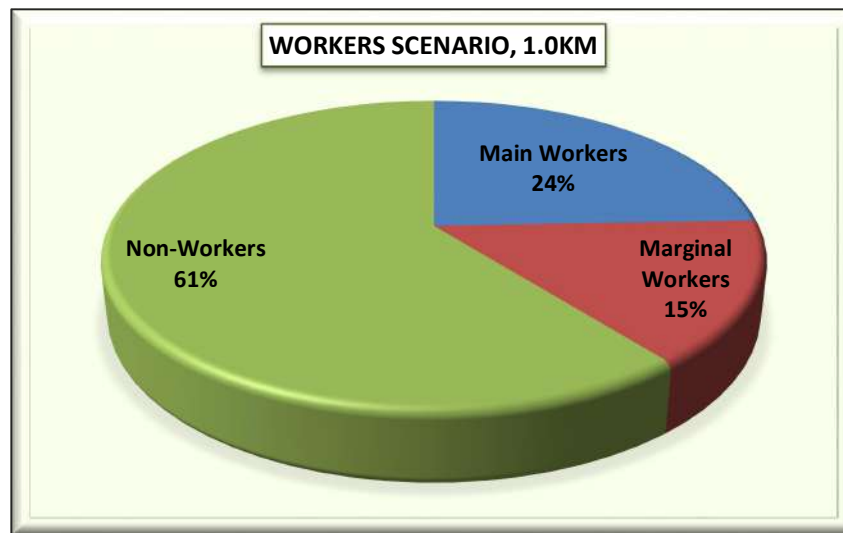


Figure 4-28: Workers Scenario of Study Area

4.6.5.6.1 COMPOSITION OF MAIN WORKERS:

The 'Main Workers' were observed as 117525 persons (24.0%) to the total population (481639) of the study area and its composition is made-up of Casual laborers as 32901 (28.0%), Agricultural laborers as 31121(26.0%), Household workers 7573(6.0%) and other workers as 45930 (39.0%) respectively. Composition of Main workers is shown below as Figure

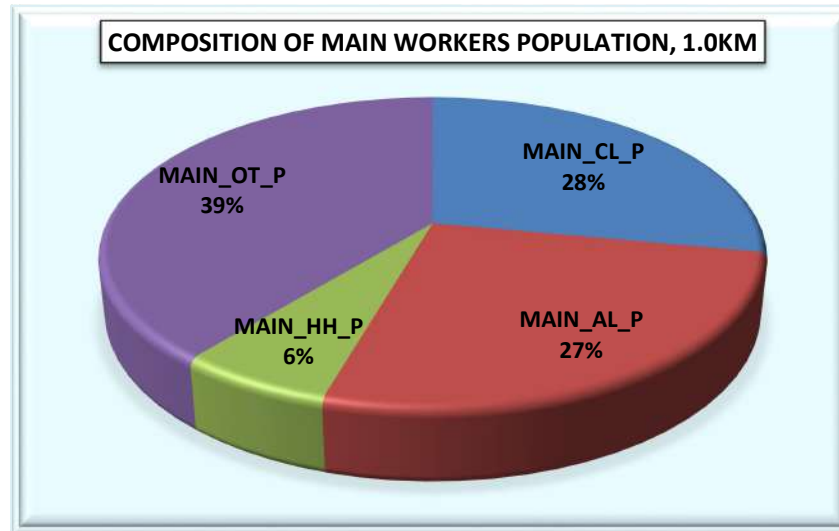


Figure 4-29: Composition of Main Workers Population

4.6.5.6.2 COMPOSITION OF MARGINAL WORKERS:

The total marginal workers are observed as 52529 which constitute 11.0% of the total population (473990) comprise of Marginal Casual Laborers as 5800(11.0%), Marginal Agricultural Laborers as 34190(65.0%), Marginal Household laborers as 3896 (7.5%) and marginal other workers were also observed as 8643 (16.5%) of the total marginal workers respectively.

Details about marginal workers in the study area are tabulated in **Table 4-34**. Composition of Marginal workers is shown in **Figure 4-30** as follows.

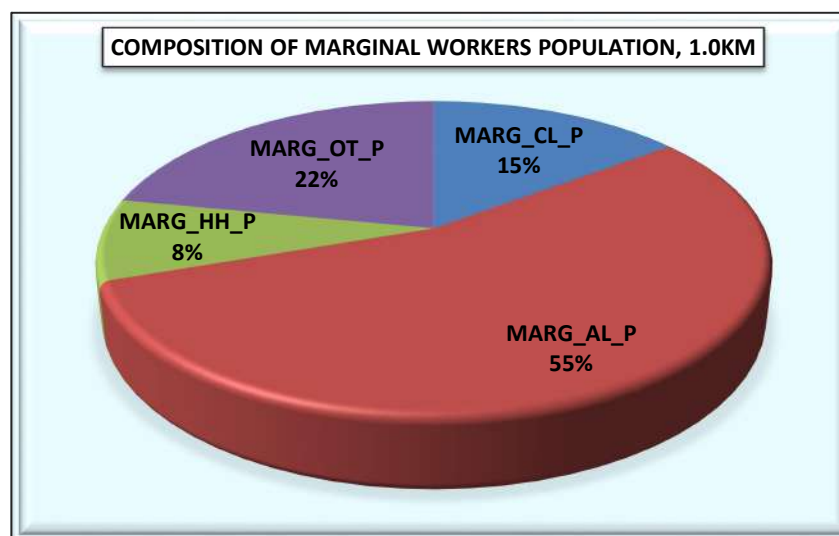


Figure 4-30 Composition of Marginal Workers

4.6.5.6.3 COMPOSITION OF NON – WORKERS:

The total Non-workers population was observed as 292135 which constitute 61.0% to the total population (481639) of the study area. Male-female wise Non-workers population was recorded as 106269 Males (36.4%) and 185866 Females (63.6%) respectively.. Details about Total Non-workers in the study area are compiled in **Table 4-35** Graphical representation of Non-workers population is shown as follows in **Figure 4-31**.

Table 4-37: Composition of Non-Workers

Non-Workers Population		
Persons	Males	Females
292135	106269(36.4%)	185866(63.6%)

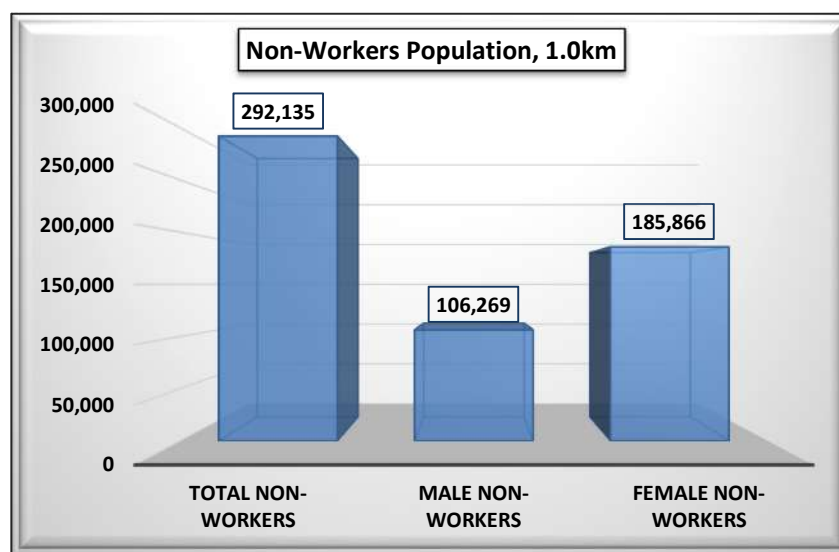


Figure: 4-31 Male-Female Distribution of Non-Workers

4.6.5.7 BASIC INFRASTRUCTURE FACILITIES AVAILABILITY (as per the census records of 2011)

A review of Basic infrastructure facilities (Amenities) available in the study area has been done on the basis of the field survey and Census records, 2011 for the study area inhabited villages of 5 main districts namely Hugli, Bankura, Puruliya, Haora&Paschim Medinipur of West Bengal state respectively. The study area has moderate level of basic infrastructure facilities like educational, medical, potable water, power supply, and transport & communication network.

As per the Census Records of India 2011, the 1.0km study zone along with the alignment has a total of 308 villages and 7 towns of 5 main districts namely Hugli (15 Villages), Bankura (84 villages), Puruliya (100 Villages & 01 Town) & Haora (12 Villages & 5 Towns) and Paschim Medinipur (97 villages & 01 Town) of West Bengal state respectively. All revenue villages/towns are mainly under 18 tehsils namely,

Khanakul – I and Khanakul – II of Hugly District, Indpur, Taldangra, & Simlapal of Bankura district, Jaipur, Purulia – II, Hura, Purulia – I, Pancha, Jhalda – I & Jhalda – II of Puruliya district, Amta – II & Bagnan – I of Haora district, Garbeta – I, Chandrakona – I & Chandrakona – II, Ghatal and Area not under any Sub-district under Paschim Medinipur district in West Bengal state respectively.

There are mainly 7 major towns named Jaypur (CT) of Hugly district, Karia (CT), Paschim Bainan (CT), Bangalpur (CT), Chandrapur (CT) & Khadinan (CT) of Haora district and Kharar (M)/10 Wards of Paschim Medinipur district were found in the 1.0km study zone of the proposed project alignment.

There are 20 other towns named Arambagh, Bankura, Bishnupur, Khatra, Purulia, Jaypur, Jhalda, Uluberia, Bagnan, Karia, Paschim Bainan, Bangalpur, Chandrapur, Khadinan, Chandrakona, C.K. Town, Ramjibanpur, Khirpai, Kharar and Ghatal, falling under all 5 concerned districts respectively, which are available for the study area villages in the range of <5km, 5-10km and >10km.

4.6.5.7.1 EDUCATIONAL FACILITIES

There is a total no. of 428 Primary schools existing in the rural part of the 1.0km study area. Seventy (88) Middle schools are recorded in the rural part of the study area. Sixty-five (65) no of Higher Secondary Schools (SS) are available in the rural part of the study area. Senior Secondary School (SSS) facility is available only in 35 villages of the study area. The educational facilities have been further strengthening now and a number of private public schools and colleges are also functioning in the surroundings of the study area. Besides, there are Engineering and Medical colleges available in Towns and District headquarters only. Higher education facilities are available in Towns of the area. There is considerable improvement in educational facility. The villages/towns of the study area have no such facilities can reach within 5.0 to 10.0km range.

4.6.5.7.2 Medical Facilities

The medical facilities are provided by different agencies like Govt. & Private individuals and voluntary organizations in the study area. As per the district census handbook information of 2011, only 15 primary health centers are available in the study area; most of the study area villages depends upon the towns / district HQ of the study area having such facility. Only 74 no of Primary Health Sub-centers are existing in the rural part of the study area. Mother & Child Welfare Centre are existing only in 24 villages of the study area. About eight (08) no of Community Health Centres and six (06) no of Allopathic Hospital found in the study area. Medical Dispensary were found only in 22 villages of the study area. Family Welfare Centers were found in only 13 villages of the study area. Overall study area villages are served by average medical facilities. Specialized medical facilities are available only in towns and District Headquarter (HQ) only.

4.6.5.7.4 Potable Water Facilities

Potable water facility is available in most of the villages/towns of the study area. The entire study area has good level of potable water facilities. Hand Pump(HP) facility observed in the study area as potable water facility. Out of total 308 villages, only 96 villages (31.2%) being served with River/Canal water in the study area. As per the census records of 2011, about 235 villages (76.3%) are being served with Tank/Pond/Lake facility in the study area.

4.6.5.7.5 Communication, Road & Transport Facilities

Apart from Post & Telegraph (P & T) services, transport is the main communication linkage in the study area. Thirty-two (32) villages were found serving with Post Office facilities in the study area, all villages are depending upon towns of the study area. The study area has average rail and road network, passes from the area. Only 5 villages named Sihuli, Kalidasdi & Amra of Puruliya district, Jara & Khandanga of Paschim Medinipur district were observed with railway station facility observed in the study zone.

Nearest towns are Purulia located at approx. 5.0km in SW direction, Raghunatahpur at approx. 30km in NE direction, Jamshedpur at approx. 65km in South, Asansol at approx. 75km in North direction, Bankura at approx. 20km in NE direction, Durga Pur at approx. 75km in NE direction, Madinapur at approx. 85km in NE direction, Ghatal at approx. 5.0km in West direction, Konaghat at approx. 10km at West direction, Hawrah at approx. 35km in East direction and Kolkata at approx. 45km in East direction respectively.

Nearest railway station is Pundag located at 5.42 km in NE from starting point. Kulgachia Railway Station is located at approx. 3.27 km from end point. Howrah Railway Station is located at approx. 30km from the end point. Nearest airport is Netaji Subhash Chandra Bose International Airport Kolkata is situated at approx. 51.01 km, aerial, from starting point of proposed alignment.

Banking Facility

The study area has almost all the schedule commercial banks with ATM facility at urban areas and the district HQ.

Power Supply

It is revealed from the compiled information on Amenities availability as per the census record of 2011; most of the villages and towns are electrified for Domestic, Agriculture, and Commercial & for all purposes.

As per the compiled information on power supply facilities in the villages/towns of the study zone, about 283 villages (92.0%) are electrified for domestic purposes, only 135 villages (43.8%) for agricultural purpose, only 142 villages (46.1%) for commercial purpose and only 111 villages (36.0%) for all purposes in the study area. Out of the total 315 villages/towns of the study area, about 25 uninhabited villages (8.1%) were observed not electrified for any purpose in the study area.

Village/town wise Basic Infrastructure and Amenities availabilities data for the entire study area is compiled and presented in Table...as follows;

Table 4-38: Village wise Basic Amenities Availability

Name of the Village	Educational				Medical								Drinking Water							CT	Communication & Transport				Approach to the Village				Power Supply				Nearest Town Distance, km
	P	M	SS	BS	IC	HC	HS	IC	H	D	VC	T	W	HP	W	R	K	PO	TO		BS	RS	PR	KR	W	FP	ED	E Ag.	EC	EA			
1. District Hugli, W.B.																																	
Paschim Thakurani Chak	5	3	3	2	0	0	1	0	0	0	0	2	2	2	1	1	1	2	1	2	2	2	2	1	2	1	1	1	1	1	1	Arambagh,23km	
Purbba Thakurani Chak	4	1	1	1	0	0	1	0	0	0	0	2	2	2	1	1	1	2	2	2	2	2	2	1	2	1	1	1	1	1	1	Arambagh,22km	
Ramchandrapur	4	1	1	0	0	1	1	1	0	1	1	2	2	1	1	2	1	2	2	2	2	2	1	1	2	1	1	1	1	1	1	Arambagh,10km	
Kaknan	7	0	0	0	0	0	1	0	0	0	0	2	2	1	1	1	1	2	2	2	2	2	1	1	1	1	1	1	1	1	1	Arambagh,25km	
Dhanyaghari	6	1	1	1	0	0	1	0	0	0	0	2	2	1	1	1	1	2	2	2	2	2	1	1	1	1	1	1	1	1	1	Arambagh,25km	
Ghoradaha	5	1	1	0	0	0	1	0	0	0	0	2	2	1	1	1	1	2	2	2	2	2	1	1	1	1	1	1	1	1	1	Arambagh,28km	
Jagatpur	7	2	1	0	0	0	1	1	0	0	0	2	2	1	1	1	1	2	2	2	2	2	1	1	1	1	1	1	1	1	1	Arambagh,50km	
Bar Nandanpur	3	0	0	0	0	0	1	0	0	0	0	2	2	1	1	1	1	2	2	2	2	2	1	1	2	1	1	1	1	1	1	Arambagh,48km	
Radhakrishnapur	3	0	0	0	0	0	1	0	0	0	1	2	2	1	1	2	1	2	2	2	2	2	1	1	2	1	1	1	1	1	1	Arambagh,10km	
Nandanpur	5	1	1	1	0	0	1	1	0	0	0	2	2	1	1	1	1	2	2	2	2	2	1	1	2	1	1	1	1	1	1	Arambagh,38km	
Banhijli	4	0	0	0	0	0	1	0	0	0	0	2	2	1	1	2	1	2	2	2	2	2	2	1	2	1	1	1	1	1	1	Arambagh,38km	
Chand Kundu	3	0	0	0	0	0	0	0	0	0	0	2	2	1	1	2	1	2	2	2	2	2	2	1	2	1	1	1	1	1	1	Arambagh,38km	
Dhaldanga	4	0	0	0	0	0	0	0	0	0	0	2	2	1	1	1	1	2	2	2	2	2	2	1	1	1	1	1	1	1	1	Arambagh,35km	
Marakhana	6	1	1	1	0	1	1	1	0	1	1	2	2	1	1	1	1	2	2	2	2	2	1	1	1	1	1	1	1	1	1	Arambagh,35km	
Hanua	3	0	0	0	0	0	1	0	0	0	0	2	2	1	1	2	1	2	2	2	2	2	1	1	2	1	1	1	1	1	1	Arambagh,35km	
2. District Bankura, W.B.																																	
Dubrajpur	2	3	1	1	0	0	1	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	2	1	2	1	1	1	1	1	1	Bankura,11km	
Natherdanga	1	0	0	0	0	0	1	0	0	0	0	2	2	1	2	2	1	2	1	2	2	2	2	1	2	1	1	2	2	2	2	Bankura,11km	
Gottarya	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	1	1	2	1	1	2	1	2	2	Bankura,11km	
Kelera	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	1	2	2	2	1	2	2	2	2	Bankura,11km	
Maitydubrajpur	1	0	0	0	0	0	1	1	0	0	1	2	2	1	2	2	1	2	2	2	2	2	2	2	2	2	1	2	1	2	2	Bankura,11km	

Draft EIA for the Development of 4/6 lane inter corridor (Greenfield) access control expressway from Varanasi to Kolkata (Package-5) from km 387+200 (near Kamalpur village, Jharkhand/west Bengal Border) to Km 622+500, NH-16, near Uluberia, Howrah District, West Bengal under Bharatmala Pariyojana Phase-II (Lot-9 Package-3) (Total length-235.300Km) by M/s National Highways Authority of India

Chapter 4- Description of Environment

Salanpur	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	1	1	2	2	2	2	2	1	1	2	2	1	2	2	2	Bankura,11km
Gandlugar	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	1	1	2	2	2	2	2	2	1	2	1	1	1	1	1	Bankura,11km
Padulara	1	1	0	0	0	0	0	0	0	0	0	2	2	1	2	1	1	2	2	2	2	2	2	1	2	1	1	2	2	2	Bankura,11km
Bhalukbasa	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	1	1	2	2	1	2	2	2	Bankura,11km
Khatgram	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	1	2	2	2	1	2	2	2	Bankura,11km
Bamni	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	1	1	2	2	1	2	2	2	Bankura,11km
Dakshin Kamalpur	1	0	0	0	0	0	0	0	0	0	0	2	1	1	2	1	1	2	2	2	2	2	2	1	2	1	1	2	2	2	Bankura,11km
Shibrampur	Uninhabited Village																													Bankura,11km	
Chandra	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	2	1	2	1	1	2	2	2	Bankura,11km
Bhutama	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	2	2	2	2	2	2	1	1	2	2	1	2	2	2	Bankura,11km
Phulkusma	1	1	1	0	0	0	1	1	0	0	0	2	2	1	2	2	1	2	1	2	2	2	1	1	2	1	1	2	1	2	Bankura,11km
Jugibad	Uninhabited Village																													Bankura,11km	
Nekrakonda	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	2	2	2	2	1	2	2	2	Bankura,11km
Dakshin Pairachali	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	1	1	2	2	2	2	2	2	1	2	1	1	2	2	2	Bankura,11km
Kaliapathar	1	1	1	0	0	0	1	0	0	0	0	2	2	1	2	1	1	2	2	2	2	2	2	2	2	2	1	2	2	2	Bankura,11km
Bandeuli	1	0	0	0	0	1	0	0	0	0	0	2	1	1	2	2	1	2	2	2	2	2	1	2	2	1	1	2	1	2	Bankura,11km
Mayurnachna	Uninhabited Village																													Bankura,11km	
Kadamdeuli	1	0	0	0	0	0	1	1	0	0	0	2	2	1	2	1	1	2	2	2	2	2	1	1	1	1	1	1	1	1	Bankura,35km
Bisharbera	Uninhabited Village																													Bankura,35km	
Banshidihi	2	1	1	1	0	0	1	0	0	0	0	2	1	1	2	2	1	2	1	2	2	2	2	1	2	1	1	1	1	1	Bankura,36km
Kharakanali	0	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	2	1	2	2	1	2	2	2	Bankura,36km
Nishchintapur	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	2	1	2	2	1	2	2	2	Bankura,36km
Jiarda	3	2	2	1	0	0	1	0	0	0	0	2	2	1	2	1	1	2	1	2	2	2	1	1	2	1	1	2	2	2	Bankura,36km
Erodihi	1	0	0	0	0	0	0	1	0	0	0	2	2	1	2	1	1	2	2	2	2	2	2	1	2	1	1	2	2	2	Bankura,33km
Tunamara	1	0	0	0	0	0	0	1	0	0	0	2	2	1	2	1	1	2	2	2	2	2	2	1	2	1	1	2	2	2	Bankura,32km
Chakaltasahar	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	1	1	2	2	2	2	2	2	1	2	2	1	1	2	2	Bankura,30km
Panchpukhuria	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	2	2	2	1	1	2	2	2	Bankura,19km
Bankata	2	1	1	0	0	0	0	0	0	0	0	2	1	1	2	1	1	2	1	2	1	2	2	1	2	2	1	1	2	2	Bankura,31km
Botkula	1	0	0	0	0	0	0	0	0	0	0	2	2	2	1	2	1	2	2	2	2	2	2	1	2	2	1	1	2	2	Bankura,31km

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Chapter 4- Description of Environment

Goaladanga	2	0	0	0	0	0	1	0	0	0	0	2	2	1	1	1	2	2	2	2	2	2	2	2	1	1	1	2	2	2	Bankura,35km
Jugda	0	0	0	0	0	0	0	0	0	0	0	2	2	1	2	1	1	2	2	2	1	2	2	1	2	1	1	1	1	1	Bankura,35km
Mauladanga	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	1	1	2	2	2	1	2	2	1	2	1	1	1	2	2	Bankura,34km
Gobindapur	1	0	0	0	0	0	1	0	0	0	0	2	2	2	1	1	2	2	2	2	2	2	2	2	1	1	1	1	1	1	Bankura,34km
Uparkechanda	3	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	1	2	2	1	2	1	1	2	2	2	Bankura,36km
Harishchandrapur	0	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	2	1	2	2	1	2	2	2	Bankura,37km
Nayada	1	0	0	0	0	0	1	0	0	0	0	2	2	1	1	2	1	2	1	2	2	2	1	1	2	1	1	1	1	1	Bankura,38km
Upargeryakula	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	1	1	2	2	2	1	2	2	1	2	1	1	2	2	2	Bankura,37km
Shalkap	2	1	1	0	0	0	0	0	0	0	0	2	1	1	2	1	1	2	2	2	2	2	2	2	2	1	1	2	2	2	Bankura,36km
Ramchandrapur	1	0	0	0	0	0	0	0	0	0	0	2	1	1	2	1	1	2	2	2	2	2	2	2	2	1	1	2	2	2	Bankura,36km
Jugibaid	0	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	1	1	2	1	1	2	1	2	Bankura,40km
Chhatapur	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	1	1	2	1	1	2	1	2	Bankura,42km
Nischintapur	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	1	1	2	2	2	1	2	2	1	1	1	1	2	2	2	Bankura,42km
Binodpur	0	0	0	0	0	0	0	0	0	0	0	2	2	1	2	1	1	2	2	2	1	2	2	1	2	2	1	2	2	2	Bankura,42km
Kurusthalia	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	1	1	2	2	2	1	2	1	1	2	2	1	2	2	2	Bankura,44km
Surbhaga Band	1	0	0	0	0	0	0	0	0	0	0	2	2	1	1	2	1	2	2	2	2	2	1	1	2	2	1	2	1	2	Bankura,27km
Mahada	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	2	2	2	2	2	2	2	1	2	1	1	2	2	2	Bankura,26km
Kadamara	3	0	0	0	0	0	0	0	0	0	0	2	2	1	1	2	1	2	2	2	2	2	2	1	2	2	1	2	1	2	Bankura,30km
Painada Modarpur	0	0	0	0	0	0	0	0	0	0	0	2	2	1	1	2	1	2	2	2	2	2	2	1	2	2	1	2	1	2	Bankura,26km
Chak Nutangram	1	0	0	0	0	0	0	0	0	0	0	2	2	1	1	2	1	1	2	2	2	2	2	1	2	2	1	2	1	2	Bankura,27km
Raghunathpur	2	0	0	0	0	0	0	0	0	0	0	2	2	1	1	2	1	2	2	2	2	2	2	1	2	2	1	2	1	2	Bankura,26km
Paryadang	2	1	0	0	0	0	1	0	0	0	0	2	2	1	1	2	2	2	1	2	2	2	2	1	2	2	1	2	1	2	Bankura,30km
Narattampur	4	1	1	0	0	0	0	0	0	0	0	2	2	1	2	2	2	2	2	2	2	2	2	1	2	1	1	2	2	2	Bankura,33km
Taltala	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	2	2	2	2	2	2	2	2	2	1	1	2	2	2	Bankura,39km
Dhengashimul	2	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	2	2	2	2	2	2	2	1	2	1	1	2	2	2	Bankura,37km
Nachna	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	2	2	2	2	2	2	2	2	2	1	1	2	2	2	Bankura,34km
Bhutamamaheshpur	0	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	2	2	2	2	2	2	2	2	2	1	1	2	2	2	Bankura,31km
Harulia	2	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	2	2	2	2	2	2	2	2	2	1	1	2	2	2	Bankura,36km
Khatbanda	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	2	2	2	2	2	2	2	2	2	1	1	2	2	2	Bankura,36km

Draft EIA for the Development of 4/6 lane inter corridor (Greenfield) access control expressway from Varanasi to Kolkata (Package-5) from km 387+200 (near Kamalpur village, Jharkhand/west Bengal Border) to Km 622+500, NH-16, near Uluberia, Howrah District, West Bengal under Bharatmala Pariyojana Phase-II (Lot-9 Package-3) (Total length-235.300Km) by M/s National Highways Authority of India

Chapter 4- Description of Environment

Harakona	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	2	2	2	2	2	2	2	2	1	1	2	2	2	Bankura,30km	
Bhedua	1	1	1	1	0	0	1	0	0	0	0	2	2	1	2	2	2	2	2	2	2	2	2	1	2	1	1	2	2	2	Bankura,34km
Banskopa	2	0	0	0	0	0	0	0	0	0	0	2	2	1	1	1	1	2	2	2	2	2	2	1	1	2	1	1	1	1	Bankura,33km
Kanaipur	1	0	0	0	0	0	0	0	0	0	0	2	2	1	1	1	1	2	2	2	2	2	2	1	1	2	1	1	1	1	Bishnupur,36km
Radhanagar	1	1	0	0	0	0	1	0	0	0	0	2	2	1	1	2	1	2	2	2	2	2	2	1	2	2	1	1	1	1	Bankura,35km
Panchmura	3	2	2	1	0	1	1	0	0	0	0	2	1	1	1	1	1	2	2	1	1	2	1	1	2	2	1	1	1	1	Bankura,33km
Lalbandh	1	1	2	2	0	0	0	0	0	0	0	1	2	1	1	2	1	2	2	2	1	2	2	1	2	2	1	1	1	1	Bishnupur,33km
Deulbhira	1	0	0	0	0	0	0	0	0	0	0	2	2	1	1	2	2	2	2	2	1	2	2	1	2	2	1	1	1	1	Bankura,35km
Bhetuadanga	1	0	0	0	0	0	0	0	0	0	0	2	1	2	1	1	1	2	2	2	2	2	2	1	2	2	1	2	2	2	Bishnupur,36km
Jambedia	1	0	0	0	0	0	0	0	0	0	0	2	2	2	1	1	1	2	2	2	2	2	2	1	2	2	1	2	2	2	Bishnupur,36km
Murakati	1	0	0	0	2	0	0	0	0	0	0	2	2	2	1	2	1	2	1	2	1	2	1	1	2	2	1	1	1	1	Bishnupur,10km
Kaniari	3	1	0	0	3	0	1	0	0	0	0	2	2	2	1	2	1	2	2	2	2	2	2	1	2	2	1	1	1	1	Bishnupur,10km
Karakanali	1	1	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	1	2	2	2	2	2	1	2	1	2	Bankura,31km
Balarampur	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	2	1	2	1	1	2	2	2	Khatra,35km
Masatkhal	1	1	1	1	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	2	1	2	2	1	2	2	2	Khatra,36km
Shyam Pur	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	2	1	2	2	1	2	2	2	Bishnupur,22km
Pachaparar	0	0	0	0	0	0	0	0	0	0	0	2	2	1	2	1	1	2	2	2	2	2	2	1	2	2	1	2	2	2	Bishnupur,22km
Barakhulia	0	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	2	1	2	2	1	2	2	2	Bishnupur,21km
Keotdhara	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	2	1	2	2	1	2	2	2	Bishnupur,21km
Balaram Pur	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	2	1	2	2	1	2	2	2	Bishnupur,20km
Siuli	2	1	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	2	1	2	2	1	2	2	2	Bishnupur,20km
3. District Puruliya, W.B.																															
Panrga	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	1	1	2	2	2	2	2	1	1	2	2	1	2	2	2	Purulia,32km
Hathimuri	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	2	2	2	2	2	2	2	1	2	2	1	2	2	2	Purulia,31km
Silphor	Uninhabited Village																										Purulia,31km				
Hargara	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	1	2	2	1	1	2	2	2	Purulia,25km
Hoangda	2	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	2	2	2	2	1	2	2	2	Purulia,29km
Dhabani	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	1	1	2	2	2	2	2	2	2	2	2	1	2	2	2	Purulia,28km
Nutandi	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	1	1	2	2	2	2	2	2	2	2	2	1	2	2	2	Purulia,29km

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Chapter 4- Description of Environment

Balibhasa	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	2	1	2	2	1	1	1	1	Purulia,19km	
Durama	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	2	2	1	2	2	2	2	1	2	2	1	2	2	2	Purulia,24km	
Baragram	2	2	2	1	0	1	1	0	0	0	0	2	1	1	1	2	1	2	1	2	1	2	2	1	2	2	1	2	1	2	Purulia,21km	
Phuljhariya	0	0	0	0	0	0	0	0	0	0	0	2	2	2	1	2	1	2	2	2	2	2	2	2	2	2	1	2	2	2	Purulia,22km	
Ramamoti	1	0	0	0	0	0	0	0	0	0	0	2	2	1	1	2	1	2	1	2	2	2	2	2	2	2	1	1	1	1	Purulia,20km	
Chaitandi	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	2	1	2	2	1	1	1	1	Purulia,21km	
Kusumtikri	1	0	0	0	0	0	0	0	0	0	0	2	2	2	1	2	1	2	2	2	2	2	2	1	2	1	1	2	2	2	Purulia,19km	
Agharpur	1	0	0	0	0	0	0	0	0	0	0	2	2	1	1	2	1	2	2	2	2	2	2	2	2	2	1	1	2	2	2	Purulia,17km
Gunja	2	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	1	2	1	1	2	2	1	1	1	1	Purulia,16km	
Jaypur (CT)	Urban Part																										Jaypur,0km					
Ghongha	2	1	1	0	0	0	0	0	0	0	0	2	2	1	1	2	2	2	2	2	2	2	1	1	2	2	1	2	1	2	Purulia,10km	
Hatuara	1	0	0	0	0	0	0	0	0	0	0	2	2	2	1	2	1	2	2	2	2	2	1	1	2	2	1	2	2	2	Purulia,8km	
Bongabari	2	1	1	1	0	0	1	1	0	0	0	2	2	2	1	2	1	2	1	2	2	2	2	1	2	2	1	1	1	1	Purulia,4km	
Manipur	2	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	1	1	2	2	1	2	2	2	Purulia,4km	
Chargali	2	0	0	0	0	0	1	0	0	0	0	2	2	2	1	2	1	2	2	2	2	2	1	1	2	2	1	1	1	1	Purulia,7km	
Sihuli	2	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	1	1	1	1	2	2	1	2	2	2	Purulia,14km	
Dumdumi	3	0	0	0	0	0	0	0	0	0	0	2	2	2	1	2	1	2	1	1	2	2	1	1	2	2	1	1	1	1	Purulia,10km	
Podlara	2	0	0	0	0	0	1	0	0	0	0	2	2	1	2	2	1	2	2	1	1	2	2	1	2	2	1	1	1	1	Purulia,5km	
Bhangra	2	0	0	0	0	0	1	0	0	0	0	2	1	1	1	2	1	2	2	2	1	2	1	1	2	1	1	1	1	1	Purulia,10km	
Jhupra	Uninhabited Village																										Purulia,10km					
Dhurahi	2	0	0	0	0	0	0	0	0	0	0	2	2	2	1	2	1	2	2	2	2	2	2	1	2	2	1	1	1	1	Purulia,10km	
Gengra	1	1	1	0	0	0	1	0	0	0	0	2	2	2	1	2	1	2	1	2	1	2	2	1	2	2	1	2	2	2	Purulia,10km	
Latuliya	1	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	1	1	1	1	Purulia,10km	
Singhbazar	2	0	0	0	0	0	0	0	0	0	0	2	1	1	1	2	1	2	2	2	2	2	1	1	2	2	1	1	1	1	Purulia,8km	
Karcha	2	0	0	0	0	0	1	0	0	0	0	2	1	1	1	2	1	2	2	2	1	2	1	1	1	2	1	1	1	1	Purulia,10km	
Sandradi	1	0	0	0	0	0	0	0	0	0	0	2	1	1	2	2	1	2	2	2	2	2	2	1	2	2	1	1	1	1	Purulia,10km	
Kathaldiha	Uninhabited Village																										Purulia,10km					
Sidpur	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	1	2	2	2	2	1	1	2	1	1	2	2	2	Purulia,12km	
Chanchra	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	2	2	1	2	2	2	2	1	2	1	1	2	1	2	Purulia,13km	

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Chapter 4- Description of Environment

Karcha	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	1	2	2	2	2	2	1	2	1	1	2	2	2	Purulia,17km
Chhota Chanchra	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	2	2	1	1	1	2	2	2	Purulia,17km
Chirumacha	2	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	1	1	2	1	1	2	1	2	Purulia,15km
Haramjanga	1	0	0	0	0	0	0	0	0	0	0	2	1	1	1	2	1	2	2	2	2	2	1	1	2	2	1	1	1	1	Purulia,10km
Jojodi	2	0	0	0	0	0	1	0	0	0	0	2	2	1	1	2	1	2	2	2	2	2	2	1	2	2	1	2	2	2	Purulia,22km
Panchudi	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	1	2	2	2	2	2	2	2	1	2	1	1	2	2	2	Purulia,21km
Dumkadi	2	1	0	0	0	0	0	0	0	0	0	2	2	1	2	2	2	2	2	2	2	2	2	1	2	1	1	2	2	2	Purulia,27km
Nadiha	2	1	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	2	1	2	2	1	2	2	2	Purulia,26km
Hulung	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	2	2	2	2	2	2	2	1	2	1	1	2	2	2	Purulia,30km
Kulabahal	2	1	1	1	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	1	1	2	2	1	2	1	2	Purulia,30km
Sijumakhna	1	0	0	1	0	0	0	0	0	0	0	2	2	2	1	1	1	2	2	2	2	2	1	1	2	1	1	2	2	2	Purulia,24km
Arjjunjora	1	1	1	1	0	0	0	0	0	0	0	2	2	1	2	2	2	2	2	2	2	2	1	1	1	1	1	2	1	2	Purulia,19km
Keshargarh	6	1	1	1	0	0	1	0	0	0	0	2	2	1	2	1	1	2	2	2	2	2	1	1	2	2	1	1	1	1	Purulia,26km
Chorgali	3	0	0	0	0	0	0	0	0	0	0	2	2	1	2	1	1	2	2	2	2	2	1	1	2	1	1	2	2	2	Purulia,35km
Hatikundar	5	2	0	0	0	0	1	0	0	0	0	2	2	1	2	2	2	2	2	2	2	2	2	1	2	1	1	2	1	2	Purulia,25km
Amlatara	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	1	1	2	1	1	2	1	2	Purulia,33km
Kajali	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	2	1	2	1	1	2	1	2	Purulia,32km
Bariarpur	2	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	2	1	2	2	1	2	2	2	Purulia,38km
Chatumatar	2	0	1	0	0	1	1	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	1	1	2	1	1	2	2	2	Purulia,35km
Sarchakalta	1	0	0	0	0	0	0	0	0	0	0	2	2	1	1	2	1	2	2	2	2	2	2	1	2	1	1	2	2	2	Purulia,47km
Baragram	2	1	1	0	0	0	1	0	0	0	0	2	2	1	1	2	2	2	2	2	2	2	2	1	2	1	1	2	1	2	Purulia,37km
Chak Gopalpur	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	1	1	2	1	1	2	2	2	Purulia,45km
Rangamatya	2	0	0	0	0	0	0	0	0	0	0	2	2	2	1	2	1	2	2	2	2	2	1	1	2	1	1	2	1	2	Purulia,47km
Golbera	1	0	0	0	0	0	0	0	0	0	0	2	2	2	1	2	1	2	2	2	2	2	2	1	2	2	1	1	1	1	Purulia,10km
Rudra	2	1	0	0	0	0	1	1	0	0	0	2	2	1	2	2	1	2	2	2	2	2	2	1	2	2	1	2	1	2	Purulia,15km
Gangudi	Uninhabited Village																														Purulia,15km
Kalidasdi	1	1	1	0	0	0	1	0	0	0	0	2	2	1	2	2	1	2	1	1	1	1	1	2	2	1	1	2	1	2	Purulia,10km
ramdasdi Alias Shyampur	1	0	0	0	0	0	0	0	0	0	0	2	2	2	1	2	2	2	2	2	2	2	2	1	2	2	1	2	2	2	Purulia,10km
Gondhudi	1	0	0	0	0	0	0	0	0	0	0	2	2	1	1	2	1	2	2	2	2	2	1	1	2	1	1	2	2	2	Purulia,28km

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Chapter 4- Description of Environment

Kanali	1	1	0	0	0	0	0	0	0	0	0	2	2	2	1	2	1	2	1	2	2	2	2	1	2	1	1	2	2	2	Purulia,10km
Khojda	1	0	0	0	0	0	0	0	0	0	0	2	1	2	1	2	1	2	2	2	2	2	2	1	2	1	1	2	2	2	Purulia,10km
Bhuinadi	1	0	0	0	0	0	0	0	0	0	1	2	2	2	1	2	1	2	2	2	2	2	2	1	2	2	1	2	2	2	Purulia,10km
Sibdi	1	0	0	0	0	0	0	0	0	0	1	2	2	2	1	2	1	2	2	2	2	2	2	1	2	2	1	2	2	2	Purulia,10km
Hulka	1	0	1	0	0	0	0	0	0	0	0	2	2	2	1	2	1	2	2	2	2	2	1	1	2	1	1	2	2	2	Purulia,10km
Kultanr Alias Nadiara	1	0	0	0	0	0	0	0	0	0	0	2	2	2	1	2	1	2	2	2	2	2	1	1	2	2	1	1	1	1	Purulia,10km
Mahalitora	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	1	2	2	1	1	2	1	2	Purulia,10km
Nadiyara	1	1	2	1	0	0	1	0	0	0	0	2	2	2	1	2	1	2	1	2	2	2	1	1	2	1	1	1	1	1	Purulia,10km
Lapara (Napara)	6	1	1	1	0	0	1	1	0	0	0	2	2	1	1	2	1	2	2	2	2	2	1	1	2	2	1	1	1	1	Purulia,40km
Damodarpur	2	1	0	0	0	0	1	0	0	0	0	2	2	1	1	2	1	2	2	2	2	2	2	1	2	2	1	1	1	1	Purulia,42km
Bhatadi	0	1	1	0	0	0	0	1	0	0	0	2	2	1	2	2	1	2	2	2	2	2	2	2	2	2	1	2	2	2	Purulia,42km
Bagda	3	1	1	1	0	1	1	1	1	0	1	2	2	1	2	1	1	2	2	2	2	2	2	1	2	2	1	2	1	2	Purulia,45km
Haridi	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	1	1	2	2	2	2	2	2	2	2	2	1	2	2	2	Purulia,54km
Chakia	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	1	1	2	2	2	2	2	2	1	2	2	1	2	2	2	Purulia,55km
Kanara	2	0	0	0	0	0	0	0	0	0	0	2	2	1	2	1	2	2	2	2	2	2	2	1	2	2	1	2	2	2	Purulia,46km
Kanchannagar	1	0	1	0	0	0	0	0	0	0	0	2	2	1	2	1	1	2	2	2	2	2	2	1	2	2	1	2	2	2	Purulia,46km
Niasa	Uninhabited Village																														Purulia,46km
Shyampur	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	1	1	2	2	2	2	2	2	1	2	1	1	2	2	2	Purulia,45km
Kundhurka	1	1	1	1	0	0	1	1	0	0	0	2	2	1	2	2	1	2	1	2	2	2	2	1	2	2	1	1	1	1	Purulia,45km
Bankanali	Uninhabited Village																														Purulia,45km
Kendbani	2	0	0	1	0	0	0	1	0	0	0	2	2	1	2	2	1	2	2	2	1	2	1	1	2	2	1	2	2	2	Purulia,58km
Laharia	2	0	0	0	0	0	1	1	0	0	0	2	2	1	2	2	1	2	2	2	2	2	1	1	2	2	1	2	2	2	Purulia,60km
Poradi	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	1	1	2	2	1	2	1	2	Purulia,60km
Simakanali	1	1	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	1	1	2	2	1	2	2	2	Purulia,61km
Debgram	1	0	0	0	0	0	0	1	0	0	0	2	2	1	2	1	1	2	2	2	2	2	2	1	2	2	1	2	2	2	Purulia,66km
Bhagaband	3	1	1	1	0	0	1	1	0	0	0	2	2	1	2	1	1	2	2	1	2	2	1	1	2	2	1	2	1	2	Purulia,62km
Guridi	1	0	0	0	0	0	0	0	0	0	0	2	1	1	2	1	1	2	2	2	2	2	2	1	2	1	1	2	2	2	Jhalda,10km
Sulung Lahar	1	0	0	0	0	0	0	0	0	0	0	2	2	2	1	2	2	2	2	2	2	2	2	2	2	1	1	2	2	2	Jhalda,10km
Karche	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	2	1	2	2	1	2	2	2	Jhalda,10km

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Chapter 4- Description of Environment

Chitmu	1	0	0	0	0	0	0	0	0	0	0	2	1	1	1	2	1	2	1	2	2	1	2	1	1	2	2	2	Jhalda,10km			
Sarjumhatu	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	2	2	2	1	2	2	2	Jhalda,10km		
Damrughutu	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	2	2	2	1	2	2	2	Jhalda,10km		
Bara Metyala	1	1	0	0	0	0	0	0	0	0	0	2	2	1	1	1	1	2	1	2	2	2	1	1	2	1	1	2	2	2	Jhalda,10km	
Damra	1	1	1	1	0	0	0	0	0	0	0	2	2	1	2	1	1	2	2	2	2	2	1	2	2	1	1	2	2	2	Jhalda,10km	
Amra	1	1	1	2	0	1	1	0	1	4	0	2	2	1	1	2	1	2	1	2	1	1	2	2	2	2	1	2	2	2	Jhalda,10km	
Tatayara	2	1	1	0	0	0	1	0	0	0	0	2	2	1	2	1	1	2	1	2	2	2	1	1	2	2	1	2	2	2	Jhalda,25km	
4. District Haora, W.B.																																
Uttar Bhatora	5	1	1	1	0	1	0	0	0	0	0	2	2	1	2	1	1	2	2	2	2	2	2	2	2	1	1	1	1	Uluberia,26km		
Solbaga	3	0	0	0	0	0	0	0	0	0	0	2	2	1	2	1	1	2	2	2	2	2	2	2	1	1	1	1	1	1	Bagnan,16km	
Nignan	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	1	1	2	2	2	2	2	2	2	1	1	1	1	1	1	Uluberia,32km	
Fatik Beria	1	0	0	0	0	0	1	0	0	0	0	2	2	1	2	1	1	2	2	2	2	2	2	2	2	1	1	1	1	1	Uluberia,30km	
Hio	1	0	0	0	0	0	0	0	0	1	0	2	2	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	2	1	2	Uluberia,25km
Dakshin Khalna	7	4	3	1	0	1	1	0	0	1	0	2	2	1	2	2	1	2	2	2	1	2	1	1	2	1	1	1	1	1	1	Uluberia,23km
Khari Geria	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	1	1	2	2	2	2	2	2	2	2	1	1	1	1	1	1	Uluberia,31km
Kasmali	9	2	1	1	0	0	1	0	0	0	1	2	2	1	2	2	1	2	2	2	2	2	1	2	2	1	1	1	1	1	1	Uluberia,37km
Kulepairi	Uninhabited Village																										Uluberia,21km					
Purbba Bainan	2	0	1	0	0	1	1	0	0	1	0	1	2	1	2	1	1	2	2	2	2	2	1	1	2	1	1	1	1	1	1	Uluberia,22km
Joka	4	0	0	0	0	0	0	0	0	0	0	2	2	1	2	1	1	2	2	2	2	2	2	1	2	1	1	1	1	1	1	Uluberia,17km
Ulanpara	4	1	1	0	0	0	0	0	0	0	0	2	2	1	2	1	1	2	2	2	2	2	1	1	2	1	1	1	1	1	1	Uluberia,17km
Karia (CT)	Urban Part																										Karia,0km					
Paschim Bainan (CT)	Urban Part																										Paschim Bainan,0km					
Bangalpur (CT)	Urban Part																										Bangalpur,0km					
Chandrapur (CT)	Urban Part																										Chandrapur,0km					
Khadinan (CT)	Urban Part																										Khadinan,0km					
5. District Paschim Medinipur, W.B.																																
Bhandirban	1	0	0	0	0	0	0	0	0	0	0	2	1	1	1	2	1	2	2	2	2	2	2	1	2	1	1	2	2	2	Chandrakona,22km	
Kukurajuri	Uninhabited Village																										Chandrakona,22km					
Khaerbani	1	0	0	0	0	0	0	0	0	0	0	2	2	1	1	1	1	2	2	2	2	2	2	1	2	2	1	1	2	2	Chandrakona,22km	

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Chapter 4- Description of Environment

Benachapra	1	0	0	0	0	0	0	0	0	0	0	2	2	1	1	1	1	2	2	2	2	2	1	1	2	2	1	1	2	2	Chandrakona,22km	
Til Bhandara	Uninhabited Village																													Chandrakona,22km		
Bara Nohari	1	1	1	0	0	0	0	0	0	0	0	2	2	1	1	2	1	2	2	2	2	2	1	1	1	1	1	1	1	1	Bishnupur,10km	
Raghunathpur	1	1	1	0	0	0	0	0	0	0	0	2	2	1	1	1	1	2	2	2	2	2	2	1	2	2	1	2	2	2	Bishnupur,10km	
Rayda	0	0	0	0	0	0	0	0	0	0	0	2	2	1	1	2	1	2	2	2	1	2	1	2	2	2	1	1	1	1	Bishnupur,10km	
Chhatakonda	1	0	0	0	0	0	0	0	0	0	0	2	2	1	1	1	1	2	2	2	2	2	2	2	1	2	1	2	2	2	Bishnupur,10km	
Ausabandi	1	0	0	0	0	0	0	0	0	0	0	2	2	1	1	2	1	2	2	2	2	2	2	2	2	2	2	1	1	1	1	Bishnupur,10km
Ramchak	Uninhabited Village																													Bishnupur,10km		
Kasua	1	0	0	0	0	0	0	0	0	0	0	2	2	1	1	2	2	2	2	2	2	2	1	1	2	1	1	1	1	1	Bishnupur,10km	
Agra	1	0	0	0	0	0	1	0	0	0	0	2	2	1	1	2	1	2	2	2	2	2	2	1	2	2	1	2	2	2	Bishnupur,10km	
Meghula	0	1	0	0	0	0	0	0	0	0	0	2	2	1	1	2	1	2	2	2	2	2	2	1	2	2	1	2	2	2	Bishnupur,10km	
Barabhandar Khanda	Uninhabited Village																													Bishnupur,10km		
Saldangra	1	0	0	0	0	0	0	0	0	0	0	2	2	1	1	1	1	2	2	2	2	2	2	1	2	2	1	1	1	1	Bishnupur,10km	
Golahat	1	0	0	0	0	0	0	0	0	0	0	2	2	2	1	1	1	2	2	2	2	2	2	1	2	1	1	1	1	1	Bishnupur,10km	
Moldanga	1	0	0	0	0	0	0	0	0	0	0	2	2	2	1	1	1	2	2	2	1	2	1	2	2	1	1	1	1	1	Bishnupur,10km	
Hingisol	0	0	0	0	0	0	0	0	0	0	0	2	2	2	1	1	1	2	2	2	1	2	1	2	2	1	1	1	1	1	Bishnupur,10km	
Baratalbeta	0	0	0	0	0	0	0	0	0	0	0	2	2	2	1	1	1	2	2	2	2	2	2	1	2	1	1	1	1	1	Bishnupur,10km	
Patpur	1	0	0	0	0	0	0	0	0	0	0	2	2	2	1	1	1	2	2	2	2	2	2	1	2	1	1	1	1	1	Bishnupur,10km	
Tasargeria	1	0	0	0	0	0	0	0	0	0	0	2	2	2	1	2	2	2	2	2	2	2	2	1	2	2	1	1	1	1	Bishnupur,10km	
Bajrakha Bankati	0	0	0	0	0	0	0	0	0	0	0	2	2	2	1	2	1	2	2	2	2	2	2	1	2	2	1	1	1	1	Bishnupur,10km	
Kankrasol	1	0	0	0	0	0	0	0	0	0	0	2	2	2	1	1	1	2	2	2	2	2	2	1	2	1	1	1	1	1	Bishnupur,10km	
Sanpdaha	1	0	0	0	0	0	0	0	0	0	0	2	2	2	1	2	1	2	1	2	2	2	2	1	2	2	1	1	1	1	Bishnupur,10km	
Garanga	1	0	0	0	0	0	1	1	0	0	1	2	2	2	1	2	1	2	2	2	2	2	2	1	2	2	1	1	1	1	Bishnupur,10km	
Dakshin Konda	Uninhabited Village																													Bishnupur,10km		
Darji	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	2	2	2	2	1	1	2	2	Bishnupur,10km	
Mangalapota	1	1	1	1	0	0	0	0	0	1	0	1	2	1	1	1	1	2	2	2	2	2	1	1	1	1	1	1	1	1	Chandrakona,26km	
Bandarbani	0	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	1	1	2	2	Chandrakona,10km	
Kashidanga	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	2	2	Chandrakona,10km	
Pathar Teria	2	1	0	0	0	0	0	0	0	0	0	2	2	1	1	2	1	2	2	1	2	2	1	1	2	1	1	2	2	2	Chandrakona,24km	

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Chapter 4- Description of Environment

Madanhari	2	0	0	0	0	0	1	0	0	0	0	2	2	2	2	2	1	2	2	2	2	2	2	2	1	1	1	1	1	Chandrakona,25km	
Dhanyachhara	1	1	0	0	0	0	0	0	0	0	0	2	2	1	1	2	2	2	2	2	2	1	1	2	1	1	2	2	2	Chandrakona,24km	
Kumardubi	1	0	0	0	0	0	0	0	0	0	0	2	2	2	1	1	1	2	2	2	2	2	2	1	2	1	1	1	1	Chandrakona,24km	
Baharabuni	Uninhabited Village																													Chandrakona,24km	
Murabani	Uninhabited Village																													Chandrakona,24km	
Khayrapara	Uninhabited Village																													Chandrakona,24km	
Gamar Kushi	Uninhabited Village																													Chandrakona,24km	
Kadambandhi	Uninhabited Village																													Chandrakona,24km	
Chandabila	0	0	0	0	0	0	1	0	0	0	0	2	2	2	2	1	1	2	2	2	2	2	1	1	2	1	1	1	1	Chandrakona,27km	
Anandanagar	1	0	0	0	0	0	0	0	0	0	0	2	2	2	2	1	1	2	2	2	2	2	1	1	2	1	1	1	1	Chandrakona,27km	
Birajpur	1	1	0	0	1	1	1	0	0	1	0	1	2	1	2	1	1	2	2	2	2	2	1	1	1	1	1	2	2	2	C.K. Town,24km
Ghoramara	1	0	0	0	0	1	1	0	0	1	0	1	2	1	1	2	1	2	2	2	2	2	2	1	1	1	1	2	2	2	C.K. Town,23km
Paramanandapur	0	0	0	0	0	0	0	0	0	0	0	2	2	1	1	2	1	2	1	2	2	2	2	1	2	2	1	1	2	2	Ramjibanpur,11km
Dogerya Ramchak	Uninhabited Village																													Ramjibanpur,11km	
Rejna	1	0	0	0	0	0	0	0	0	0	0	2	2	1	1	2	1	2	2	2	2	2	2	1	2	2	1	1	2	2	Ramjibanpur,8km
Kochgerya Ramchak	1	0	0	0	0	0	0	0	0	0	0	2	2	1	1	1	1	2	2	2	2	2	2	1	2	2	1	1	2	2	Ramjibanpur,9km
Jara	5	2	2	1	0	1	1	0	0	2	0	1	2	1	1	2	1	2	1	2	2	1	1	1	2	1	1	1	1	1	Khirpai,8km
Tegerya Dharmmapur	0	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	2	2	1	1	1	1	2	2	Khirpai,8km
Ghola	1	0	0	0	0	0	0	0	0	0	0	2	2	2	1	2	1	2	2	2	2	2	2	1	2	2	1	1	1	1	Khirpai,10km
Narayanpur	1	1	0	0	0	0	0	0	0	0	0	1	2	1	1	2	1	2	2	2	2	2	2	1	2	1	1	1	1	1	Ramjibanpur,8km
Madhabpur	2	1	0	0	0	0	1	1	0	1	1	1	2	1	1	2	1	2	1	2	1	2	1	1	2	1	1	1	1	1	Khirpai,10km
Beurgram	1	1	2	0	0	0	0	0	0	0	0	2	2	1	1	2	2	2	2	2	1	2	2	1	2	2	1	1	1	1	Kharar,5km
Agra	2	0	0	0	0	0	0	0	0	0	0	2	1	1	1	2	2	2	1	2	1	2	2	1	2	2	1	1	1	1	Kharar,5km
Purshuri	1	1	0	0	0	0	1	1	0	0	1	1	2	1	1	1	1	2	2	2	2	2	2	1	2	2	1	1	1	1	Kharar,5km
Betagram	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	2	2	2	2	2	2	2	1	2	2	1	1	2	2	Kharar,5km
Shyamkuri	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	2	2	2	2	2	2	2	1	2	2	1	1	2	2	Kharar,5km
Kankabati	1	0	0	0	0	0	1	0	0	0	0	2	2	1	1	2	1	2	2	2	2	2	2	1	2	2	1	1	1	1	Khirpai,8km
Hajra	1	0	0	0	0	0	0	0	0	0	0	2	2	1	1	2	1	2	2	2	2	2	2	1	2	2	1	1	1	1	Khirpai,11km
Amdhere	0	0	0	0	0	0	0	0	0	0	0	2	2	1	1	2	1	2	2	2	2	2	2	1	2	1	1	1	2	2	Khirpai,10km

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Chapter 4- Description of Environment

Goyalsini	1	0	0	0	0	0	0	0	0	0	0	2	2	1	1	2	1	2	2	2	2	2	1	2	1	1	1	2	2	Khirpai,10km
Belgerya	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	1	1	1	1	1	2	2	Khirpai,10km
Arjungerya	0	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	1	1	1	1	1	2	2	Khirpai,10km
Kashanda	1	1	1	0	0	0	0	0	0	0	0	2	2	1	1	2	1	2	2	2	2	2	1	2	1	1	1	2	2	Khirpai,5km
Andhare	2	0	0	0	0	0	0	0	0	0	0	2	2	1	1	2	1	2	2	2	2	2	1	2	1	1	1	2	2	Khirpai,6km
Gohaldanga	1	1	1	0	0	0	0	0	0	0	0	2	2	1	2	2	2	2	1	2	2	2	1	2	2	1	1	1	1	Khirpai,10km
Nishchintapur	0	0	0	0	0	0	0	0	0	0	0	2	2	1	2	1	1	2	1	2	2	2	1	1	1	1	1	1	1	Chandrakona,10km
Ishangar	1	0	0	0	0	0	0	0	0	0	0	2	2	1	1	1	1	2	2	2	2	2	1	1	1	1	1	1	1	Chandrakona,10km
Kunarpur	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	1	1	2	2	2	2	2	1	1	1	1	1	1	1	Chandrakona,10km
Deulbere	1	0	0	0	2	0	2	0	2	1	1	2	2	1	1	2	1	2	2	2	2	2	1	1	2	2	1	1	1	Chandrakona,10km
Maheshpur	1	1	0	0	0	1	1	0	1	0	0	2	2	2	1	2	1	2	2	2	2	2	2	2	1	1	1	1	1	Chandrakona,10km
Murakata	1	1	0	0	0	0	0	0	0	0	0	2	2	2	1	2	1	2	2	2	2	2	1	1	2	2	1	1	1	Chandrakona,10km
Khandanga	1	0	0	0	0	0	1	1	1	0	0	2	2	1	1	2	2	2	2	2	2	1	1	2	2	1	1	1	1	Chandrakona,10km
Kshirati	1	0	0	0	0	0	0	0	0	0	0	2	2	1	1	2	2	2	2	2	2	2	1	1	2	2	1	1	2	Chandrakona,10km
Bhairabpur	1	0	0	0	0	0	0	0	0	4	0	2	2	1	2	2	2	2	1	2	2	2	1	1	2	2	1	1	1	Chandrakona,10km
Ghoshkira	1	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	2	2	2	2	1	1	1	Chandrakona,10km
Shirsa	0	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	2	1	2	2	1	2	2	Chandrakona,10km
Khursi	1	0	0	0	0	0	1	1	0	1	1	1	2	1	2	1	1	2	2	2	2	2	2	1	1	1	1	1	2	Chandrakona,10km
Kalla	1	1	0	0	0	0	0	0	0	1	0	1	2	2	1	1	1	2	2	2	2	2	2	1	1	2	1	1	1	Chandrakona,10km
Simla	1	0	0	0	0	0	0	0	0	0	0	2	2	2	1	1	2	2	2	2	2	2	2	1	1	2	1	2	2	Chandrakona,10km
Dhaikhanda	1	0	0	0	0	0	0	0	0	0	0	2	2	1	1	1	2	2	2	2	2	1	2	2	2	1	2	2	2	Chandrakona,10km
Langalbhangra	Uninhabited Village																												Chandrakona,10km	
Gobindapur	1	0	0	0	0	0	0	0	0	0	0	2	2	1	1	2	1	2	2	2	2	2	1	2	1	1	1	1	1	Kharar,5km
Mansukha	6	1	1	1	0	0	1	0	0	0	0	2	2	1	2	1	1	2	2	2	2	2	1	2	2	1	1	1	1	Ghatal,10km
Daulatchak	3	0	0	0	0	0	1	0	0	0	0	2	2	1	2	1	1	2	2	2	2	2	2	2	2	1	1	1	1	Ghatal,10km
Chaulisinghapur (P)	0	0	0	0	0	0	0	0	0	0	0	2	2	1	2	1	1	2	2	2	2	2	2	2	2	1	1	2	2	Ghatal,8km
Gangaprasad	2	0	0	0	0	0	0	0	0	0	0	2	2	1	2	1	1	2	2	2	2	2	2	2	2	1	1	1	1	Ghatal,10km
Shrirampur (P)	2	0	0	0	0	0	0	0	0	0	0	2	2	1	2	1	1	2	2	2	2	2	2	2	2	1	1	1	1	Ghatal,8km
Lalkundu	0	0	0	0	0	0	0	0	0	0	0	2	2	1	1	2	2	2	2	2	2	2	2	2	2	1	1	1	1	Ghatal,8km

Draft EIA for the Development of 4/6 lane inter corridor (Greenfield) access control expressway from Varanasi to Kolkata (Package-5) from km 387+200 (near Kamalpur village, Jharkhand/west Bengal Border) to Km 622+500, NH-16, near Uluberia, Howrah District, West Bengal under Bharatmala Pariyojana Phase-II (Lot-9 Package-3) (Total length-235.300Km) by M/s National Highways Authority of India

Chapter 4- Description of Environment

Brindabanchak	Uninhabited Village																										Ghatal,8km					
Ajodhyakundu	Uninhabited Village																										Ghatal,8km					
Jadupur	1	0	0	0	0	0	1	0	0	0	0	2	2	1	2	2	1	2	2	2	1	2	1	2	2	2	1	1	1	1	Ghatal,16km	
Krishnabati	0	0	0	0	0	0	0	0	0	0	0	2	2	1	2	2	2	2	2	2	1	2	1	2	2	2	1	1	1	1	Ghatal,16km	
Kamdebpur	1	0	0	0	0	0	0	0	0	0	0	2	2	1	1	2	1	2	2	2	2	2	2	1	2	1	1	1	1	1	Kharar,1km	
Gopinathpur	1	0	0	0	0	0	0	0	0	0	0	2	2	1	1	1	1	2	2	2	2	2	2	2	2	2	2	1	1	2	2	Kharar,5km
Shyamsundarpur	1	0	0	0	0	0	0	0	0	0	0	2	2	1	1	2	1	2	2	2	2	2	2	2	2	2	1	2	2	2	Kharar,5km	
Kharar (M)/10 Wards	Urban Part																										Kharar,0km					
												Status for Availability and Non-Availability is shown as A (1) & NA (2) respectively																				
TOTAL (1.0KM)	28	88	65	35	8	15	74	24	6	22	13																					

Source-<http://www.censusindia.gov.in/2011census/dchb/DCHB.html>

Abbreviations:

Educational Facilities: P-Primary School, M-Middle School, SS-Higher Secondary Schools, SSS- Senior Secondary School
 Medical Facilities: CHC- Community Health Centre, PHC-Primary Health Centre, PHSC-Primary Health Sub-Centre, MCWC-Maternity and Child Welfare Centre, H-Hospital, D- Dispensary, FWC-Family Welfare Centre
 Drinking Water Facilities: T-Tap Water, W-Well Water, HP-Hand Pump, TW-Tube Well Water, R-River Water, Tk-Tank Water, O-Other Drinking Water Facility
 Communication and Transport Facilities: PO-Post Office, SPO-Sub-Post Office, PTO- Post & Telegraph Office, Tel. - Telephone Connection, Mob. - Mobile Phone Coverage, BS-Bus Services, RS-Railways Services
 Approach to Village: PR- Paved Roads, KR-Kuchha Road, FP-Foot Path
 Power Supply: ED-Power Supply for Domestic use, E Ag.- Power Supply for Agricultural use, EC- Power supply for Commercial use, EA-Electricity for All Purposes

Draft EIA for the Development of 4/6 lane inter corridor (Greenfield)access control expressway from Varanasi to Kolkata (Package-5) from km 387+200 (near Kamalpur village, Jharkhand/west Bengal Border) to Km 622+500, NH-16, near Uluberia, Howrah District, West Bengal under Bharatmala Pariyojana Phase-II (Lot-9 Package-3) (Total length-235.300Km) by M/s National Highways Authority of India

Chapter 4- Description of Environment

4.6.5.8 BRIEF DESCRIPTION OF PLACES OF RELIGIOUS, HISTORICAL OR ARCHAEOLOGICAL IMPORTANCE AND TOURIST INTEREST IN VILLAGES AND TOWNS OF THE DISTRICT:

Place of Historical and Tourist Importance

1. District Hugli, West Bengal

Bandel Church: The word Bandel probably came from the Bengali word bandar which means port. During the time of the Mughals and Portugueses, Bandel was an important port of Hugli district. The city is now famous for its church (Basilica) and monastery situated about 2 km. from Bandel railway station.

Imambara: Situated at Chinsurah, the Imambara building was started in the year 1841 by Haji Muhammad Mohsin and was completed after 20 years, i.e. 1861.

Furfura Sharif: Furfura Sharif (also known as Furfura Darbar Sharif) is a village in Jangipara C.D. Block of Srirampore Sub-division. The mosque here was built by Muqlish Khan in 1375.

Kamarpukur: Kamarpukur, in Goghat is the birth place of Sri Ramkrishna. The Sri Ramkrishna temple, built here in 1951, is a site of international pilgrimage.

Shanderswartala: Situated at the bank of river Ganges at the north of the Duttaghat, it is the most important and oldest temple of Chinsurah. In the 16th century, Digambar Halder placed the Lingam of Lord Shiva and afterwards the temple was established by Siddheswar Roychodhury. There is also a Durga temple which was established on 1845.

Hangsheswari Temple: Hansheshwari temple is located in the town of Bansbaria of Hugli district. Bansbaria was one of the main villages of ancient Saptagram, once the main port and commercial complex of that area. Bansbaria presently an industrial town between Bandel and Tribeni and is only 48 km from Kolkata. Raja Narsingh Deo was the founder of the temple which was built between 1801 through 1814.

Debanandapur: The birth place of Amar Kathasilpi Sarat Chandra Chattopadhyay, this village is situated about 3 km. west from Bandel railway station and was one of the seven important villages named Sapta Gram at the time of Mughals. On 17th September 1875 Sarat Chandra was born in this village.

Temples in Balagarh: The Brindavan Jew temple in Guptipara is actually a cluster of four 17th century terracotta temples. Local legend has it that Lord Clive visited this temple before the Battle of Plassey and presented one of his swords to the mahanta (chief priest).

Nritya Gopal Smriti Mandir: Built on the Grand Trunk Road in 1860 by Zamindar Harihar Seth, this building is an example of the confluence of native and colonial styles of architecture. It now houses a public library.

Antpur Math: Antpur, a village in Jangipara C.D. Block of the Srirampore Sub-division is most famous for Swami Vivekananda who, along with 8 other disciples of Sri Ramkrishna Paramhansa took his oath of asceticism here on 24th December 1886. It is maintained by the Ramkrishna Mission.

Taraknath Temple at Tarakeswar: The Taraknath temple, dedicated to the Hindu God Shiva worshiped as Taraknath, is a major pilgrimage spot in the town of Tarakeswar, West Bengal, India. Built in 1729, the temple is an atchala structure of Bengal temple architecture with a natmandir in front.

Watch Tower: It is situated at the middle place of Chinsurah town. The four faces of which indicate the directions. In 1914 'British' Emperor the Edward established this steel made hollow clock tower resembling a tomb.

Suakhal and Moyur Mahal: There are two picnic spots at the side of Delhi Road nearest to the Bandel railway station. In addition to other facilities boating also can be enjoyed in both places. At Suakhal there is an interesting science exhibition like talking robot, danger cave etc. This place is maintained by Hugli Zilla Parishad.

Jafarganj Cemetery: Jafarganj Cemetery was built by Nawab Mir Jafar over an area of 3.51 acres within an enclosure of waved walls, about half a mile north to the Nizamat Fort Campus and inside the campus of Namak Haram Deorhi.

Joy Krishna Library: Uttarpara Jaykrishna Public Library, the district library is and one of the first of its kind in Asia.

Some other places are Serampore College, The Church of St. Olaf, Church of Sacre Coeur de Jesu, The Hugli Collectorate, Buddha Temple, Deulpara, Light House Tomb, Parbatichak, Residence of Divisional Commissioner, Barddhaman Division, Chandannagar Museum and Indo-French Institute, Chandannagar Strand, Chandannagar Church, The Underground House (Patalbari), Nandadulal Temple,

4.6.5.9 Major Social and Cultural Activities of the District like Festivals and Fairs

Brief notes on the major festivals and melas of the district are given below:

Major Festivals of the District - Durga Puja, Durga Puja of Goswami Family, Durga Pujas of Seoraphuli, Durga Pujas of Guptipara, Goudiya Vaisnavism, Sakti Cult, Kali Puja, Devi Sorbomongola, Hansheshwari Temple, Ananta Vasudeva temple, Manasa Puja, Bisalakshi, Chandi & Jagaddhatri Puja, Worship of Lord Siva, Dharmathakur worship, Makar Samkranti and Baruni Snan (holy dip).

Other Famous Pujas - Other Sakti Goddesses include Bagdevi (not to be confused with Devi Saraswati) of Ilchhoba in Pandua, Savitri Devi of Bhandarhati in Dhaniakhali, another Savitri Devi of Alati in Pursura, Ganga (not to be confused with the river-goddess) of Ilchhoba in Pandua, Simhabahini of Birlok in Khanakul. Bagdevi has no image, Savitri Devi of Bhandarhati is a piece of Pal sculpture with four hands and in a warring pose.

Simhabahini is icon-graphically similar to ten-armed Durga. Some of these goddesses are particularly worshipped by people of the once untouchable castes.

Islamic Festivals -The annual 'Urs' of the Pir (Muslim cleric or preacher or priest) is held in the Bengali calendar month of Chaitra (March-April). Zafar Khan Gazi, another warrior saint's tomb is in Tribeni and is a venue of two important festivals also accompanying fairs in which Hindus and Muslims participate alike. Other local festivals occasioned by annual ceremonies in memory of Pirs are the Pir Saheber Mela at Dhalerbagh in Polba, Pir Alir Mela at Shahbazar Mela in Dhaniakhali, Pir Saheber Mela at Ankpur in Haripal, Pirer Urs at Nababpur in Chanditala, Pirer Urs in Furfura in Jangipara and Pirer Urs at Natibpur in Khanakul.

Christian Festivals:“ There are several festivals peculiar to the two oldest Christian churches in the district.

District Bankura, West Bengal

Places of Religious Importance:

Bishnupur: Bishnupur is famous for the temples with terracotta art and large water areas. There are several temples in the Bishnupur town for which travellers travel throughout the year. **Joyrambati:** Joyrambati, located at the distance of 44 km from Bishnupur is the birth place of Maa Sarada Devi,

the wife and religious consort of great nineteenth century sage Shree Ramkrishna. The famous temple of Singha Bahini Devi (a form of Goddess Durga) is also of a special attraction.

Places of Historical or Archaeological Importance:

The most interesting remains found in the district Bankura are at Bishnupur, where there are a number of temples representing the most complete set of specimens of the peculiar Bengali style of temple architecture. There are other temples of archaeological interest at Bahulara (traces of Jainism), Ekteswar and Sonatapol and remains of old forts are found at Karasurgarh, Asurgarh and Shyamsundargarh. (Source: Bengal District Gazetteers-Bankura by L.S.S. O'Malley).

Places of Tourist Interest:

Bankura: A green tryst with Dokra - Bankura district, which forms a part of the eastern Chhota Nagpur plateau, has been 'decorated by nature with her own hands'.

Bishnupur: The land of Temples, Terracotta and Craftsmanship - The temple town and paradise of Terracotta crafts, Bishnupur is also the place of 'Baluchari Saree' and renowned for its Seni Gharana music.

Malleshwar Temple: Dedicated to Lord Shiva, it is the oldest temple in Bishnupur.

Rasmancha: Rasmancha was built in 1600 AD by Bir Hambir for the Ras festival of Lord Krishna. The temple is one of its kinds in India.

Pancha Ratna Temple of Shyam Raya: Built in 1643 by King Raghunath Singha, Shyam Rai temple has the most intricate sculptural details amongst all the Bishnupur temples. The walls are richly decorated with terracotta carvings featuring different aspects of Lord Krishna's life. The architecture of this temple is unique in its own way and is one of the highest prioritized monuments of the Archaeological Survey of India (ASI).

Jorebangla Temple of Keshto Rai: The Jore Bangla temple resembles two thatched huts joined together and surmounted by a single tower. This temple in brick was built by Malla king Raghunath Singha Dev II in 1655.

Madanmohan Temple: This picturesque temple was completed under Malla king Durjon Singh in the year 1694 AD, the temple has a four-facet summit in the ekaratna style.

Kalachand Temple: It is of ekratna style and is on the bank of Lal-bandh.

Terracotta Project: The exquisite craftsmanship of the terracotta artisans is evident in the temples of Bishnupur. But the hub of terracotta artisans is indeed Panchmura and Uliwara villages. Panchmura is just 20 km. from Bishnupur town.

Mukutmanipur: This place has become the most attractive tourist destination in Bankura district. The second biggest earthen dam in India, Mukutmanipur is 55 Km away from Bankura town and is situated at the confluence of river Kangsabati and Kumari.

Jhilimili: Just 15 km away from Mukutmanipur, Jhilimili stands with its beautiful, undisturbed dense natural forest. The road from Ranibandh to Jhilimili offers a wonderful view of spectacular forests on varying heights on both sides, finally reaching Jhilimili, which is mounted on the top of a hillock.

Susunia: Susunia hill, just 20 km. from Bankura, is a very popular trekking destination. It is also an important tourist destination for those who visit the place to see “Susunia Dhara” (a natural spring) and also the Chandavaran inscriptions. Excavation has revealed the inscriptions dating back to 4th century AD.

Sutan Forest: Bankura is also popular for beautiful tourist spots like Sutan, near Ranibandh and Eco-Park, near Taldangra, both covered with dense forest, decorated with small lakes and thrilling with wild animals. Only Sutan has a Tourist Cottage of West Bengal Forest Department.

Biharinath Hill: Bounded by Purulia and river Damodar on both sides Biharinath hill in Bankura is the tallest hill of Bankura with a height of 448 metres. Covered in thick forests, Biharinath blooms with the shades of “Kaash Phool”, Shimul and Palash during seasons. 57 km from Bankura town, it is thought to be an ancient centre of Jainism.

Ekteshwar Temple: Only 2 miles south east of Bankura, on the left bank of Darakeshwar River, is the temple of Ekteshwar (Unifier Lord Shiva). The temple was built of laterite and terracotta plaques.

Bikna – Tryst with Dokra: The dokrametal casting is an ancient craft of India and was once widespread throughout the country.

Abhibykti – Home of rare arts in Chhandar: Barely 20 km from Bankura town, the village Chhandar is the birthplace of famous artist Jamini Roy.

Dihar: Only 8 km from Bishnupur, it is famous for the Saileshwar and Sareshwar temples on the bank of river Darakeshwar.

Bahulara: It is situated just 25 km from Bishnupur and is famous for its Siddheshwar Shiva temple.

Gokulnagar: Just 40 minutes from Bishnupur, there is a huge beautiful Pancharatna temple of Gokuleshwar.

Joypur: Near Gokulnagar, Joypur is famous for its two temples with terracotta craft and scenic forest beauty.

Major Social and Cultural Activities of the District like Festivals and Fairs

Brief notes on the major festivals and *Melas* of the district are given below:

District Level Festivals

Almost all the fairs of the district are associated with certain religious activities. Fairs are organized in the occasions of Durga *Puja* (religious offerings), Kali *Puja*, Lakshmi *Puja* and Saraswati *Puja*. Major festivals of other religions, such as Eid al-Adha, Eid-ul-Fitr, Vaisakhi, Budha Purnima, and Christmas are also celebrated. Other important fairs and festivals are Choitro Gajan of Ekteswar, Dharmarajer Gajan of Beliatore, Ras Utsab of Bishnupur, Kaliyadaman of Jagadallah and Purandarpur, Purer Utsab of Indas, Basuli Mela of Chhatna and Dhara Utsab of Susunia. Bhadu *Puja* and Tusu *Puja* find wide participation of women.

District Puruliya, West Bengal

Puruliya being located in the Chota Nagpur Plateau region, is blessed with enormous natural beauty.

Ajodhya Pahar (Hill): Ajodhya Pahar is located in the southwest part of Puruliya district. It is about 42 km from Puruliya town via Sirkabad. It is a famous place of tourism.

Jaichandi Pahar: Jaichandi Pahar is located very close to Raghunathpur Municipality. It is about 44 km. from Puruliya town. This is very popular as trekking spot as well as a famous picnic spot.

Panchet Pahar: This hill is situated in the northeast of Raghunathpur Town. At the foot of the hill towards the southern end are the ruins of the fort of the powerful Rajas of Panchakotraj.

Puruliya Town: It is the district town of Puruliya District. It is well connected with all parts of the country by rail and road. The Saheb Bundh, located in the heart of this town, is famous for its scenic beauty.

Baghmundi: Located in the foothill of Ajodhya Hill, Baghmundi is about 58 km from Puruliya town. This is famous for its natural beauty. This is also famous for temples with terracotta art.

Jhalda: This small municipal town is 50 km. from Puruliya Town on the way to Ranchi. It is also well connected by Road and Rail. It is famous for its natural beauty.

Kuilapal Nanna Forest: This forest is located in Bundwan P.S. of this district. Kuilapal forest is the natural forest with long Sal trees. It has a best stretch of different indigenous natural and planted forests. This is a beautiful tourist spot. Visitors from all corners of state and from outside visits this area with great interest.

Matha Forest: This is located in the foot hill of Ajodhya Hills in Bagmundi P.S. It is about 15 km from Bagmundi town. This deep green forest is a very good picnic spot.

Duarsini: Located at Bundwan P.S., this spot has great scenic charm clustered around by hillocks, forests and small rivulets. This place attracts large number of tourists every year.

Murguma: About 55 km. from Puruliya town, it is located in the north of Begunkodar of Jhalda P.S. The dam is on the tributary of Kasai River. This is a very good picnic spot. The natural beauty of Ajodhya hills is visible from this point.

Khairabera: This is an Irrigation Dam amidst hills and forest. It is a beautiful and pleasant place with high potentiality to be developed as an attractive tourist spot.

Deulghat: A place near Baram in Arsha P.S., it has the ruins of some 15 Temples and small shrines near the Kasai River, about 6 km from the south of Jaipur which is about 25 km away from Puruliya town.

Doladanga: Situated on the bank of Kansabati Reservoir in Manbazar P.S., this place is a ideal for picnic spot. The huge water body, dense forest and an island in the middle of the reservoir have increased the charm of this place.

Garh Panchakot: It's a famous historical place located within Neturia C.D. Block and is 60 km. away from Puruliya town. It has the ruins of some forts built by the kings of Panchakot in 1600 A.D.

Birinchinath: Near Mandandi in Neturia P.S. on the southern lower slopes of the Panchet hill, it is the site of an old temple which has now disappeared. Asunken linga is approached by steps into a pit with a modern super structure.

Ganpur: A village at Santuri P.S. It has on its outskirts an abandoned temple which exemplifies the type of atchala temple, especially built in the 17th century in Bankura district.

Cheliama: A big village on Ahalyabai Road in Raghunathpur-II C.D. Block, is nearly 46 km from Puruliya town. The village contains the temple most richly decorated with terracotta in Puruliya district and one of the few surviving from the 17th century in West Bengal.

Telkupi: A village at Raghunathpur P.S. and about 8 km. north-east of Cheliama, it is described as 'perhaps, the finest and largest number of temples within a small space that is to be found in the Chutia Nagpur Circle in Bengal'.

Banda: A village also called Deulghera in Raghunathpur P.S. about 1 km. from Cheliama. It has a solitary temple in "rekha" style with broken amalaka still in place.

Deulbhita: This is a small village under Para Panchayat Samity and is 40 km away from Puruliya town. The ruins of some temples along with many Shivalingas still exist. The images of Hara-Parvati, Jain Tirthankar, Gayatri, Lord Venkateswara and Vishnu in different postures bear the architectural grace of the 10th century.

Para: It is situated in the north-east of Puruliya town and is about 30 km. from the district Headquarter. A village with a Thana (Police Station) of the same name, it has two pre-Muslim deuls to the east.

Pakbirra: It is located within Pancha C.D. Block and 40 km. from Puruliya town. Only three temples are standing, all of them have lost most of their frontal stones. The smallest of this faces east.

Suissa: It is situated within Baghmundi C.D. Block at a distance of about 50 km from the district headquarter. Numerous iconic images are seen here, probably obtained from the temples which once existed here or in the neighbourhood.

Chorida: It is a small village situated 3 km away from Baghmundi C.D. Block. This place is famous for traditional mask making which are generally used in ‘Chhou Dance’.

Budhpur: A village at Manbazar P.S., it is about 11 km. south of Pakbirra and 6 km north of Manbazar on the Hura Road, on the north bank of the Kasai river.

Charra: A village, in Puruliya Muffasil Thana, situated at northeast of Puruliya town. Until recently, there were two small stone built rekha deuls in this village.

Major Social and Cultural Activities of the District like Festivals and Fairs

Brief notes on the major festivals and *melas* of the district are given below:

District Level Festivals and Fairs

District Puruliya have some unique cultural characteristic which is reflected through the festivities observed here. Most of the festivals of Puruliya are Shiber Gajan and Mela, Disum Sendra, Dharma Thakurer Puja–O–Mela, Rohini Utsav and Mela, Erohk Sim/Batauli, Manasa Puja, Karam Parab and Mela, Chata Parab and Mela, Bhadu, Jita Asthami, Garaya or Saharai or Bandhua Parab, Jathel Utsav, Raas mela, Tushu/Tusu, Bhansingh Pooja–O–Parab, Akhan Jatra, Chandi Puja, Magh Sim, Baha, Bhejabindha, Poush Parbon, Bandhna Parab, Palash Parban.

Other Important Festivals & Fairs: Other festivals of Puruliya district include Durga puja (usually held in October), Kali puja (usually held in November), Saraswati puja (usually held in February), Viswakarma puja (usually held in September), Basanti puja (last week of March), Eid, Christmas and others.

District Haora, West Bengal

Places of Religious Importance:

Laxmi-Janardhan Temple and Sitala Temple: Laxmi-Janardan Temple is situated in Sinti village of Udaynarayanpur C.D. Block. The temple is of *at-chala* type. In the archway of the temple, terracotta panels depicting life of Lord Krishna can be seen. The temple is in a ruinous condition. As per records this historical temple was established during 1699 *sakabda* i.e. c.1777 AD.

Sridhar Temple: In Asanda village of Udaynarayanpur C.D. Block, temple of Sridhar can be found. This large *nava-ratna* temple was established in 1711 *sakabda* i.e. c.1789 AD.

Gopinath Temple and Maninath Temple: Maninath temple is situated in Garh Bhabanipur village in Udaynarayanpur C.D. Block. Old temple of Gopinath is now in abandoned condition.

Damodar Temple: Damodar temple of the Mandal family dating back to 1699 *Sakabda* i.e. c.1769 AD is situated in Jhikira village of Amta-II C.D. Block.

Sitanath Temple: Sitanath temple is situated in Jhikira village in Amta-II C.D. Block. This temple was established during 1705 *sakabda* i.e. c.1783 AD.

Syam-Sundar Temple: Syam-Sundar temple of Mallik family is situated in Jhikira village of Amta-II C.D. Block.

Garh Chandi Temple: Nawa-ratna temple of Garh Chandi is found in Jhikira village of Amta-II C.D. Block. Local people claim that the original structure goes back to the time of Emperor Husain Shah.

Jai Chandi Temple: Jay Chandi temple of Jhikira village in Amta-II C.D. Block was established during 1672 *sakabda* i.e. c.1730 AD. Terracotta decoration of scattered lotus medallion and plaques of Ganesa, Durga and Kartikeya can be seen in this temple.

Madan Gopal Temple: Madan Gopal temple is situated in Mellak village of Bagnan-II C.D. Block. This *at-chala* temple is the largest as well as the oldest temple still in worship in Haora district.

Navaratna Temple of Damodar and Kali Temple: Navaratna temple of Damodar is an ancient temple of Haora district situated in Kalyanpur village of Bagnan-II C.D. Block. This temple was built dating back to 1708 *sakabda* i.e. c.1786 AD.

Khatiyal Siva Temple: Khatiyal Siva temple is situated at Sultanpur village in Shyampur-II C.D. Block. This temple was built dates back to 1588 *sakabda* i.e. c.1666 AD.

Siva Temples at Jagatballavpur: *At-chala* Siva temple of the Pal family can be seen in Jagatballavpur village in Jagatballavpur C.D. Block. This temple belongs to dating back to 1686 *sakabda* i.e. c.1764 AD.

Temple of Bhubaneshwar: *At-chala* temple of Bhubaneshwari is situated in Mahishamuri village in Amta-II C.D. Block. This ancient temple was built dating back to 1601 *sakabda* i.e. c.1679 AD.

Temple of Motilal Dharma: Temple of Motilal Dharma is the oldest temple in Jaypur village of Amta-II C.D. Block. This temple is of *at-chala* design which was built in 1606 *sakabda* i.e. c.1684 AD.

Temple of Sridhar in Jaychanditala: Temple of Sridhar in Jaychanditala is also of *atchala* design. This temple was built dating back to 1704 *sakabda* i.e. c.1782 AD.

Temple of Lakshmi-Janardhan: Temple of Lakhmi-Janardhan is also situated in the same village of Amta-II C.D. Block. This temple was built by *Shri* Kuliram Ray in the Bengali year 1112 i.e. c.1705 AD.

Jaleshwar Siva Temple: Jaleshwar Siva temple of Jaypur village is an *at-chala* style temple with a *char-chala* porch.

Govinda Jew Temple: Govinda Jew temple of Majumdar family is situated in Gazipur village of Amta-II C.D. Block. This temple was built in dating back to 1636 *sakabda* i.e. c.1718 AD.

Places of Historical or Archaeological Importance

Some important historical or archaeological site exists in the district. Some flints and spearheads made of animal bones have been excavated as chance findings from Harinarayanpur village under Bagnan Police Station. These implements are primarily detected as of Neolithic age. These collections are preserved at district museum at Bagnan founded by Late Tarapada Santra, an archaeologist of repute and also can be seen at the “Ananda Niketan Kirtisala”. Here mention may be made of a terracotta image from Char Radhapur on Rupnarayan river bank resembling the Roman God of war ‘Janus’ according to archaeologists. The site is located in geographical proximity of Tamralipta Port of Purba Medinipur district. Several stone and terracotta art works, mostly potteries and Hindu religious images have been discovered, which as per researchers, relate mostly to Pal dynasty of mid eighth century AD to mid twelfth century AD (*Howrah Zila Parisad, Haora Zela Parikrama: pp. 57-72*)

Places of Tourist Interest:

Gadiara: Gadiara is located in the extreme south-east corner falls under Shyampur-I C.D. Block of Haora district. In the confluence of the Bhagirathi River and Rupnarayan River, Gadiara stands as a picturesque place.

Garchumuk: Garchumuk in Shyampur-II C.D. Block is another famous and charming picnic spot in the district.

Samtaberia Panitras: Samtaberia is the place where the celebrated Bengali novelist *Amar Kathasilpi* Sarat Chandra Chattopadhyay spent his last days in a country house built by himself.

Ananda Niketan Kritisala: Ananda Niketan Kritisala located at Tepur-Nabasan village in Bagnan-I C.D. Block. It is referred as one of the best rural museums of West Bengal managed by the private bodies.

Howrah Bridge: The Gateway of Kolkata, Howrah Bridge acts as a logo of Kolkata. Originally named New Howrah Bridge (as it replaced a pontoon bridge at the same location that earlier linked the two cities of Howrah and Kolkata (Calcutta)), the bridge was commissioned in the year 1943. After the great Bengali poet Rabindranath Tagore, the bridge was renamed Rabindra Setu on 14th June, 1965. The third-longest cantilever bridge at the time of its construction, the Howrah Bridge is currently the sixth-longest bridge of its type in the world.

Howrah Railway Station: Howrah railway station is the oldest and largest railway complex in India with 23 platforms and having the largest handling capacity in comparison to any other railway stations in India.

Belur Math : The headquarters of the Ramakrishna Math and Mission was founded by Swami Vivekananda, the chief disciple of *Shree Shree* Ramakrishna Paramhansa Dev. Located on the west bank of Hoogly river, at Belur this place is of heritage and national importance as referred by the ex-President of India Dr. A.P.J. Abul Kalam Azad.

Santragachhi Jheel: Located next to Santragachhi Railway Station, this 32 acres or 13, 75,000 square feet large lake (*Jheel*) attracts 4000 to 5000 migratory winter birds, ducks and moorhens each year between November& February.

Acharya Jagadish Chandra Bose Indian Botanical Garden: Situated at Shibpur, this botanical garden is renamed after the great scientist Jagadish Chandra Bose on 25th June, 2009 and thus renamed as The Acharya Jagadish Chandra Bose Indian Botanic Garden. Founded in 1787, this garden was previously known as the Royal Botanic Garden.

Indian Institute of Engineering Science and Technology, Shibpur: Located at Shibpur, this is a Premier National Institution for research and education in engineering, science and technology. It is classified as an Institute of National Importance.

Vidyasagar Setu: To reduce the load on the Rabindra Setu or Howrah Bridge, Vidyasagar Setu or the second Hooghly Bridge was constructed. Named after the 19th century Bengali educationist and reformer *Pandit* Ishwar Chandra *Vidyasagar*, the foundation stone of the bridge was laid down by the Prime Minister of India Smt. Indira Gandhi on 20th May 1972.

Major Social and Cultural Activities of the District like Festivals and Fairs

Brief notes on the major festivals and melas of the district are given below:

Festivals Celebrated in District Haora

The worship of Sakti: Haora is well known for Goddess Kali worship. As per the Brahminical Hindu religion of Bengal the *Sakti* cult is often to be called as Kali. It is conceived as the divine mother or the female consort of the supreme creator Siva. The Goddess is worshipped in several forms and names in the district viz. *Raksha Kali*, *Samsan Kali* and so on. It is interesting to note that most of the people of the district are fascinated by the large images of the Goddess.

The worship of Siva : The mighty non-Aryan pre-Vedic ferocious god called '*Rudra*', at a later point of time included in the Hindu pantheon as calm and sober '*Siva*', is highly beloved God in Bengal.

Panchananda Puja: *Panchananda* or *Panchu Thakur* is also to be mentioned in this context. He is known as a folk God who looks after the welfare of children. Elsewhere he is treated as Shiva, but in Haora district his distinction is retained.

Reverence of Pirs: In the memory of departed Pirs many fairs and festivals are held at different places of the district. The *astana* (house) of Pir Gayesuddin in Gayespur village in Domjur P.S. is famous.

Some More Folk Festivals:

Folk festivals of Haora district is noted for some more exclusive distinctiveness. The *Soyla* festival, the festival of *Entel Thakur*, the festival of *Ghentu Thakur*, the *Dhela Fela* festival, the *Heleni* festival are few examples in this regard. The *Soyla* is a *Manasa* centric festival. Bengali calendar months

Phalgun to *Chaitra* (mid-February to mid-April) and *Bhadra* (mid-August to mid-September) are the months for annual worship of *Manasa*.

District Paschim Medinipur, West Bengal

Places of Religious or Historical Importance:

Kali Temple of Natun Bazar is situated on the banks of Kangasabati River in Medinipur town. This east facing temple is constructed in the Panchatantra style. Jhargram near Medinipur is famous for Jhargram Raj Palace. Radha Krishna temple is famous in this area. Ramgard and Lalgard Forts built by the Chauhan kings is situated in Chandrakona, a town located between Ghatal and Grabeta of the Paschim Medinipur district. Samoleswar Mahadev temple in Dantan in Paschim Medinipur district is a famous temple in this region. Shilabati River in Garbeta is an important tourist place in Paschim Medinipur district. Sahasralinga and Rameshwar Nath temple situated in Daulpur village of Nayagram region in Paschim Medinipur is an ancient temple for worship. Malancha is located on the north-western side of the Kharagpur town where Dakshina Kali Mandir is situated. The ancient temple of Pancharatna, situated in Khirpai Town, is very famous for its architectural work.

Pathra is a village located on the banks of the Kangsabati River around 10 km away from Medinipur. In this village 34 very old temples of 200 years old are situated and all of them are under the management of Archaeological Survey of India. Chilkigarh is famous for Navratna Temple located 14 km. away from Jhargram. Egra is town in Paschim Medinipur district which is known for the Hatnagar Mahadeb Temple. Bahiri is a village in the Paschim Medinipur district which is known for the ruins of 'Buddhist Stupas' namely Paltikri, Saptikri, Dhantikri and Godhantikri. Karnagarh is a village located approximately 10 k.m. north of Medinipur town. The prime attraction of this area is ruins of very ancient stone forts, temples and tanks. Kurumbera Fort is situated around 6 km. away from the Keshiari village. Shiva Temple, built in 1438, is also a prominent place in this area. Kankrajhar is located in the north-western part of the Jhargram Sub-division. The entire area is covered with trees like sal, teak, mahua and kendu is a place of natural beauty. Jagannath Temple, a Hindu religious site located at Natun Bazar of Medinipur, was constructed in 1851 and is a famous religious place for worship. Khejuri Burial Gound is a historical site that has around 33 tombs, belonging to 17th and 19th Centuries and surrounded by wall. Umapati Shiv Mandir in Gangadaspur

was built in 19th Century in Aatchala (eight storied) style of architecture is also a popular place of attraction of the region.

Places of Archaeological Importance:

The following are the important Archaeological Sites; in the district:

Bankati: This site is under Sankrail Police Station of Jhargram Sub-division. Stone weapons ageing to Neolithic and Mesolithic age were found from here.

Chaugarh: This site in Jhargram Sub-division under Gopiballavpur Police Station. Blades of Mesolithic age and pebble tools made of sand stone dating to Neolithic age were found here.

Ghoripincha: This site is under Gopiballavpur Police Station of Jhargram Sub-division. Various types of stone implements of Neolithic and Mesolithic age are found from here.

Dolki: This site is under Nayagram Police Station of Jhargram Sub-division Weapons of Neolithic and Lower Paleolithic age were found from here.

Hatibari: This site is under Gopiballavpur Police Station of Jhargram Sub-division. Tools and weapons of Paleolithic age shaped as 'U' and 'V' letters are found here.

Kayasol: A village in Gopiballavpur Police Station of Jhargram Sub-division from where a good number of stone weapons were found out.

Hatimari and Jamagera: Archaeological sites under Gopiballavpur Police Station

Karkala and Khayarasol: Archaeological sites under Jhargram Sub-division where prehistoric weapons were found.

Kele Jharia, Kurchibari, Kumarberia and Machs Bandha: These are the other important archeological sites in this district. A number of pre-historic materials were discovered from these places.

Places of Tourist Interest:

Jhargram: Jhargram is the heart of natural forest region in the Paschim Medinipur district. Big trees like Sal, Piyasal and Mahua are found in this dense forest area. In summer, Mahua trees are blanketed

with aromatic flowers and in monsoon the Sal trees are laden with bloom. This forest region is one of the best tourist destinations in West Bengal.

Belpahari: This tourist spot is situated 45 km away from Jhargram. It is a forest paradise under Dolma Hills. Large varieties of tropical trees such as Sal, Mahua, Piyal, Sonajhuri, Jhau, Siris and Eucalyptus are the main attraction of this region.

Kendugarh: Kendugarh is situated 75 km away from Jhargram. It is a pleasure to see the stark wilderness and beauty of Sal trees in this forest region.

Major Social and Cultural Events - Brief notes on the major festivals and melas of the district are given below:

District Specific Festivals of Paschim Medinipur

Apart from the State level common pujas, the following pujas are also observed in the district of Paschim Medinipur:

1. Baram Puja: On Pous Sankranti (last day in the Bengali calendar month Pous i.e. November-December), the deity 'Baram' is worshiped by the tribals of the district. The forest deity is revered mainly by the Garbeta region of Paschim Medinipur district. Low caste Hindus such as Hadi and Doms also worship this Deity. Baram is the goddess of the woods worshipped by Lodhas, Harias and Patots. This puja is performed under a tree. They believe that this goddess safeguards them from the attack of wild animals, in the forest.

2. Mangal Chandi Puja: It is celebrated in the Bengali calendar month of Pous (November-December) in Garbeta region.

3. The Bama Purnima: This festival falls in the Bengali calendar month of Bhadra (August-September). Mainly in Jhargram area this festival is held on full moon night (Purnima).

4. Salai Puja: This festival is celebrated in the Bengali calendar month of Falgun (February-March) or Chaitra (March-April) by the Santals. This is Dol (spring festival) of the Santals. An old tree is selected for puja and offering of Sal saplings and Mohua (a kind of flower) are brought in.

Other Festivals and Fairs of District:

Paschim Medinipur district comprises of different communities, saints and devotees. Therefore a number of melas, festivals and socio-religious events are being observed in the district.

Gandhi Mela in Medinipur: The ‘Father of the Nation’ Mahatma Gandhi had visited Medinipur four times between, 1921 & 1946. Swadeshi mela was arranged in the places where Mahatma Gandhi had stayed during his visits. Thousands of people from various places attend the mela.

Charak Gajan Mela: Charak Gajan mela is arranged in many places in district. Janeshwar Charak mela under Keshpur Police Station is more than 300 years old. This mela lasts for seven days.

Rash Mela: During winter season, Rash Mela is being arranged in many places of the district.

Rath Mela: This is a fair on Loada, under Debra Police Station and continues for two days.

Tribal Festivals and Fairs: Tribal deities and their festivals are being celebrated in many places in the district. They are Karan pujas, Bandan Parab, Basini Johu, Salui etc.

Festivals of Islam: Islamic festivals are also being celebrated in the district. Among them the most important festival is Urs Festival during February-March at Mianbazar of Medinipur town and Masnad-e-ala (Hijli) of Khejini-Boga.

Christian Festivals: X-Mas fair (Baradinar mela) is arranged in the Church School Campus (Nirmal Hriday Ashram) every year.

Mahotsav Mela: In the Bengali calendar month of Jaisthaya (May-June), Dantamahotsav of Gopiballavpur is held, which relates to Radha Govinda Ji. Vaishnav devotees from West Bengal and Odisha gather here. This fair is also famous for Bulbul Dance.

Folk festival, Damadama puja and Fair: Mother Chamunda is believed to be a watchful deity. She protects people from wild animals. She is worshiped throughout the year. Goat blood is offered to her.

Rajbari Chhata Parab and Fair: With the patronage of Jhargram Rajbari on the Sukladawari of Bhadra, a straight Sal tree is worshiped which is revered by the Brahmins.

Rehabilitation & Resettlement (R & R)

Policy to be adopted (central/state) in respect of the project affected persons including home oustees, land oustees and landless labors. Hence, any planning with respect to rehabilitation & resettlement is applicable.

4.7 BIOLOGICAL ENVIRONMENT

4.7.1 INTRODUCTION

The ecological study reflects the potential of a regional ecosystem and its biological components. In India, the biological diversity of plants and animals varies from region to region on account of their diversity and density. Producers (plants), consumers (animals), and decomposers (microbes) govern the whole cycle of ecology. Plant and animals both are interdependent on each other.

The biological study is essential to understand the impact of any developmental project on the existing flora and fauna of the study area. Studies on various aspects of the ecosystem play an important role in identifying sensitive issues for undertaking appropriate action to mitigate the impact if required.

The Environment baseline data generation report in respect of flora-fauna has been prepared to assess the current ecology & biodiversity scenario of the area and then based on the proposed project activities, to carry out Environmental Management Plan. The plan will identify and address the impacts, where these are adverse in nature, and thereafter design mitigation measures to manage such impacts in a manner as to conserve the environment and ecology of the area. Conservation of biodiversity is essential for sustainable development.

The main objective of the ecological survey is aimed to find out the baseline status of flora and fauna (terrestrial and aquatic ecosystem) of the study area before the start of developmental works of the proposed 4/6 lanes Varanasi-Kolkata Expressway Project in the Purulia, Bankura, Pashchim Medinipur, Hooghly, and Howrah districts of West Bengal under the Bharatmala Pariyojana.

4.7.2 DESCRIPTION OF THE STUDY AREA

The proposed 4/6 lanes Varanasi-Kolkata Expressway Project is proposed to develop from the Kamalpur village (Situated at the border of Jharkhand and West Bengal) to Uluberia village of Howrah District of West Bengal under the Bharatmala Pariyojana. The total length of the proposed expressway is 234.8 km. Maximum length of the expressway passes through the rural agricultural land

in comparison to the forest land in this section of Bharatmala Pariyojana. For the developmental activities in the forest areas, the forest proposal shall be prepared after consultation with the concerned authority for Forestry Clearance under the FC act section 2, 1980. On the other hand, agricultural land, village land, canals, rivers, and village roads are involved in the project area. The proposed project area (Purulia, Bankura, Pashchim Mednipur, Hooghly, and Hawrah districts) falls under Seismic Zone-III, which is categorized as a moderate intensity seismic zone (As per 1893:2002). The location and land use details are given in Fig. 1 and 2.



Figure 4-32: Location of the project in the West Bengal

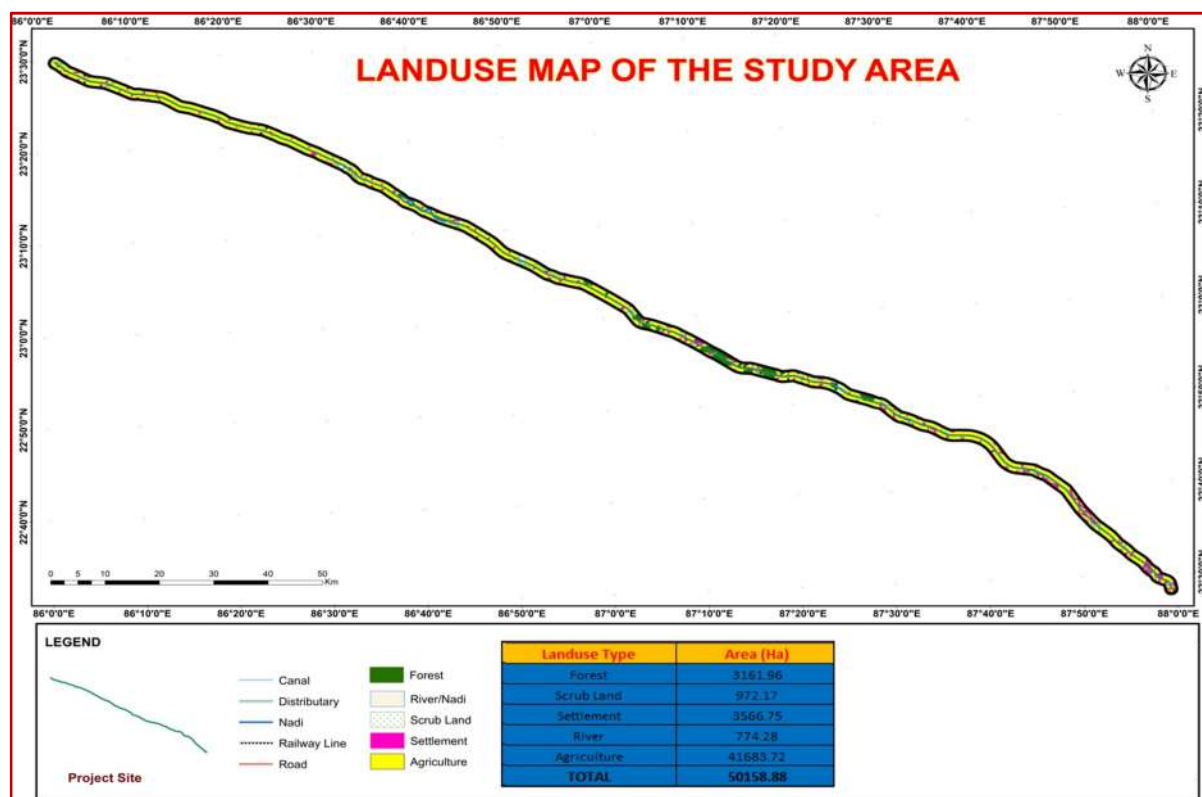


Figure 4-33: Landuse map of the study area

4.7.3 Description of Eco-sensitive zones in the Study Area (Wildlife Sanctuary/ National Parks / Animal or Elephant Corridors/ Protected Wetlands etc.)

There are no National parks, Wildlife Sanctuary, Biosphere Reserves, Tigerreserves (existing as well as proposed), within 10 km from the present alignment of the expressway development project (Fig. 3). **On the other hand, theJangal Mahal Elephant Corridor is situated at a distance of 7.75 km towards the south between sampling sites 06 and 08.However, the present expressway will pass through few Protected Forests of West Bengal.** Other areas protected under international conventions, national or local legislation for their ecological, landscape, cultural, or other related value don't exist in the core and buffer zones of the present project, except for a few Protected Forests. On the other hand, the proposed alignment will cross over several riverine channels in Purulia, Bankura, Pashchim Mednipur, Hooghly, and Howrah districts of West Bengal. Adequate structures across all the drainages shall be constructed in order to maintain the natural hydrology and protect all forms of biota found in all the water bodies of the study area.

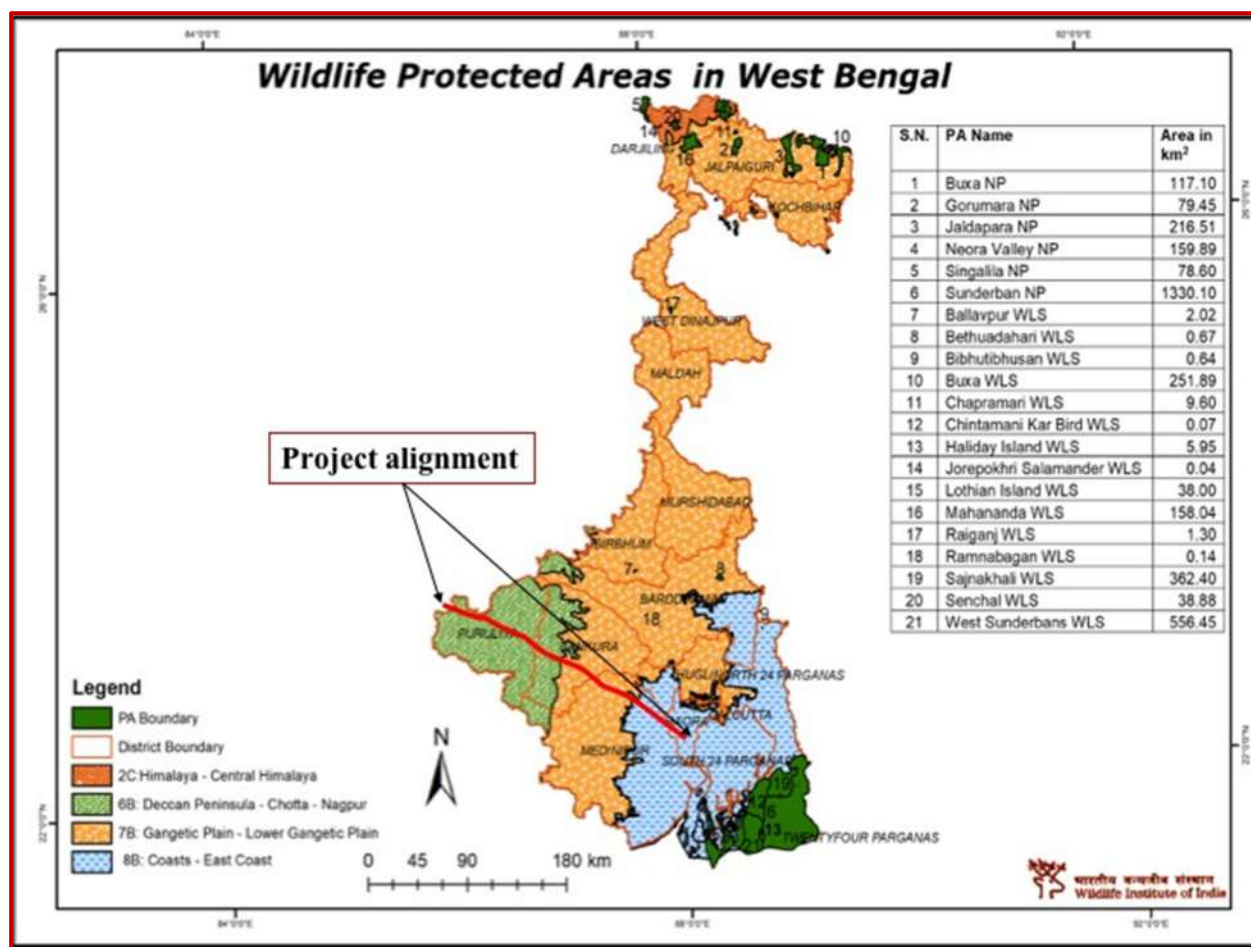


Figure 4-34: Eco-Sensitive Zone Map of the Study Area

4.7.4 Forests Status in the study area and West Bengal

The forests of this state have a rich assemblage of diverse habitats and vegetation designated with the help of eight different forest types. The diverse fauna and flora of West Bengal possess the combined characteristics of the Himalayan, sub-Himalayan, and Gangetic plains. However, the present project is located in the Gangetic plain. As per the Champion and Seth Classification of Forest Types (1968), the forests of West Bengal are classified into seven categories: Tropical semi-evergreen forest, Tropical Semi-Evergreen Forest, Tropical Moist Deciduous Forest, Littoral and Swampy Forest, Tropical Dry Deciduous Forest, Sub-Tropical Hill Forest, Montane Wet Temperate Forests, Himalayan Moist Temperate Forests and Sub Alpine Forest.

4.7.5 Elephant Movement in the Study Area

The study area does not have any declared permanent elephant habitat (*Elephas maximus indicus*), but their displacement has been evident several times throughout the year in several villages. A total of 118 permanent elephants are residing in the different areas of West Midnapur, Bankura, and Purulia districts. On the other hand, the southern part of West Bengal also receives seasonal visits of more than 150 elephants from Jharkhand.

The present highway project will also restrict elephant movement to some extent within the study area. However, groups of elephants may cross the area through the animal passage points or canals for their feeding, etc. Frequent movement of elephant groups has been observed in the Purulia district, especially in the border area between West Bengal and Jharkhand.

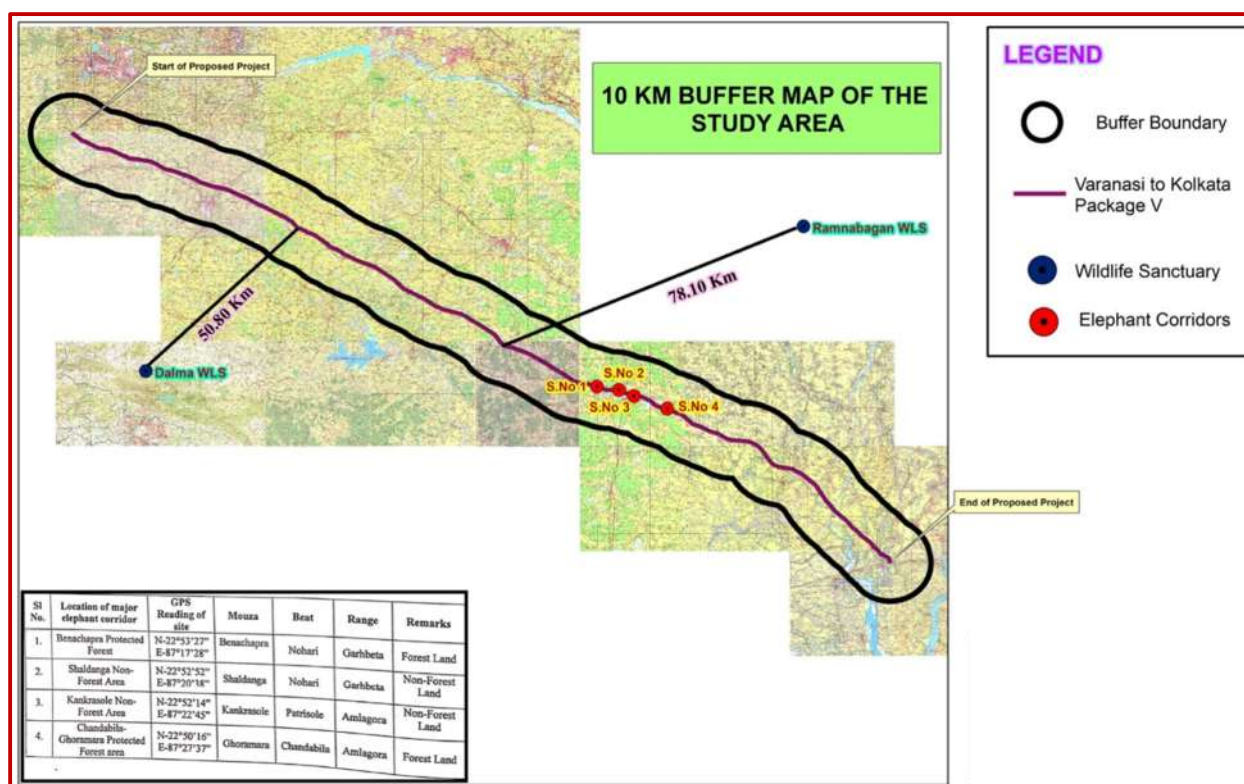


Figure 4-35: Eco-Sensitive Zone Map of the Study Area

4.7.6 DRAINAGE / WATER BODIES OF THE STUDY AREA

The Proposed project area as a whole is located in the southern part of the West Bengal in the Gangetic plains. Most of the riverine channels are seasonal and are the part of the different tributaries of Shilabati River and Damodar River. In the present study area, alignment of the expressway will cross over the Parga Nadi, Patloi Nadi, Shilabati Nadi, Jaipanda Nadi, Purundar Nadi, Sinkri Nadi, Rupnayaran Nadi, Mundeshwari River, Damodar Kata Nadi and Damodar River at different locations in Purulia, Bankura, Pashchim Medinipur, Hooghly, and Howrah districts of West Bengal. Most of the above mentioned riverine systems are seasonal and only flows during the monsoon period. Few ponds are also recorded nearby the different villages mainly used for fish farming, cattle feeding, and irrigation purpose, etc.

Scope and Objectives of the Study

The above study aims in identifying potential impacts on flora and fauna and to suggest relevant compensatory and mitigatory measures to protect/conservate biodiversity in the likely impacted area due to the various project activities. Following points to be covered under the scope of work:

- Survey of terrestrial & aquatic flora & fauna for core & buffer zone separately.
- Details of endemic species found in the study area and their IUCN status, Schedule status (as per WPA, 1972).
- Survey of the study area in terms of features like breeding & spawning grounds, habitats, flight paths, and the migratory path of the animals.
- Survey of flora covering types e.g. agriculture crop, commercial crop, plantation, natural vegetation/forest type, grass land. The endangered & endemic species of flora & fauna beside any other flora, if present are also to be identified.
- The survey has been covering a total listing of the faunal population. The survey has also covered endangered, endemic, migratory & detail of aquatic fauna.
- The assessment of potential damage to terrestrial & aquatic flora and fauna. The impact should be categorized as primary & secondary, temporary and long term, unavoidable & risk transboundary impacts, possible irreversible change.

4.7.7 Methodology/ Data Collection

A primary field survey was carried out within a 1 km radius of the proposed alignment during the **Pre Monsoon (March to May, 2024)**. Both terrestrial and aquatic ecosystems have been studied to understand the biological environment. Secondary data were collected from authentic sources like the Forests Department, Fisheries Department, Agriculture Department of Purulia, Bankura, Pashchim Mednipur, Hooghly, and Howrah districts of West Bengal, and available published literature.

Flora (Aquatic and Terrestrial)

For the collection of data for aquatic flora, the methodology prescribed in the standard book of Adoni (1985), NEERI (1998), and APHA (2015) has been adopted. A total of **12** sampling points were selected for the collection of samples for the study of aquatic flora.

On the other hand, for the terrestrial data, community analysis was carried out during the summer season. For the collection of terrestrial data, a total of **08** sampling points were selected. In every study site, quadrates of 10m X 10m (100 sq.m.) size were randomly laid to study tree species. The circumference of all the adult individuals [≥ 30 cm circumference at breast height (CBH)] was measured with Freeman's tape. The study of communities was carried out by using qualitative characteristics, and quantitative characteristics. Qualitative characteristic mainly involved presence/absence of the species, genera, and family. This showed the community structures, composition and other characteristic can be readily described by visual observation without actual measurements.

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On the other hand, for the terrestrial data an extensive field survey was conducted at **08** different locations in the study area. During the survey, the Line Transect method was used for the study of mammals and Transact & Patch sampling were used for Amphibians, visual encountered methods was used for reptiles and butterflies. The presence of wildlife was also confirmed from the animal calls, footmarks, excreta, and from the local inhabitants depending on the animal sightings and the

frequency of their visits in the project area which was later confirmed from the different government offices like the forest department or wildlife department, etc.

Observations of birds were made during a walk-through in the chosen transect for sighting birds. The number of birds observed in each sampling location was listed. Birds were noted and identified with the help of binocular and standard field identification guides.

4.7.8 Sampling Sites

A total of **08 sites (TS-1 to TS-08)** were selected for the terrestrial vegetation, avian fauna, and other terrestrial animals like reptiles, mammals, etc. Also, for the collection of samples and data of aquatic flora and fauna, **12 separate sites (AS-1 to AS-12)** were selected at different locations of the study area (**Table 1 and Figure 4&5**).

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Table 4-39: List of Sampling Location Selected for Study of Biological Environment

Terrestrial Sampling				
No.	Location Name	Zone	Latitude	Longitude
1	Guridih village - Forest land	Core and Buffer	23°29'15.48"N	86° 3'2.81"E
2	Ramdih village - Rural Area	Core and Buffer	23°22'33.22"N	86°21'11.68"E
3	Choregali village - Forest Site	Core and Buffer	23°17'20.79"N	86°33'20.57"E
4	Taltala village - Forest Site	Core and Buffer	23° 1'44.75"N	87° 1'33.00"E
5	Keotdhara village - Forest Site	Core and Buffer	22°55'20.71"N	87°12'30.42"E
6	Mangalapota village - Forest Site	Core and Buffer	22°51'33.16"N	87°24'48.17"E
7	Tungir ghat village-Rural Forest Site	Core and Buffer	22°41'10.62"N	87°46'28.71"E
8	Bangalpur village - Rural Area	Core and Buffer	22°29'26.13"N	87°58'19.00"E
Sampling Stations for Aquatic Flora and Fauna				

No.	Location Name	Zone	Latitude	Longitude
1	River Site- Guridih village	Core and Buffer	23°29'10.67"N	86° 3'8.48"E
2	River Site-Panrga village	Core and Buffer	23°27'10.98"N	86° 8'13.11"E
3	River Site-Sijumakhna village	Core and Buffer	23°18'11.82"N	86°31'49.78"E
4	Shilabati River-Kanara village	Core and Buffer	23°11'59.05"N	86°42'13.55"E
5	Shilabati River-Gotherdanga village	Core and Buffer	23° 6'1.11"N	86°52'45.88"E
6	Joypanda River-Radhanagar	Core and Buffer	22°57'42.46"N	87° 8'32.23"E
7	Shilabati River-Golahat village	Core and Buffer	22°52'45.13"N	87°20'58.32"E
8	Shilabati River-Ghoshkira village	Core and Buffer	22°48'3.00"N	87°31'27.51"E
9	Dwarkeshwar River-Tungir ghat	Core and Buffer	22°41'9.79"N	87°46'25.39"E
10	Mundeshwari River -Pansiuli Bazar	Core and Buffer	22°35'56.63"N	87°51'16.76"E
11	Damodar Canal -Fatik Beria village	Core and Buffer	22°32'54.41"N	87°54'33.33"E
12	Damodar River -Ulanpara village	Core and Buffer	22°28'38.44"N	87°59'15.76"E

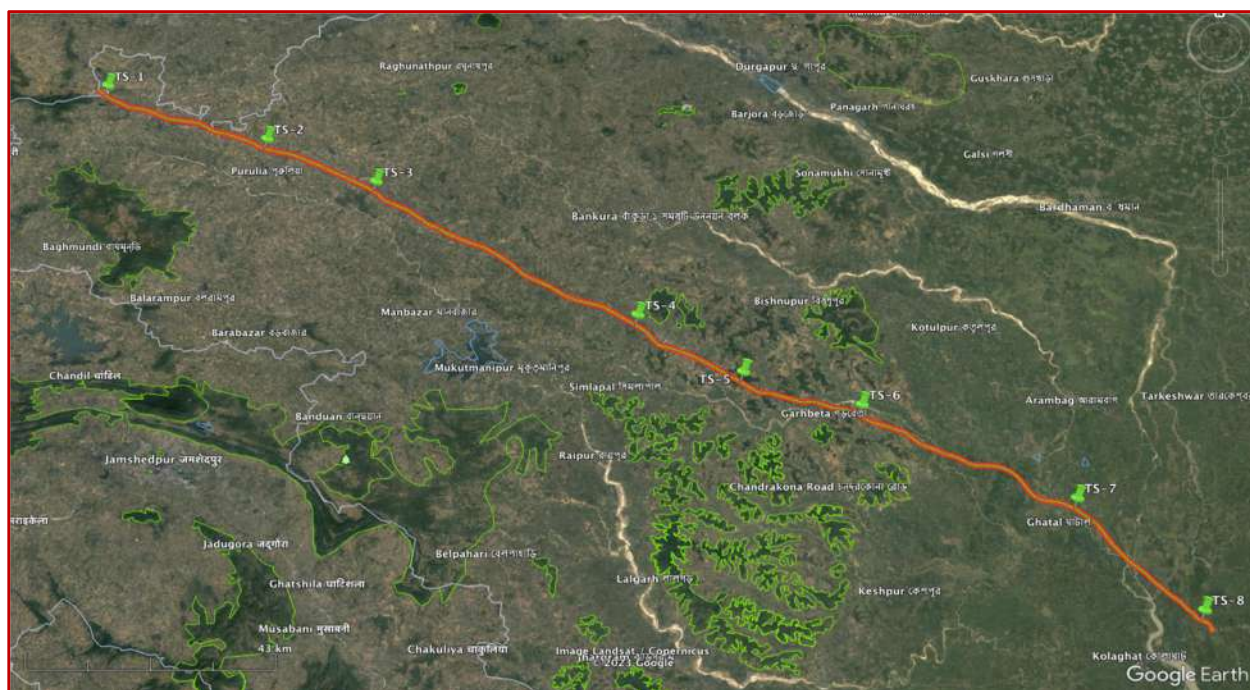


Figure 4-36: Location of sampling sites of Terrestrial Flora-Fauna

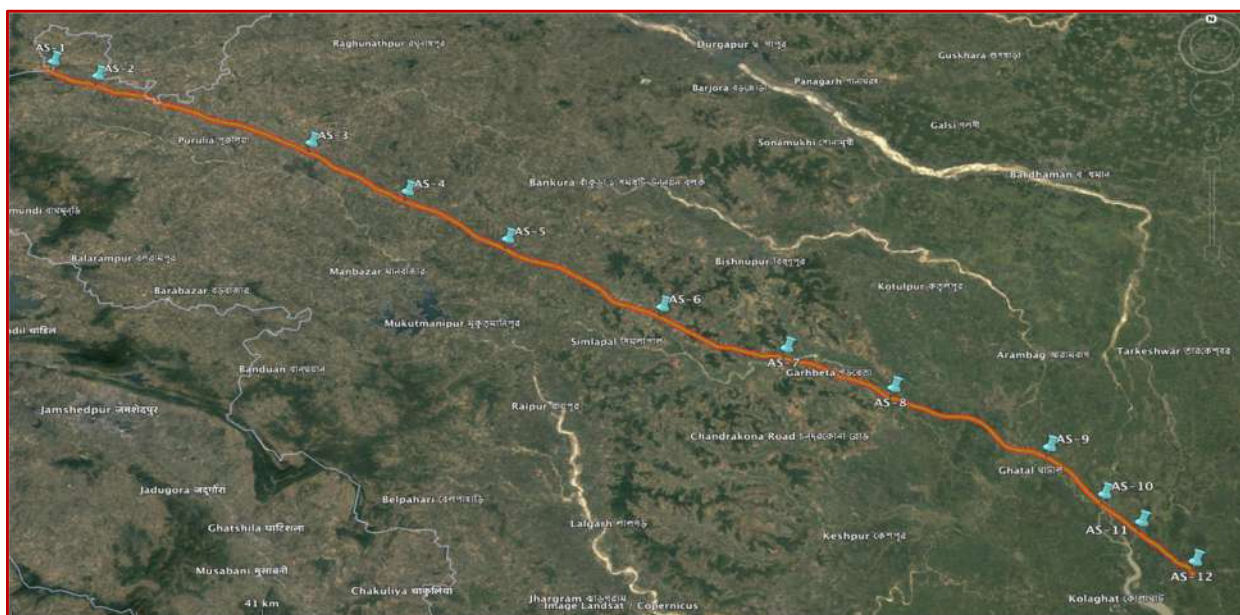


Figure 4-37: Location of sampling sites of Aquatic Flora-Fauna

Flora of the Study Area

Maximum part of the core and buffer zone of the study area is purely rural agricultural land in comparison to forest land. The present expressway will pass through few protected forests of West Bengal. The forests of the study area have major floral composition in comparison to the agricultural land where scattered vegetation pattern have been recorded. Approximately 108 Ha of forest land has to be acquired and will be diverted for the various developmental activities to develop the expressway. The forest proposal shall be prepared after consultation with concerned forest department for Forestry Clearance under section 2, 1980. A large number of trees will require cut for the proposed expressway development. The tree counting is in process therefore the details of total no. of trees which needs to be cut will be provided in the final EIA/EMP report. If necessary, cutting of the trees will be done as per guidelines of MoEF & CC and respective state forest department. In the rural areas, most of the trees falling along the alignment are the part of agro forestry, however, natural vegetation is present in the forest areas. Against the cutting of the trees, compensatory plantation will be done along the expressway, on government land, nearby the villages, etc. Most of the trees will be relocated/ translocated.

The common species grown near villages are mostly edible or useful plants. The most dominant tree species in the study area are *Aegle marmelos* (Bel), *Azadirachta indica* (Neem), *Buchnamia Lanza* (Piar), *Embllica officinalis* (Amla), *Dalbergia sissoo* (Sisam), *Ficus bengalensis* (Bargad), *Musa paradisiacal* (Kela), *Syzygiumcumini* (Jamun), *Cassia siamea* (Kasod/Siris), *Mangifera indica* (Aam) and in the case of shrubs, *Antigonum leptopus*, *Ricinus communis*, *Lantana camara*, *Jatropha gossipifolia* and *Cassia auriculata* etc. Details of the forest in Purulia, Bankura, Pashchim Mednipur, Hooghly, and Howrah districts of West Bengal are given in Table 2.

Table 4-40: Details of forest (sq.km) in the Study area as per the India State of Forest Report-2021.

District	Geographical Area	Very dense forest	Mod. Dense forest	Open forest	Total	% of GA	Change	Crub
Purulia	6,259	37.36	194.94	158.58	388.88	6.23	38.88	0.68
Bankura	6,882	222.33	395.27	198.98	815.58	11.88	58.58	0.59
Pashchim Mednipur	9,368	256.21	591.64	313.69	1161.54	12.37	10.54	0.24
Hooghly	3,149	0.00	14.00	46.00	60.00	1.91	0.00	0.00
Howrah	1,467	0.00	50.00	53.77	103.77	7.07	-0.23	0.00

Source: India State of Forest Report-2019.

4.7.11 Flora of Core zone

Terrestrial Flora of Core zone

Vegetation details of the core zone were collected from 08 selected sites in the study area. Due to the presence of few rural agricultural land Protected Forests in the study area, the diversity and density of flora in the core and buffer zones fluctuated at all the sites. On the other hand, the flora of the buffer zone comprises mostly agroforestry, i.e., fruit-bearing plants, herbs, climbers, etc. **Maximum floral diversity and density were recorded at sites 03, 05, 06, and 08, whereas scattered vegetation patterns were recorded at the rest of the sites.** The details of the vegetation recorded from the core zone are given in Table 3 along with the vegetation details of the buffer zone.

4.7.12. Agricultural vegetation/ Commercial vegetation of the Core zone.

Details of the agricultural vegetation and commercial crops were collected from the buffer zone of the 08 selected sites, and the details are given in table 3.

Table 4-41: List of Crops seasonally planted by respective farmers in the study area

Family Name	Botanical Name	Local/Trade Name
Poaceae	<i>Zey mays</i>	Makkha/Maize
	<i>Triticum aestivum</i>	Wheat
	<i>Oryza sativa</i>	Paddy
Fabacea	<i>Cicer arietinum</i>	Channa
Apiaceae	<i>Coriander sativum</i>	Dhaniya
Amaranthaceae	<i>Abelmoschus esculentus</i>	Bhendi
Cucurbiataceae	<i>Mamordica charanta</i>	Karela
Solanaceae	<i>Capsicum annum</i>	Mirchi
	<i>Lycopersicon lycopersicum</i>	Tomato
	<i>Solanum melongena</i>	Brinjal
	<i>Capsicum annum</i>	Mirchi
	<i>Solanum tuberosum</i>	Potato
Amaryllidaceae	<i>Allium cepa</i>	Onian
Fabaceae	<i>Cajanus cajan</i>	Pigeon pea
Caricaceae	<i>Carica papaya</i>	Papaya
Malvaceae	<i>Okra</i>	Ladyfinger/ Bhindi
Cucurbitaceae	<i>Lagenaria siceraria</i>	Bottle gourd/ Lauki
Source: Present Survey Data Supported by Agriculture Department of West Bengal.		

Aquatic Flora of Core zone (Phytoplankton/ Macrophytes).

Vegetation details of the core zone were collected from 12 selected sites of the study area. Details of phytoplankton and macrophytic vegetation of the core and buffer zone are given in tables 4 to 6 and Figures 6 and 7. The details of aquatic floral (Macrophytes & Phytoplankton) recorded from the core zone was similar to the aquatic vegetation of the buffer zone also. So, the same information is applicable for the core and buffer zone. None of the aquatic vegetation were under REET category in the study area.

Table 4-42: List of Aquatic Macrophytic vegetation of Core and Buffer Zone

S.No.	Name of the Taxa	Family Name	UCN status	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10	S-11	S-12
1	<i>Azolla pinnata</i>	Salviniaceae	LC	+		+	+			+	+	+	+	+	
2	<i>Cyperus alopecuroides</i>	Cyperaceae	LC	+	+	+	+	+	+	+	+	+	+		+
3	<i>Cyperus difformis</i>	Cyperaceae	LC	+	+	+	+	+	+	+	+	+	+	+	+
4	<i>Eichhornia crassipes</i>	Montederiaceae	LC			+					+	+		+	+
5	<i>Drillia verticillata</i>	Hydrocharitaceae	LC			+		+	+	+		+	+	+	+

6	<i>Ipomea aquatica</i>	Convolvulaceae	LC	+	+		+	+	+	+	+	+	+	+	+
7	<i>Ipomea carnea</i>	Convolvulaceae	LC				+	+				+			+
8	<i>Lemna minor</i>	Araceae	LC	+	+	+	+	+	+	+	+	+	+	+	+
9	<i>Ludwigia parviflora</i>	Onagraceae	LC	+	+	+	+	+	+	+	+	+	+	+	+
10	<i>Nelumbo sp.</i>	Nelumbonaceae	LC									+	+	+	+
11	<i>Nymphoides aquatica</i>	Menyanthaceae	LC		+		+	+	+	+	+	+	+		+
12	<i>Phragmites karka</i>	Poaceae	LC							+	+		+	+	
13	<i>Pistia stratiotes</i>	Araceae	LC				+		+				+	+	
14	<i>Polygonum glabrum</i>	Polygonaceae	LC	+	+	+	+	+	+	+	+	+	+	+	+
17	<i>Typha latifolia</i>	Typhaceae	LC			+	+			+		+			+
16	<i>Typha orientalis</i>	Typhaceae	LC						+		+		+	+	
Total No. of Species				7	8	9	12	9	10	11	11	13	13	12	12

Source : Primary data of P&M Solution, Noida

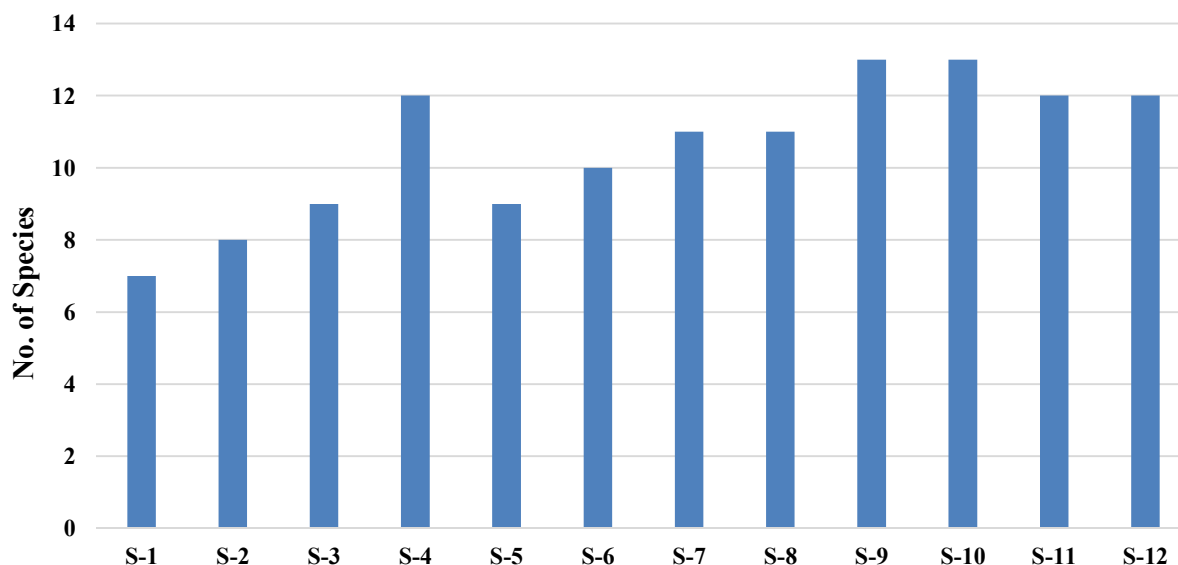


Figure 4-38: Qualitative list of Aquatic Macrophytic vegetation of Core and Buffer Zone

Phytoplankton

The species were collected from 12 selected sites from the study area. During present investigation, total of 54 phytoplankton species were identified and collected from 12 selected sites from the study area from study area which were composed of Chlorophyceae (18 species & 33 %); Cyanophyceae

(17 species & 32 %); Bacillariophyceae (13 species & 24 %) and Euglenophyceae (6 species & 11 %) (Fig. 2 and Table 2). Details of Phytoplankton species are given in table 5 and Figure 7.

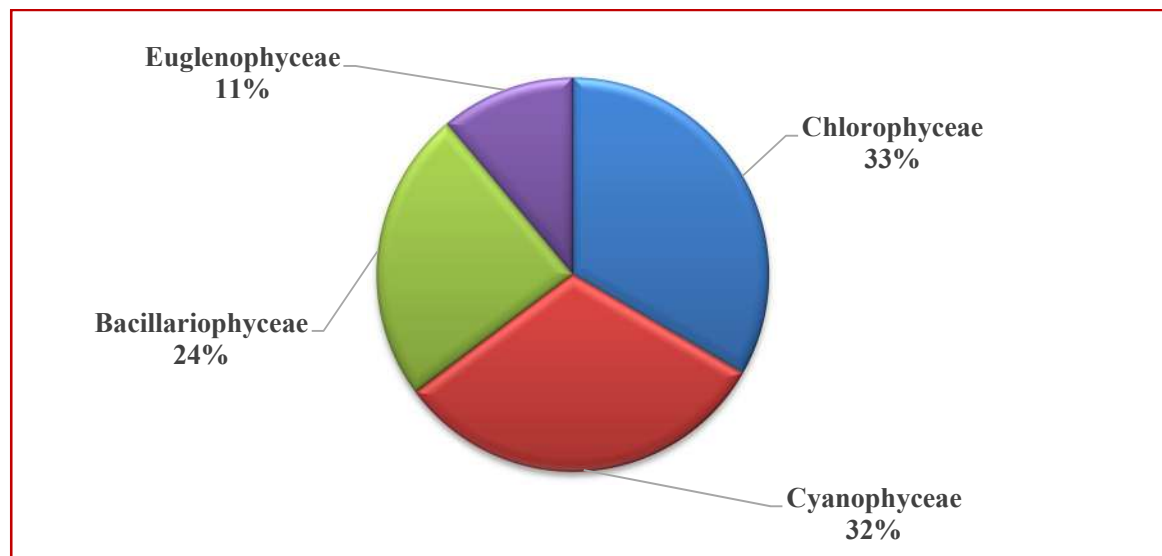


Figure 4-39 : Qualitative composition of Phytoplankton species in the study area

Table 4-43: List of Phytoplankton species present in different water bodies in study area (Core and Buffer Zone).

S.N.	Taxonomic Details	S-1	S-2	S-3	S-3	S-4	S-5	S-6	S-7	S-8	S-9	-10	-11	-12	Schedule Status in WPA (1972)	IUCN Status
	Chlorophyceae														NA	NA
1	<i>Ankistrodesmus</i> sp.		+	+	+	+	+	+	+	+		+	+	+	NA	NA
2	<i>Ankistrodesmus falcatus</i>	+	+	+		+	+	+	+		+	+	+	+	NA	NA
3	<i>Arthrodesmus</i> sp.	+		+	+	+		+	+	+		+	+		NA	NA
4	<i>Chlorella vulgaris</i>	+			+	+	+		+	+	+		+		NA	NA
5	<i>Closteriopsis</i> sp.		+	+	+	+	+			+		+	+	+	NA	NA
6	<i>Closterium quadratum</i>		+	+			+	+	+	+				+	NA	NA
7	<i>Cosmarium formii</i>	+		+	+	+			+	+	+	+	+		NA	NA
8	<i>Cosmarium margaritatum</i>		+	+	+		+	+		+		+		+	NA	NA
9	<i>Gonium</i> sp.		+			+	+	+			+		+	+	NA	NA

10	<i>Oocystis crassa</i>	+		+		+			+	+		+	+		NA	NA
11	<i>Pediastrum duplex</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	NA	NA
12	<i>Pediastrum simplex</i>	+		+	+	+				+	+	+	+		NA	NA
13	<i>Spirogyra</i> sp.	+	+			+	+	+	+	+			+	+	NA	NA
14	<i>Tetradon trignonum</i>		+	+	+						+	+		+	NA	NA
15	<i>Tetrastrum</i> sp.		+	+		+	+	+		+	+		+	+	NA	NA
16	<i>Ulothrix zonata</i>	+	+			+	+		+		+	+	+	+	NA	NA
17	<i>Volvox</i> sp.	+				+	+	+		+	+		+		NA	NA
18	<i>Zygnema</i> sp.	+	+	+	+	+			+	+	+	+	+	+	NA	NA
	Total	11	12	13	10	15	12	10	11	14	11	12	15	12		
	Cyanophyceae														NA	NA
1	<i>Anabaena</i> sp.	+	+	+	+	+	+	+		+		+	+	+	NA	NA
2	<i>Anabaena circinalis</i>	+	+		+	+	+	+	+	+		+	+	+	NA	NA
3	<i>Anabaena flosaque</i>	+	+	+	+	+		+	+		+		+	+	NA	NA
4	<i>Anacystis</i> sp.		+	+	+	+	+		+	+	+	+	+		NA	NA
5	<i>Aphanocapsa</i> sp.	+	+	+		+	+	+	+	+		+	+	+	NA	NA
6	<i>Aphanothece</i> sp.	+			+	+	+	+			+		+	+	NA	NA
7	<i>Chroococcus</i> sp.		+		+	+		+	+	+	+		+		NA	NA
8	<i>Gloeocapsa</i> sp.	+				+	+		+			+	+	+	NA	NA
9	<i>Lyngbya</i> sp.		+	+		+	+	+	+	+	+	+	+		NA	NA
10	<i>Merismopedia</i> sp.	+		+	+				+	+		+		+	NA	NA
11	<i>Merismopedia tenuissima</i>	+	+	+	+	+	+	+	+	+	+		+	+	NA	NA
12	<i>Microcystis</i> sp.	+		+		+	+	+	+	+	+	+	+	+	NA	NA
13	<i>Microcystis aeruginosa</i>	+	+		+	+				+	+		+	+	NA	NA
14	<i>Nostoc</i> sp.	+	+	+			+	+	+	+	+			+	NA	NA
15	<i>Spirillatoria subbrevis</i>	+		+	+	+	+	+	+		+	+	+	+	NA	NA
16	<i>Spirulina</i> sp.		+	+		+		+	+	+	+	+	+		NA	NA
17	<i>Spirulina laxissima</i>	+	+			+		+		+	+		+	+	NA	NA
	Total	13	12	11	10	15	11	13	13	13	12	10	15	13		
	Bacillariophyceae														NA	NA
1	<i>Achnanthes</i> sp.	+	+	+		+		+	+			+	+	+	NA	NA
2	<i>Amphora ovalis</i>	+	+	+	+	+	+	+	+	+	+		+	+	NA	NA
3	<i>Cocconeis</i> sp.		+	+	+	+	+	+	+	+		+	+	+	NA	NA
4	<i>Cyclotella</i> sp.	+	+	+		+	+	+	+	+	+	+	+	+	NA	NA
5	<i>Cymbella affinis</i>		+	+	+	+	+	+	+	+		+	+	+	NA	NA
6	<i>Eunotia major</i>	+		+	+	+	+	+	+	+	+	+	+	+	NA	NA
7	<i>Fragillaria pinnata</i>		+		+	+	+		+	+		+	+		NA	NA
8	<i>Gomphonema</i> sp.	+		+		+		+	+	+	+	+	+	+	NA	NA
9	<i>Gomphonema lanceolatum</i>	+	+		+	+			+				+		NA	NA

10	<i>Melosira granulata</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	NA	NA
11	<i>Navicula subrhyncocephala</i>		+	+		+	+		+	+	+	+	+		NA	NA
12	<i>Nitzschia palea</i>	+		+	+	+	+	+	+		+		+	+	NA	NA
13	<i>Synedra ulna</i>		+			+	+	+	+	+	+	+	+	+	NA	NA
	Total	8	10	10	8	13	10	10	13	10	8	10	12	10		
	Euglenophyceae														NA	NA
1	<i>Euglena acus</i>	+	+	+	+	+		+	+	+	+	+	+	+	NA	NA
2	<i>Euglena</i> sp.		+		+	+	+	+	+	+	+	+	+		NA	NA
3	<i>Euglepha</i> sp.	+		+	+	+	+	+	+	+		+	+	+	NA	NA
4	<i>Phacus</i> sp.	+	+	+	+	+	+	+	+	+	+		+	+	NA	NA
5	<i>Phacus caudatus</i>	+	+	+	+	+	+	+	+	+		+	+	+	NA	NA
6	<i>Trachelomonas</i> sp.	+	+	+	+	+	+	+	+	+	+	+	+	+	NA	NA
	Total	5	5	5	6	6	5	6	6	6	4	5	6	5		

Source: Primary Survey data of P&M Solution, Noida.

Table 4-44: Site wise Qualitative list of Phytoplankton species study area (Core and Buffer Zone).

Class	S-1	S-2	S-3	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10	S-11	S-12
Chlorophyceae	11	12	13	10	15	12	10	11	14	11	12	15	12
Cyanophyceae	13	12	11	10	15	11	13	13	13	12	10	15	13
Bacillariophyceae	8	10	10	8	13	10	10	13	10	8	10	12	10
Euglenophyceae	5	5	5	6	6	5	6	6	6	4	5	6	5
Total No. of Species	37	39	39	34	49	38	39	43	43	35	37	48	40

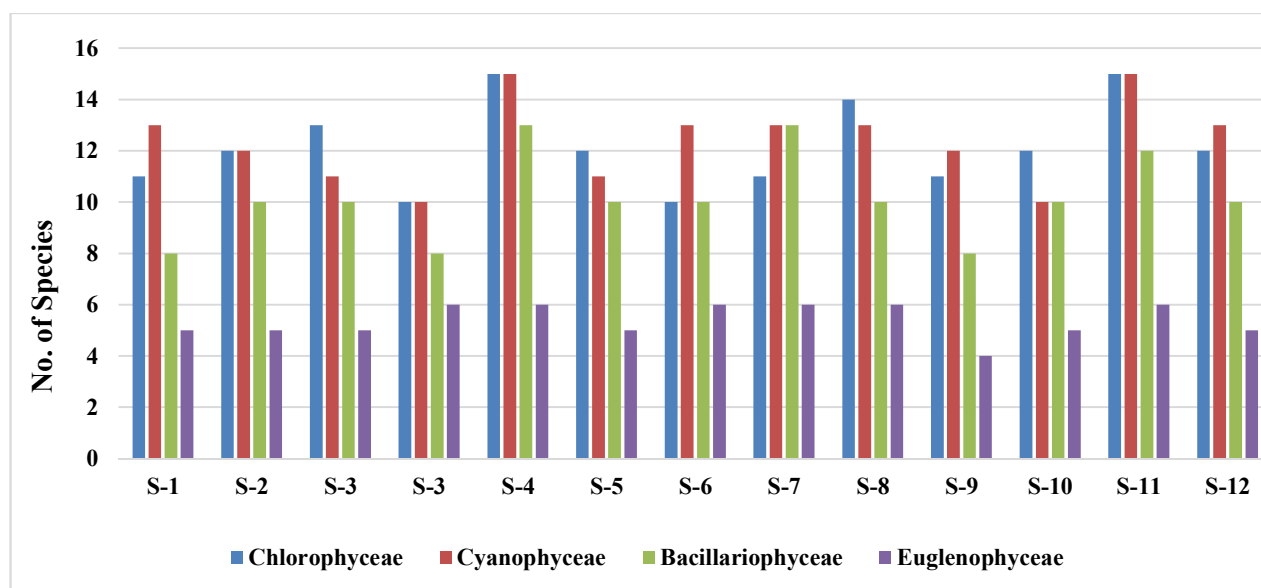


Figure 4-40: Site wise qualitative distribution of Phytoplankton species in the study area

4.7.13 Flora of Buffer zone

Terrestrial Flora of Buffer zone (Natural vegetation/Commercial vegetation).

During the present survey, a total of 71 species of trees, 25 species of shrubs/herbs, 10 species of Grass, and 13 species of Climbers were recorded from the core and buffer zone of the present study area. On the other hand, out of 71 tree species, only 57 were recorded in the core zone. The below-mentioned vegetation details have been collected from the core as well as the buffer zone of the present study area. All the details have been furnished based on the field survey at eight (08) different locations and data supported by the Department of Forest, West Bengal.

Table 4-45: List of Trees, Shrubs, Herbs and Grasses Species observed in Study area

S.No.	Botanical Name	Common/Hindi Name	Name of family	Core Zone	Buffer Zone
1.	<i>Acacia auriculiformis</i>	Austrelian babul	Fabaceae		+
2.	<i>Acacia catechu</i>	Khair	Fabaceae	+	+
3.	<i>Acacia nilotica</i>	Desi babool	Fabaceae	+	+
4.	<i>Adina cordifolia</i>	Karam	Rubiaceae		+
5.	<i>Aegle marmelos</i>	Bel	Rutaceae		+
6.	<i>Ailanthus excels</i>	Adusa	Simaroubaceae	+	+
7.	<i>Albizia procera</i>	Safed Siris	Mimosaceae	+	+

8.	<i>Albizzia amara</i>	Siris	Mimosoideae		+
9.	<i>Albizzia lebbeck</i>	Sirish	Mimosaceae	+	+
10.	<i>Alstonia scholaris</i>	Saptaparni	Apocynaceae		+
11.	<i>Annona squamosa</i>	Sharifa / Sitaphal	Annonaceae		+
12.	<i>Anogeissus latifolia</i>	Dhaura	Combretaceae	+	+
13.	<i>Anthocephalus cadamba</i>	Kadamb	Rubiaceae	+	+
14.	<i>Artocarpus heterophyllus</i>	Kathal	Moraceae	+	+
15.	<i>Artocarpus lacucha</i>	Badahar/Dohu	Moraceae	+	+
16.	<i>Artocarpus heterophyllus</i>	Jack fruit	Moraceae	+	+
17.	<i>Azadirachta indica</i>	Neem	Meliaceae	+	+
18.	<i>Bauhinia racemosa</i>	Apta	Leguminosae	+	+
19.	<i>Bauhinia variegata</i>	Kachnar	Leguminosae		+
20.	<i>Bergera koenigii</i>	Kadipatta	Rutaceae	+	+
21.	<i>Bombax ceiba</i>	Semal	Malvaceae	+	+
22.	<i>Borassus flabellifer</i>	Nariyal	Palmae	+	+
23.	<i>Buchnamia Lanza</i>	Piar	Anacardiaceae	+	+
24.	<i>Butea monosperma</i>	Palas	Leguminosae	+	+
25.	<i>Carica papaya</i>	Papita	Caricaceae		+
26.	<i>Cascabela thevetia</i>	Pila Kaner	Apocynaceae	+	+
27.	<i>Cassia fistula</i>	Amaltas	Caesalpinaceae	+	+
28.	<i>Cassia siamea</i>	Chakundi/Kassod	Caesalpiniaceae	+	+
29.	<i>Dalbergia latifolia</i>	Kala-shisham	Fabaceae	+	+
30.	<i>Dalbergia sissoo</i>	Sissoo	Fabaceae	+	+
31.	<i>Delonix regia</i>	Gulmohar	Caesalpiniaceae	+	+
32.	<i>Diospyros melanoxylon</i>	Tendu	Ebenaceae	+	+
33.	<i>Eucalyptus citriodora</i>	Safeda / Neelgiri	Myrtaceae	+	+
34.	<i>Eucalyptus globules</i>	Nilgiri	Myrtaceae	+	+
35.	<i>Ficus benghalensis</i>	Bargad	Moraceae	+	+
36.	<i>Ficus benjamina</i>	Pakar	Moraceae	+	+
37.	<i>Ficus elastica</i>	Rubber Plant	Moraceae	+	+
38.	<i>Ficus racemosa</i>	Gular	Moraceae	+	+
39.	<i>Ficus religiosa</i>	Pipal	Moraceae	+	+
40.	<i>Gmelina arborea</i>	Gamhar	Verbenaceae	+	+
41.	<i>Hibiscus rosa-sinensis</i>	Gurhal / Urhul	Malvaceae		+
42.	<i>Lagerstroemia parviflora</i>	Sidha	Lythraceae	+	+
43.	<i>Lagerstroemia speciosa</i>	Jarul	Lythraceae	+	+
44.	<i>Madhuca longifolia</i>	Mohua tree	Sapotaceae	+	+
45.	<i>Magnifera indica</i>	Aam	Anacardiaceae	+	+
46.	<i>Melia azedarach</i>	Bukkam Neem	Meliaceae		+

47.	<i>Monoon longifolium</i>	Ashok Tree	Annonaceae	+	+
48.	<i>Moringa oleifera</i>	Sahjan/Munga	Moringaceae	+	+
49.	<i>Musa paradisiacal</i>	Banana	Musaceae	+	+
50.	<i>Nerium oleamder</i>	Kaner	Apocynaceae		+
51.	<i>Nyctanthes arbor-tristis</i>	Harshingar	Oleaceae	+	+
52.	<i>Phoenix sylvestris</i>	Date palm	Arecaceae	+	+
53.	<i>Phyllanthus emblica</i>	Amla	Phyllanthaceae	+	+
54.	<i>Pisidium guava</i>	Guava	Myrtaceae		+
55.	<i>Pongamia pinnata</i>	Karanj	Fabaceae	+	+
56.	<i>Prosopis cineraria</i>	Shami Tree	Mimosaceae	+	+
57.	<i>Prosopis juliflora</i>	Vilayati babool	Fabaceae	+	+
58.	<i>Pterocarpus marsupium</i>	Bija	Leguminosae	+	+
59.	<i>Punica granatum</i>	Anar	Lythraceae		+
60.	<i>Sarracca indica</i>	Ashok	Annonaceae	+	+
61.	<i>Schleichera oleosa</i>	Kusum	Sapindaceae	+	+
62.	<i>Shorea robusta</i>	Sal	Depterocarpaceae	+	+
63.	<i>Syzygium cumini</i>	Jamun	Myrtaceae	+	+
64.	<i>abernaemontana divaricata</i>	Chandani	Apocynaceae	+	+
65.	<i>Tectona grandis</i>	Sagwan	Verbenaceae	+	+
66.	<i>Terminalia arjuna</i>	Arjun	Combretaceae	+	+
67.	<i>Terminalia belerica</i>	Bahera	Combretaceae	+	+
68.	<i>Terminalia chebula</i>	Harra / Harad	Combretaceae	+	+
69.	<i>Terminalia tomentosa</i>	Asan Tree	Combretaceae		+
70.	<i>Zizyphus jujube</i>	Ber	Rhamnaceae	+	+
71.	<i>Zyziphus mauritiana</i>	Ber	Rhamnaceae	+	+
Shrub & Herbs					
1	<i>Acanthospermum hispidum</i>	Kanti	Asteraceae	+	+
2	<i>Acheranthus aspera</i>	Aghada	Amaranthaceae	+	+
3	<i>Argemone mexicana</i>	Pila dhtura	Papaveraceae	+	+
4	<i>Bambusa arundinacea</i>	Katang bamboo	Poaceae	+	+
5	<i>Dendrocalamus strictus</i>	Bamboo	Poaceae	+	+
6	<i>Baugainvella glabra</i>	Paper flower	Nyctaginaceae	+	+
7	<i>Calotropis procera</i>	Aakra	Asclepiadaceae	+	+
8	<i>Cassia auriculata</i>	Tarwar	Fabaceae	+	+
9	<i>Cassia tora</i>	Tarota /Takla	Caesalpiniaceae	+	+
10	<i>Chenopodium album</i>	Manure weed	Amaranthaceae	+	+
11	<i>Cleome viscosa</i>	Pivali tilval	Cleomaceae	+	+
12	<i>Dalura metel</i>	Dhotra	Solanaceae	+	+
13	<i>Echinops echinatus</i>	Unthkantali	Asteraceae	+	+

14	<i>Ervatamia divaricata</i>	Chandani	Apocynaceae	+	+
15	<i>Euphorbia hirta</i>	Mothi dudhi	Evphorbiaceae	+	+
16	<i>Jatropha gossipifolia</i>	Cotton-leaf	Euphorbiaceae	+	+
17	<i>Lantana camara</i>	Ghaneri	Verbenaceae	+	+
18	<i>Mimosa pudica</i>	Chui Mui	Mimosaceae	+	+
19	<i>Ocimum sanctum</i>	Tulsi	Labiatae	+	+
20	<i>Parthenium hysterophorus</i>	Gajar grass	Asteraceae	+	+
21	<i>Ricinus communis</i>	Arand	Euphorbiaceae	+	+
22	<i>Ricinus communis</i>	Castor oil plant	Euphorbiaceae	+	+
23	<i>Solanum surattense</i>	Bhuringani	Solanaceae	+	+
24	<i>Tridax procumbens</i>	Kambarmodi	Asteraceae	+	+
25	<i>Xanthium strumarium</i>	Chota Dhatura	Asteraceae	+	+
Grasses					
1	<i>Apluda mutica</i>	Mauntian grass	Poaceae	+	+
2	<i>Apluda mutica</i>	Banjura grass	Poaceae	+	+
3	<i>Commelina benghalensis</i>	Bokna	Commelinaceae	+	+
4	<i>Cynodon dactylon</i>	Doob	Poaceae	+	+
5	<i>Cyperus rotundus</i>	Motha	Cyperaceae	+	+
6	<i>dactyloctenium aegyptium</i>	Crow foot grass	Poaceae	+	+
7	<i>Digitaria ternate</i>	--	Graminae	+	+
8	<i>Kyllinga tenuifolia</i>	--	Cyperaceae	+	+
9	<i>Pennisetum purpureum</i>	Elephant grass	Poaceae	+	+
10	<i>Saccharum spontaneum</i>	Kans	Poaceae	+	+
Climbers					
1	<i>Abrus precatorius</i>	Gunja	Fabaceae	+	+
2	<i>Antigonon leptopus</i>	Anantalata	Polygonaceae	+	+
3	<i>Bougainvillea glabra</i>	Booganbel	Nyctaginaceae	+	+
4	<i>Celastrus paniculata</i>	Kujari	Celastraceae		+
5	<i>Cissampelos pareira</i>	Khariya lata	Menispermaceae	+	+
6	<i>Clitoria ternatea</i>	Shankhpashpi	Fabaceae	+	+
7	<i>Coccinia grandis</i>	Jungli Kundru	Cucurbitaceae	+	+
8	<i>Combretum indicum</i>	Madhu Malati	Combretaceae	+	+
9	<i>Cuscuta reflexa</i>	Amarbel	Convolvulaceae	+	+
10	<i>Hemidesmus indicus</i>	Anantamul	Apocynaceae		+
11	<i>Ipomoea cairica</i>	Neeli Bel	Convolvulaceae	+	+
12	<i>Tilospora cordifolia</i>	Giloy	Menispermaceae	+	+
13	<i>Zizyphus oenoplia</i>	Makor	Rhamnaceae	+	+
Total no. of species				103	119
Source: Primary Survey data supported by Data of Department of Forest, West Bengal					

4.7.14 ROAD SIDE TREES

The tree inventory of the existing tree species on the project alignment has been prepared. Bel, Neem is the common species growing in the area of concern. A tree inventory of the existing tree species on the project alignment has been prepared.

4.7.15 Aquatic Flora of Buffer zone (Phytoplankton/ Macrophytes/ Aquatic Weeds)

Macrophytes: The diversity of aquatic macrophytes was similar in both the core and buffer zones. The details of the phytoplankton and macrophytic vegetation of the buffer zone are given in Tables 4 and 5 and Figure 7.

4.7.16 Agricultural vegetation/ Commercial vegetation of the buffer zone.

The variety of cropping patterns was similar in the core and buffer zones of the study area. The vegetation details of the buffer zone were collected from the eight (08) selected sites, and their details are given in Table 3.

Fauna of the Study Area

The state of West Bengal, in the eastern region of India, is home to a rich and bewildering variety of forests and wildlife. Proposed alignment passing through the purely forest land and the rural agricultural land in Purulia, Bankura, Pashchim Medinipur, Hooghly, and Howrah districts of West Bengal. A large number of mammals, reptiles, and avian fauna are found in the state. At some places, the expressway will pass adjacent to some villages in the study area. Apart from the Protected Forests, the rest of the study area is devoid of any major natural forest, so, wildlife animals are rarely found in the rural areas. However, occasional presence of Elephants and Leopard (especially near the dense forests) has been observed in the study area. On the other hand, only some moving domesticated animals were observed within the project area.

The assessment of the faunal population was done on the basis of the primary survey as well as secondary data collected from different government offices like the forest department, wildlife department, etc. The presence of wildlife was also confirmed by the local inhabitants depending on the animal sightings and the frequency of their visits to the project area especially in and around the Protected Forest. During the present study period, a large number of local bird's species are noticed in the buffer zone of the study area. **There are several bird habitats have been observed in the core zone and buffer zone. It is highly recommended to the client and workers to take care of the**

birds and their habitat before cleaning of sites, cutting and translocating the trees in the forest areas. The maximum diversity wildlife species have been recorded surrounding the sites 1, 4, 5 and 6 in the study area.

Fauna of the Core Zone

Terrestrial fauna of core zone (Mammals/Reptiles/amphibians/birds/insects etc.).

Table 4-46: List of Mammals/Reptiles/Amphibians/Birds recorded from the Core Zone

No.	Scientific Name	Common Name	Family	Status as per WPA-1972/2022	UCN status
Mammals					
1	<i>Bandicota bengalensis</i>	Bandicoot Rat	Sciuridae	IV	LC
2	<i>oselaphus tragocamelus</i>	Nilgai	Bovidae	III	LC
3	<i>Canis aurius</i>	Jackal	Pteropodidae	I	LC
4	<i>Cervus unicolor</i>	Sambar Deer	Cervidae	I	VU
5	<i>Cuon alpinus</i>	Indian Wild Dog/Dhole	Canidae	II	EN
6	<i>Fellis chaus</i>	Jungle cat	Soricidae	I	LC
7	<i>Funambulus palmarum</i>	Three-striped Squirrel	Suidae	III	LC
8	<i>Herpestes edwardsi</i>	Indian Grey Mongoose	Canidae	II	LC
9	<i>Hyaena hyaena</i>	Stripped hyena	Leporidae	I	LC
10	<i>Manis crassicaudata</i>	Indian Pangolin	Manidae	I	EN
11	<i>Mus booduga</i>	Indian Field Mouse	Sciuridae	IV	LC
12	<i>Presbytis entellus</i>	Common langur	Cercopithecidae	II	LC
13	<i>Pteropus giganteus</i>	Indian Flying Fox	Pteropodidae	V	LC
14	<i>Rattus rattus</i>	Common House Rat	Muridae	V	LC
15	<i>Vulpes bengalensis</i>	Indian fox	Felidae	I	LC
Reptiles and Amphibians					
1	<i>Bufo melanostictus</i>	Common toad	Bufonidae	IV	LC
2	<i>Bungarus caeruleus</i>	Krait	Elapidae	IV	NE
3	<i>Calotes versicolor</i>	Garden lizard	Agamidae	IV	NE
4	<i>Euphlyctis hexadactyla</i>	Common frog	Dicroglossidae	IV	LC
5	<i>Hemidactylus flaviviridis</i>	House Gecko	Gekkonidae	--	NE
6	<i>Naja naja</i>	Cobra	Elapidae	I	LC
7	<i>Ptyas mucosa</i>	Rat Snake	Colubridae	I	NE
8	<i>Rana temporaria</i>	Common frog	Ranidae	IV	LC
9	<i>Varanus bengalensis</i>	India monitor lizard	Varanidae	I	LC
UCN Status =LC: Least Concern, VU: Vulnerable, NT: Near Threatened, EN: Endangered; NE: Not Evaluated,					
Source: Primary Survey data and the data supported by Department of Forest, West Bengal.					

❖ **Avian fauna of the core zone:**

Avian fauna of the core and buffer zone were similar as listed in table 11. So, the similar information is applicable for the core and buffer zone.

❖ **Butterflies of the Core Zone:** the details of the butterflies found in the core of the study areas listed in the table 9.

Table 4-47: Butterflies observed in the Core zone

S. No.	Common Name	Scientific Name	Family	ICN Status
1.	Plain Tiger	<i>Danaus chrysippus</i>	Nymphalidae	LC
2.	Common emigrant	<i>Catopsilia pomona</i>	Pieridae	LC
3.	Common crow	<i>Euploea core</i>	Nymphalidae	LC
4.	Small grass yellow	<i>Eurema brigitta</i>	Pieridae	LC
Source: Primary Survey data and the data supported by Department of Forest, West Bengal.				

4.7.17. Aquatic Fauna of Core zone (Zooplankton/ Macro-invertebrates/ Fishes/ Amphibians/ Turtles etc.)

All the aquatic fauna recorded from the core zone were also recorded from the buffer zone and most of the sampling sites are the same for the core and buffer zone as given in Table 1. So, the list of aquatic fauna of the core zone is merged with the details of the buffer zone and is given in Table 13,14 and 15.

Fauna of Buffer zone

To prepare a detailed report on the status of faunal biodiversity of the present study area of Purulia, Bankura, Pashchim Medinipur, Hooghly, and Howrah districts (1 km buffer) and to assess the impacts due to digging/ leveling of alignment route/ construction of bridge/ operational activity which evolves suitable mitigation measures to protect & conserve the biodiversity following components were studied:- terrestrial biodiversity, wildlife survey (diversity), habitat study (feeding, breeding, roosting areas), distribution of birds, rare & endangered species of the study area.

The fauna of the study area (Core and Buffer zone) varies upon the local topography and different types of habitats. The fauna of the study area has been categorized into two categories based on their habitat, i.e. (i) Aquatic fauna and (ii) Terrestrial fauna.

During the present survey, there are some seasonal, perennial and private water body was observed along with the proposed alignment, which will also be affected due to the present project activities. The alignment of the expressway will pass over these seasonal and perennial streams.

4.7.18 Terrestrial Fauna of Buffer zone (Mammals/Reptiles/Amphibians/Birds/ Insects etc.)

Southern part of the West Bengal state is endowed with rich flora and fauna and has always been rich in biodiversity in comparison to the central part of the state. The major part of the study area lies under rural agricultural fields which restricts the wildlife habitat significantly. However, due to the presence of maximum protected forests in the study area, some wild animals like Wild boar, Jackal, Wild cat, Mongoose, Common monitor lizard are found nearby all the selected sites. According to the local inhabitants few Elephant groups have been seen occasionally in the study area, but during the field survey these animals were not recorded. Apart from these, Peafowl (Mor) have been recorded nearby the several selected sites in the study area. A list of the animals of the study area has been prepared on the basis of field survey, inquire from the local people and with help of secondary data of forest department. The animals, thus recorded were cross-checked with Wildlife (Protection) Act, 1972 for their schedule status. Faunal details of the study area are given in Tables 10 to 12.

i. Mammals and Reptiles/ Amphibians

The domesticated animals like Goat (*Capra aegagrus*); Buffalo (*Bubalus bubalis*); Cow (*Bos primigenius*); Horse (*Equus caballus*); Ass (*Equus hemionus*) and Dog (*Canis lupus familiaris*) were observed moving in different parts of the study area, especially nearby villages. Other mammals and reptiles found in the study area are listed in **Table 10**.

Table 4-48 : List Mammals, Reptiles and Amphibians recorded from the Buffer Zone

No.	Scientific Name	Common Name	Family	Status as per VPA-1972	IUCN status
Mammals					
1	<i>Axis axis</i>	Spotted Deer /Chital	Cervidae	II	LC
2	<i>Bandicota bengalensis</i>	Bandicoot Rat	Sciuridae	IV	LC
3	<i>Elaphurus tragocamelus</i>	Nilgai	Bovidae	III	LC
4	<i>Canis auratus</i>	Jackal	Canidae	I	LC
5	<i>Cervus unicolor</i>	Sambar Deer	Cervidae	I	VU
6	<i>Cuon alpinus</i>	Indian Wild Dog/Dhole	Canidae	II	EN
7	<i>Elephas maximus indicus</i>	Indian elephant	Elephantidae	I	EN

8	<i>Fellis chaus</i>	Jungle cat	Soricidae	I	LC
9	<i>Funambulus palmarum</i>	Three-striped Squirrel	Suidae	III	LC
10	<i>Funambulus pennanti</i>	Five striped palm squirrel	Hyaenidae	III	LC
11	<i>Herpestes edwardsi</i>	Indian Grey Mongoose	Canidae	I	LC
12	<i>Hyaena hyaena</i>	Stripped hyena	Leporidae	I	LC
13	<i>Lepus nigricollis</i>	Indian Hare	Canidae	II	LC
14	<i>Manis crassicaudata</i>	Indian Pangolin	Manidae	I	EN
15	<i>Mus booduga</i>	Indian Field Mouse	Sciuridae	IV	LC
16	<i>Panthera pardus fusca</i>	Leopard/ Tendua	Felidae	I	LC
17	<i>Presbytis entellus</i>	Common langur	ercopithecidae	II	LC
18	<i>Pteropus giganteus</i>	Indian Flying Fox	Pteropodidae	V	LC
19	<i>Rattus rattus</i>	Common House Rat	Muridae	V	LC
20	<i>Rousettus leschenaultia</i>	Indian Fulvous Fruit- Bat	Muridae	V	LC
21	<i>Suncus murinus</i>	Grey musk Shrew	Muridae	V	LC
22	<i>Sus scrofa</i>	Wild Boar	Canidae	II	LC
23	<i>Vulpes bengalensis</i>	Indian fox	Felidae	I	LC
Reptiles and Amphibians					
1	<i>Bufo melanostictus</i>	Common toad	Bufonidae	IV	LC
2	<i>Bungarus caeruleus</i>	Krait	Elapidae	IV	NE
3	<i>Calotes versicolor</i>	Garden lizard	Agamidae	IV	NE
4	<i>Crotalus sp.</i>	Pit viper	Viperidae	II	LC
5	<i>Enhydryas enhydryas</i>	Smooth water snake	Homalopsidae	IV	LC
6	<i>Euphylyctis hexadactyla</i>	Common frog	Dicroglossidae	IV	LC
7	<i>Eutropis carinata</i>	Common skink	Scincidae	IV	LC
8	<i>Gehyra mutilata</i>	House Gecko	Gekkonidae	--	NE
9	<i>Naja naja</i>	Cobra	Elapidae	I	LC
10	<i>Ophiophagus hannah</i>	King cobra	Elapidae	I	LC
11	<i>Ptyas mucosa</i>	Rat Snake	Colubridae	II	NE
12	<i>Python molurus</i>	Indian python / Azgar	Pythonidae	I	LC
13	<i>Rana temporaria</i>	Common frog	Ranidae	IV	LC
14	<i>Testudo graeca</i>	Common Tortoise	Testudinidae	IV	VU
15	<i>Varanus bengalensis</i>	India monitor lizard	Varanidae	I	LC
LC Status =LC: Least Concern, VU: Vulnerable. NT: Near Threatened, EN: Endangered; NE: Not Evaluated, Source: Primary Survey data and the data supported by Department of Forest, West Bengal.					

Avian Fauna

A total of 79 avian species were observed from the different locations of the study area. There are possibilities to have more avian species in the study area due to the presence of forests and suitable habitat. Among avian fauna, **three (3) Schedule-I species** such as *Clanga hastata* (Indian Spotted Eagle), *Gyps bengalensis* (White-backed Vulture / Gidh), and *Pavo cristatus* (Peafowl / Mor) were recorded in the study area. The details of the avian species are listed in the table 11.

Table 4-49: Avian Fauna observed from the study area (Core and Buffer Zone)

S.No	Scientific Name	English Name	UCN Status	Schedule Status (PA, 1972)
1	<i>Accipiter badius</i>	Shikra	IV	LC
2	<i>Acridotheres tristis</i>	Myna	IV	LC
3	<i>Acrocephalus dumetorum</i>	Blyth's Reed Warbler	IV	LC
4	<i>Alcedo atthis</i>	Small blue kingfisher	IV	LC
5	<i>Alcedo atthis</i>	Common Kingfisher	IV	LC
6	<i>Amandava amandava</i>	Red munia	IV	LC
7	<i>Amaurornis phoenicurus</i>	White-breasted waterhen	IV	LC
8	<i>Anas platyrhynchos domesticus</i>	Domestic Duck	IV	LC
9	<i>Anthus trivialis</i>	Ttree Pipit	IV	LC
10	<i>Arachnothera flavigaster</i>	Sunbird	IV	LC
11	<i>Ardea cinerea</i>	Grey heron	II	LC
12	<i>Ardea purpurea</i>	Purple heron	II	LC
13	<i>Ardeola grayii</i>	Indian pond heron	II	LC
14	<i>Athene brama</i>	Spotted Owlet	IV	LC
15	<i>Bubulcus ibis</i>	Cattle egret	IV	LC
16	<i>Butorides striatus</i>	Striated heron	IV	LC
17	<i>Casmerodius albus</i>	Great egret	II	LC
18	<i>Centropus sinensis</i>	Crow pheasant	IV	LC
19	<i>Ceryle rudis</i>	Pied kingfisher	IV	LC
20	<i>Charadrius dubius</i>	Little ringed plover	IV	LC
21	<i>Ciconia episcopus</i>	White-necked stork	IV	VU
22	<i>Cinnyris asiaticus</i>	Purple Sunbird	IV	LC
23	<i>Clanga hastata</i>	Indian Spotted Eagle	I	VU
24	<i>Columba livia</i>	Pigeon	IV	LC
25	<i>Coracias benghalensis</i>	Indian Roller	IV	LC
26	<i>Corvus macrorhynchos</i>	Jungle crow	IV	LC

27	<i>Corvus splendens</i>	Crow	V	LC
28	<i>Cuculus micropterus</i>	Indian Cuckoo	IV	LC
29	<i>Dendrocitta vagabunda</i>	Rufous Treepie	IV	LC
30	<i>Dendrocygna icolour</i>	Fulvous whistling duck	IV	LC
31	<i>Dicrurus adsimilis</i>	Black drango	IV	LC
32	<i>Egretta alba</i>	Larger egret	II	LC
33	<i>Egretta garzetta</i>	Little egret	II	LC
34	<i>Eudynamis scolopaceus</i>	Asian Koel	IV	LC
35	<i>Francolinus pondicerianus</i>	Titar	IV	LC
36	<i>Gallinule chloropus</i>	Common moorhen	IV	LC
37	<i>Gallus gallus</i>	Jungle hen	IV	LC
38	<i>Gallus gallus domesticus</i>	Cock	IV	LC
39	<i>Gallus gallus domesticus</i>	Hen	IV	LC
40	<i>Gyps bengalensis</i>	hite-backedVulture / Gidh	I	CR
41	<i>Halcyon smymensis</i>	White-throated kingfisher	IV	LC
42	<i>Leptocoma sericea</i>	Black Sunbird	IV	LC
43	<i>Leptocoma zeylonica</i>	Purple-rumped Sunbird	IV	LC
44	<i>Machlolophus aplonotus</i>	Indian Yellow Tit	IV	LC
45	<i>Merops orientalis</i>	Green Bee-eater	IV	LC
46	<i>Milvus migrans</i>	Black Kite	IV	LC
47	<i>Motacilla flava</i>	Yellow Wagtail	IV	LC
48	<i>Nectarinia asiatica</i>	Purple Sunbird	IV	LC
49	<i>Nycticorax nycticorax</i>	Black-crowned night heron	IV	LC
50	<i>Oriolus xanthornus</i>	Black-headed Oriole	IV	LC
51	<i>Passer domesticus</i>	House sparrow	IV	LC
52	<i>Pavo cristatus</i>	Peafowl / Mor	I	LC
53	<i>Pelecanus onocrotalus</i>	Great white pelican	IV	LC
54	<i>Phalacrocorax carbo</i>	Great cormorant	IV	LC
55	<i>Phalacrocorax niger</i>	Little cormorant	IV	LC
56	<i>Ploceus philippinus</i>	Baya Weaver	IV	LC
57	<i>Pluvialis fulva</i>	Pacific golden plover	IV	LC
58	<i>Pseudibis papillosa</i>	Red-naped ibis	IV	LC
59	<i>Psittacula krameri</i>	Rose ringed Parakeet	IV	LC
60	<i>Psittacula krameri</i>	Rose Ringed Parakeet	IV	LC
61	<i>Pycnonotus cafer</i>	Red-vented bulbul	IV	LC
62	<i>Pycnonotus cafer</i>	Red Vented Bulbul	IV	LC
63	<i>Regulus regulus</i>	White Pigeon	IV	LC
64	<i>Sarkidiornis melanotos</i>	Knob-billed duck	IV	LC
65	<i>Saxicoloides fulicata</i>	Indian Robin	IV	LC

66	<i>Saxicoloides fulicatus</i>	Indian robin	IV	LC
67	<i>Spilopelia senegalensis</i>	Little brown dove	IV	LC
68	<i>Stigmatopelia chinensis</i>	Spoted b/w Dove	IV	LC
69	<i>Sturnia pagodarum</i>	Brahminy Starling	IV	LC
70	<i>Sturnus contra</i>	Asian pied starling	IV	LC
71	<i>Tachybaptus ruficollis</i>	Little grebe	IV	LC
72	<i>Tadorna ferruginea</i>	Ruddy shelduck	IV	LC
73	<i>Tringa tetanus</i>	Common redshank	IV	LC
74	<i>Turdoides caudate</i>	Common babbler	IV	LC
75	<i>Tyto alba</i>	Barn Owl	IV	LC
76	<i>Upupa epops</i>	Common hoopoe	IV	LC
77	<i>Vanellus indicus</i>	Red-wattled lapwing	IV	LC
78	<i>Vanellus malabaricus</i>	Yellow-wattled Lapwing	IV	LC
79	<i>Zosterops palpebrosus</i>	Indian White Eye	IV	LC

Source: Primary Survey data and the data supported by Department of Forest, West Bengal.

iii. Butterflies

Table4-50: Butterflies observed from the Buffer zone of the study area

S.No.	Common Name	Scientific Name	Family	CN Status
1.	Plain Tiger	<i>Danaus chrysippus</i>	Nymphalidae	LC
2.	Common emigrant	<i>Catopsilia pomona</i>	Pieridae	LC
3.	Scarlet dragonfly	<i>Prothemis erythraea</i>	Libellulidae	LC
4.	Sunflower	<i>Chlosyne lacinia</i>	Nymphalidae	LC
5.	Stripped Tiger	<i>Danaus genutia</i>	Nymphalidae	LC
6.	Common crow	<i>Euploea core</i>	Nymphalidae	LC
7.	Blue tiger	<i>Tirumala limniace</i>	Nymphalidae	LC
8.	Small grass yellow	<i>Eurema brigitta</i>	Pieridae	LC

Source: Primary Survey data and the data supported by Department of Forest, West Bengal.

4.7.19 Aquatic Fauna of Buffer zone (Zooplankton/Macro-invertebrates/ Fishes/ Amphibians/ Turtles etc.)

Aquatic fauna is referred to as any form of an animal that has adapted to living in the aquatic environments such as rivers, lakes, ponds, dams, streams, etc.). Apart from some perennial rivers, several seasonal water bodies like village ponds, streams, and irrigation canals are also present in the study area. In general, faunal account of any water bodies can be divided into following categories, i.e., (i) zooplankton, (ii) Macro-invertebrates/Insects/Benthos (iii) Fishes (iv) Amphibians/ Reptiles/

etc. Details of Zooplankton; Macro-invertebrates/insects/benthos; Amphibians/Reptiles and Fishes recorded from the different water bodies situated in the buffer zone of the present project in the Purulia, Bankura, Pashchim Mednipur, Hooghly, and Hawrah districts of West Bengal are given in tables 13, 14 and 15.

i. Zooplankton

Zooplankton is commonly found in all types of aquatic habitats. These are recognized as secondary producers and considered as one of the best tools for the environmental monitoring program. During the present study period, a total of 60 zooplankton species was recorded and identified which were comprised of class Protozoa (10 species& 17%), Rotifera (23 species& 38%), Cladocera (12 species& 20%), Copepoda (11 species& 18%), and Ostracoda (4 species& 7%). The maximum diversity of zooplankton species was recorded at site 10 followed by the others sites. The zooplankton diversity of different habitats and their details are given in Table 13 and Figure 8a and 8b.

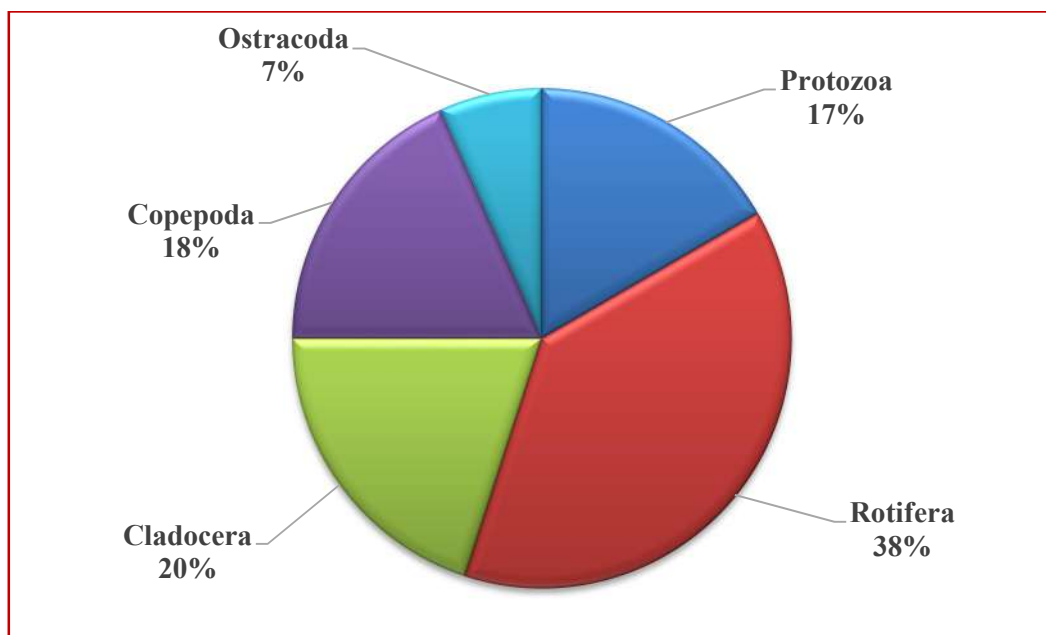


Figure 4-41: Qualitative contribution and % composition of zooplankton classes in the study area

Table 4-51: Zooplankton species found in the different water bodies situated in the buffer zone

S.N	Name of the Taxa	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10	S-11	S-12	Schedule status in WPA (1972)	IUCN Status
Protozoa															
1	<i>Arcella</i> sp.	+	+	+	+	+	+	+	+	+	+	+	+	NA	NA
2	<i>Arcella discoides</i>	+		+	+	+		+	+	+	+		+	NA	NA
3	<i>Arcella vulgaris</i>	+	+		+		+	+			+	+	+	NA	NA
4	<i>Centropyxis</i> sp.			+		+	+		+	+		+		NA	NA
5	<i>Centropyxis ecornis</i>	+	+		+		+	+	+		+	+	+	NA	NA
6	<i>Diffugia</i> sp.		+	+	+	+	+	+	+	+	+	+	+	NA	NA
7	<i>Diffugia cuminata</i>	+					+	+	+			+	+	NA	NA
8	<i>Euglypha</i> sp.	+	+		+	+		+	+	+	+		+	NA	NA
9	<i>Metopus</i> sp.	+	+		+	+			+	+	+			NA	NA
10	<i>Opercularia</i> sp.			+	+		+	+			+	+	+	NA	NA
	Total	7	6	4	8	6	7	8	8	6	8	7	8		
Rotifera															
1	<i>Anuraeopsis</i> sp.	+	+	+	+		+			+	+			NA	NA
2	<i>Anuraeopsis fissa</i>	+	+		+		+	+	+		+	+	+	NA	NA
3	<i>Asplanchna</i> sp.			+	+	+	+	+			+	+	+	NA	NA
4	<i>Asplanchna brightwelli</i>	+	+	+		+	+	+	+	+	+	+	+	NA	NA
5	<i>Brachionus</i> sp.	+	+	+									+	NA	NA
6	<i>Brachionus angularis</i>	+			+	+	+	+	+		+	+		NA	NA
7	<i>Brachionus calyciflorus</i>	+		+			+	+	+	+	+	+	+	NA	NA
8	<i>Brachionus quadridentatus</i>		+	+		+	+	+	+		+	+		NA	NA
9	<i>Brachionus falcatus</i>				+		+			+	+		+	NA	NA
10	<i>Brachionus forficula</i>	+		+	+			+	+			+		NA	NA
11	<i>Cephalodella gibba</i>			+			+				+		+	NA	NA
12	<i>Filinia</i> sp.	+			+	+	+	+		+	+	+	+	NA	NA
13	<i>Filinia longiseta</i>	+	+	+		+	+	+	+		+	+	+	NA	NA
14	<i>Keratella</i> sp.	+	+			+		+	+			+	+	NA	NA
15	<i>Keratella Cochlearis</i>	+		+	+		+	+		+	+	+		NA	NA
16	<i>Keratella Tropica</i>		+			+	+	+			+	+	+	NA	NA
17	<i>Lecane</i> sp.	+		+	+	+		+	+	+		+		NA	NA
18	<i>Lecane luna</i>	+	+				+	+			+	+	+	NA	NA
19	<i>Monostyla quadridentatus</i>			+	+	+	+	+	+		+	+		NA	NA
20	<i>Mytilina</i> sp.		+	+			+			+	+		+	NA	NA

21	<i>Polyarthra vulgaris</i>	+		+	+									NA	NA
22	<i>Testudinella patina</i>	+	+				+	+		+	+	+	+	NA	NA
23	<i>Trichocerca</i> sp.	+		+	+	+		+	+	+		+		NA	NA
	Total	16	11	15	12	11	17	17	11	10	17	17	14		
Cladocera															
1	<i>Alona</i> sp.	+	+		+		+	+	+	+	+		+	NA	NA
2	<i>Alona intermediate</i>	+		+	+	+	+		+	+	+	+	+	NA	NA
3	<i>Bosmina</i> sp.	+	+	+	+			+	+		+	+		NA	NA
4	<i>Bosmina longirostris</i>	+	+	+	+		+	+			+	+	+	NA	NA
5	<i>Ceriodaphnia</i> sp.	+	+	+	+	+	+	+	+	+	+	+	+	NA	NA
6	<i>Chydorus sphaericus</i>	+		+		+	+	+	+		+	+		NA	NA
7	<i>Daphnia</i> sp.	+	+		+	+	+			+	+		+	NA	NA
8	<i>Daphnia pulex</i>		+	+	+		+	+	+			+	+	NA	NA
9	<i>Diaphnosoma excisum</i>	+	+	+		+	+	+		+	+	+	+	NA	NA
10	<i>Leydigia</i> sp.	+		+	+	+	+	+	+	+	+	+	+	NA	NA
11	<i>Moina daphnia</i>		+		+			+					+	NA	NA
12	<i>Simocephalus</i> sp.	+	+	+	+	+		+	+	+	+	+	+	NA	NA
	Total	10	9	9	10	7	9	10	8	7	10	9	10		
Copepoda															
1	<i>Cyclops</i> sp.		+		+		+	+	+	+	+	+	+	NA	NA
2	<i>Diaptomus</i> sp.	+	+	+		+		+	+				+	NA	NA
3	<i>Eucyclops</i> sp.	+		+	+		+	+	+	+	+	+	+	NA	NA
4	<i>Teleodiptomus viduus</i>		+		+	+	+	+	+	+	+	+	+	NA	NA
5	<i>Mesocyclops</i> sp.	+	+	+	+		+	+			+	+	+	NA	NA
6	<i>Nauplius larvae</i>	+	+	+	+		+	+	+	+	+	+	+	NA	NA
7	<i>Neodiptomus</i> sp.					+	+	+		+	+		+	NA	NA
8	<i>Nitzii amphibia</i>	+	+	+		+	+	+			+		+	NA	NA
9	<i>Paradiptomus</i> sp.	+		+	+	+	+	+	+	+	+	+	+	NA	NA
10	<i>Thermocyclops</i> sp.	+	+	+	+		+			+	+	+		NA	NA
11	<i>Thermocyclops crassus</i>	+	+	+	+	+	+	+	+	+	+	+	+	NA	NA
	Total	8	8	8	8	6	10	10	7	8	10	8	10		
Ostracoda															
1	<i>Cyprinotus</i> sp.		+					+	+	+	+	+	+	NA	NA
2	<i>Cypris</i> sp.	+		+	+	+	+		+		+	+	+	NA	NA
3	<i>Stenocypris</i> sp.	+	+	+	+		+	+		+	+		+	NA	NA
4	<i>Stenocypris malcolmsoni</i>	+	+	+	+	+	+	+	+	+	+	+		NA	NA
	Total	3	3	3	3	2	3	3	3	3	4	3	3		
Source: Primary Survey data and the data supported by Department of Forest, West Bengal.															

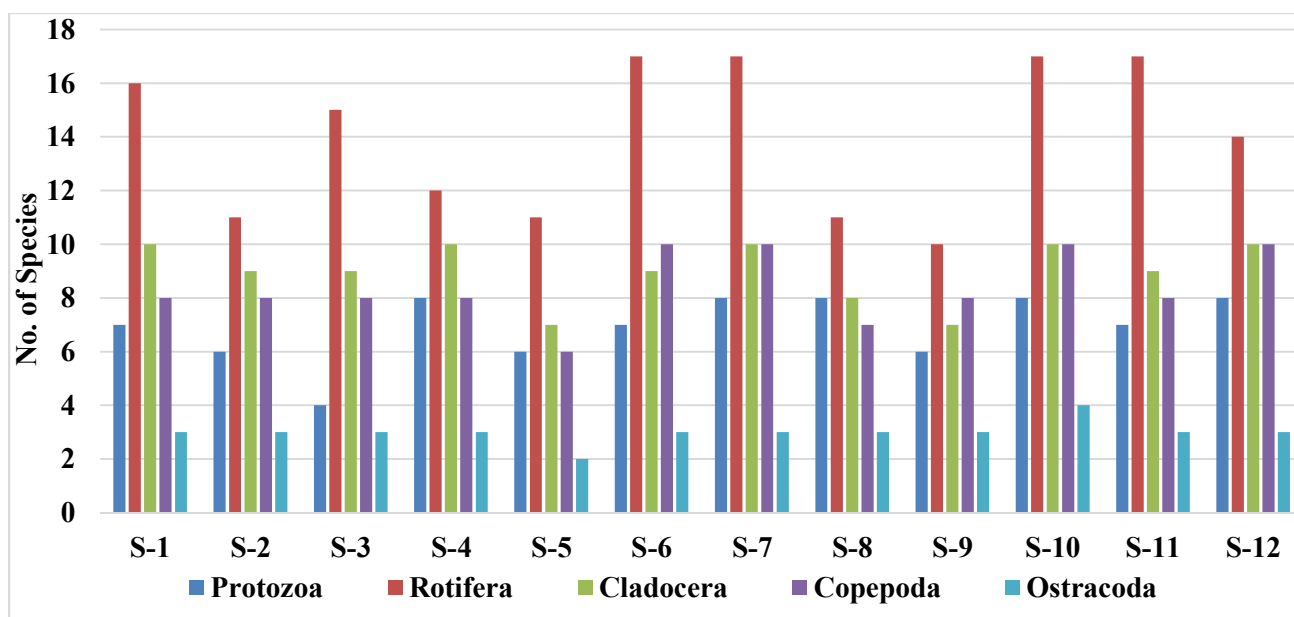


Figure 4-42: Site wise qualitative variation in Zooplankton species in the study area

ii. Macro-invertebrates (Insects/Benthos)

Macro-invertebrates are commonly found in all types of aquatic habitats, such as streams, rivers, wetlands, lakes, and ponds. The term macro-invertebrate is used for those animals that have no backbone and can be seen with the naked eye. These animals generally include insects, crustaceans, mollusks, and annelids. They are significant within the food chain as larger animals such as fish and birds rely on them as a food source. Among macro-invertebrates, 21 individuals of insects and 18 of mollusca were collected and identified from the different locations of the study area, and their details are given in Table 14.

Table 4-52: Macro-invertebrates recorded from the different water bodies of the study area

No.	Taxonomic details	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10	S-11	S-12	Schedule Status in WPA (1972)	IUCN Status
Mollusca															
1	<i>Bellamya bengalensis</i>	+	+	+	+	+	+	+	+	+	+	+	+	NA	NE
2	<i>Bellamya dissimilis</i>		+	+	+	+	+	+	+	+	+	+	+	NA	NE
3	<i>Corbicula fluminalis</i>	+					+		+			+		NA	NE
4	<i>Corbicula sp.</i>	+	+	+	+	+	+	+	+	+	+	+	+	NA	NE
5	<i>Gyraulus convexiculus</i>			+	+	+	+	+	+	+	+	+	+	NA	NE
6	<i>Gyraulus sp.</i>	+	+	+	+	+	+	+	+	+	+	+	+	NA	NE

7	<i>Indoplnorbis exustus</i>	+			+	+	+	+	+		+	+	+	NA	NE
8	<i>Lymnaea acuminata</i>	+	+		+	+	+	+	+		+	+	+	NA	NE
9	<i>Lymnaea sp.</i>	+	+	+	+	+	+	+	+	+	+	+	+	NA	NE
10	<i>Melanoides lineatus</i>			+			+	+	+	+		+	+	NA	NE
11	<i>Melanoides tuberculatus</i>		+		+	+					+			NA	NE
12	<i>la globosa (apple snail)</i>	+		+	+	+	+		+	+	+	+		NA	NE
13	<i>Pila sp.</i>		+		+	+	+	+	+		+	+	+	NA	NE
14	<i>Pisidium clarkeanum</i>	+		+	+	+	+	+		+	+	+	+	NA	NE
15	<i>Thira sp.</i>		+	+	+		+	+	+	+	+	+	+	NA	NE
16	<i>Thira tuberculata</i>	+		+	+		+			+	+	+		NA	NE
17	<i>Unio tigridis</i>	+	+		+	+	+	+	+		+	+	+	NA	NE
18	<i>Vivipara bengalensis</i>	+	+	+			+	+	+	+		+	+	NA	NE
	Total	12	11	12	15	13	17	14	15	12	15	17	14		
	Insecta														
1	<i>Amphiops sp.</i>				+			+			+		+	NA	NE
2	<i>Baetis nymph</i>	+			+	+	+	+	+	+				NA	NE
3	<i>Berosus pulchellus</i>	+	+	+	+		+	+	+	+	+	+	+	NA	NE
4	<i>Caenid mayfly</i>			+		+	+	+		+		+		NA	NE
5	<i>Chaoborus sp.</i>	+		+	+		+	+		+	+	+		NA	NE
6	<i>Chironomus plumosus</i>	+	+		+		+	+	+	+	+		+	NA	NE
7	<i>Chironomus sp.</i>			+		+			+		+	+		NA	NE
8	<i>Cybister limbatus</i>	+	+	+	+		+	+		+	+	+		NA	NE
9	<i>Damsel flies nymphs</i>	+	+	+	+	+	+	+	+	+		+	+	NA	NE
10	<i>Dragon flies nymphs</i>	+	+	+	+	+	+	+	+	+	+	+	+	NA	NE
11	<i>Ephydra larvae</i>	+				+	+	+	+	+	+	+		NA	NE
12	<i>Hirudineria glossophonia</i>			+	+		+			+		+	+	NA	NE
13	<i>Hirudineria sp.</i>		+	+		+		+	+		+			NA	NE
14	<i>Hydropsyche sp.</i>				+			+			+			NA	NE
15	<i>mnodrillus hoffmeisteri</i>	+	+	+			+			+	+			NA	NE
16	<i>Mayflies nymphs</i>	+	+	+	+	+	+	+	+	+	+	+	+	NA	NE
17	<i>Mosquitos larvae</i>	+	+	+	+	+	+	+	+	+		+	+	NA	NE
18	<i>Ranatra elongata</i>	+	+	+	+	+	+	+	+	+	+	+	+	NA	NE
19	<i>Ranatra filliformis</i>	+	+		+		+		+	+	+	+	+	NA	NE
20	<i>Stone flies nymphs</i>	+		+		+	+		+	+		+	+	NA	NE
21	<i>Tubifex tubifex</i>	+	+	+	+	+	+	+	+	+		+	+	NA	NE
	Total	15	12	15	15	12	17	16	14	17	15	15	12		
Source: Primary Survey data supported by Data of Department of Forest, West Bengal.															

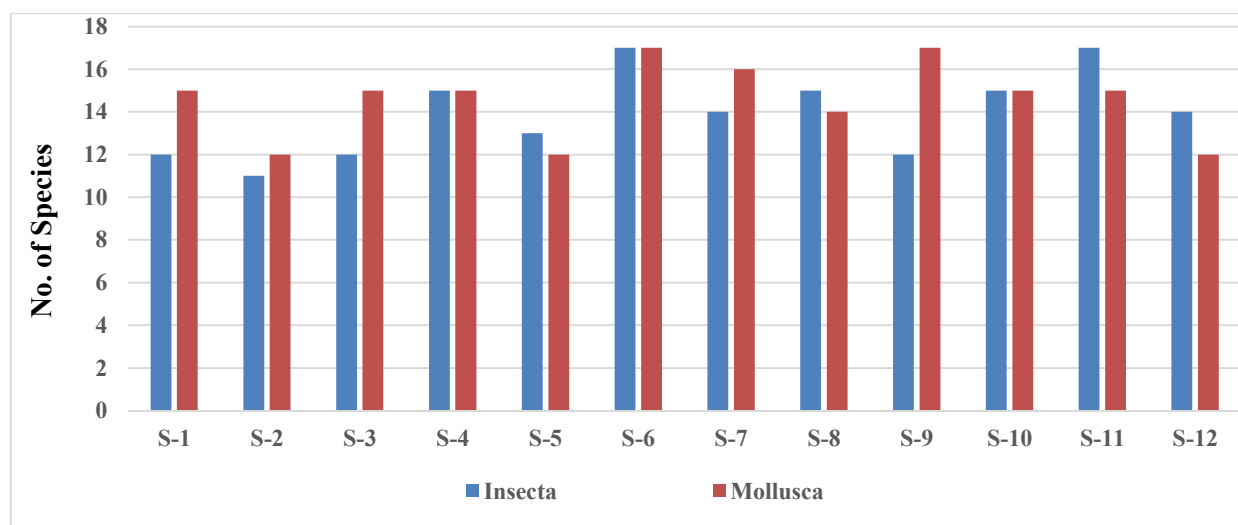


Figure 4-43: Site wise qualitative variation in macro-invertebrates in the study area

iii. Amphibians

Amphibians and reptiles are commonly found at places along the margin of aquatic and terrestrial systems. There are several water bodies present in the study area like rivers, streams, ponds, stop dams etc. which are providing shelter to many amphibian species. Some of the commonly reported amphibian species in the present study areas are *Bufo melanostictus* (common Indian toad), *Euphlyctis cyanophlyctis* (Indian skipper frog), and *Hoplobatrachus tigerinus* (Indian bullfrog). None of the Amphibians have been observed under the of Rare, Endangered, and threatened category whereas, **Monitor lizzard** (*Varanus bengalensis*) have been recorded among reptiles in the study area, which is listed under the **Schedule-I category** in the animals list of Wildlife Protection Act, 1972 and its subsequent amendments.

(iii) Fishes

The study area of the present expressway development project area has several lentic and lotic water bodies in which few are perennial and most of the water bodies are seasonal or monsoon fed. Apart from some major rivers, few private ponds are also present in the study area mainly used for the culture of fishes. All these water bodies support some fish species. Fishes found in the study area have been listed in Table 15.

Table 4-53: Fish Fauna found in different seasonal and perennial water bodies in the study area

S. No	Name of the Taxa	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	-10	-11	-12	IUCN Status	Schedule status in WPA (1972)
1	<i>Catla catla</i>	+		+	+	+	+	+		+	+	+		VU	NA
2	<i>Channa stiiatus</i>		+		+		+		+	+	+		+	LC	NA
3	<i>Channa punctatus</i>		+	+		+	+	+				+	+	LC	NA
4	<i>Cirrhinus carpio</i>						+	+				+	+	LC	NA
5	<i>Cirrhinus mrigala</i>	+	+	+	+				+	+	+		+	LC	NA
6	<i>Cirrhinus reba</i>	+			+	+	+	+	+		+	+	+	LC	NA
7	<i>Labeo bata</i>			+			+			+	+	+	+	LC	NA
8	<i>Labeo rohita</i>	+	+	+				+		+	+	+	+	LC	NA
9	<i>acrobrachium malcomsoni</i>	+	+	+	+	+	+	+	+	+	+	+	+	LC	NA
10	<i>Mastacembelus armatus</i>				+		+	+	+	+	+	+		LC	NA
11	<i>Mystus bleekri</i>			+		+		+		+	+	+	+	LC	NA
12	<i>Mystus tengara</i>	+	+	+	+	+	+	+	+	+	+	+	+	LC	NA
13	<i>Puntius sarana</i>	+		+	+		+	+	+	+	+	+		LC	NA
14	<i>Puntius sophore</i>		+	+		+		+	+	+	+	+		LC	NA
15	<i>Puntius stigma</i>		+				+	+			+	+	+	LC	NA
16	<i>Puntius ticto</i>	+			+			+				+	+	LC	NA
17	<i>Xenentodon cancila</i>		+	+	+	+	+	+	+	+	+		+	LC	NA
18	<i>Pangasius buehanani</i>			+			+	+	+	+	+		+	LC	NA
		8	9	12	10	8	13	15	10	13	15	14	14		

Note: VU= Vulnerable, LC= Least Concern and NA= Not Application.

Source: Primary Survey data of P&M Solution and data supported by Department of Fisheries, West Bengal

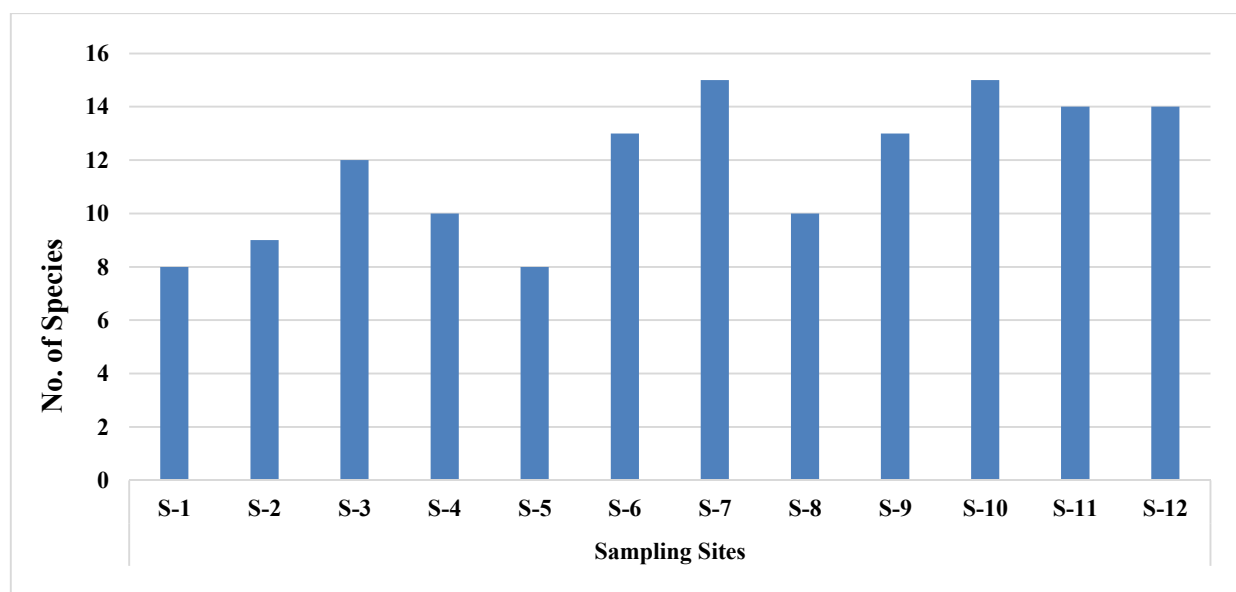


Figure 4-44: Site wise qualitative distribution fishes in the study area

4.7.20 Observations of Present Study (Flora & Fauna)

FLORA

The maximum part of the study area is rural agricultural fields and barren land as compared to the Forest land and protected forest. Hence, significant variations among major floral diversity and density have been recorded at all the sites. During the developmental phase, a large number of vegetation will be removed. No, rare, endangered, or threatened floral species were observed from the core and buffer zone of the present study. However, during site preparation/cleaning care will be taken to protect the rare natural vegetation if found. Compensatory greenbelt development and plantation in patches will be done in the buffer zone to enhance the natural habitat for the local wildlife species.

Fauna

The starting point of the present project alignment is located at the border of Jharkhand and West Bengal states, which have diverse groups of wildlife. Some protected forests are part of the project area; however, there are no national parks, biosphere reserves, wildlife corridors, or tiger or elephant reserves (existing or proposed), within 5 km of the project area. On the other hand, the **Jangal Mahal Elephant Corridor** is situated at a distance of 7.75 km towards the south between sampling sites

06 and 08. However, four number of elephant corridors are crossing the present highway alignment at different location (Fig. 3B).

As per the the Wildlife (Protection) Act (1972) and its recent amendment in 2022, there are 19 Schedule-I species are found in the study area such as **Jackal** (*Canis aurius*), **Sambar Deer** (*Cervus unicolor*), **Jungle cat** (*Fellis chaus*), **Stripped hyena** (*Hyaena hyaena*), **Indian Pangolin** (*Manis crassicaudata*), **Indian fox** (*Vulpes bengalensis*), **Indian elephant** (*Elephas maximus indicus*), **Indian Grey Mongoose** (*Herpestes edwardsi*), **Indian Pangolin** (*Manis crassicaudata*), **Leopard/Tendua** (*Panthera pardus fuses*), **Indian fox** (*Vulpes bengalensis*), **Cobra** (*Naja naja*), **Rat Snake** (*Ptyas mucosa*), **King cobra** (*Ophiophagus hannah*), **Indian python / Azgar** (*Python molurus*), **India monitor lizzard** (*Varanus bengalensis*), **Indian Peafowl** (*Pavo cristatus*); **Indian Spotted Eagle** (*Clanga hastate*); and **White-backed Vulture / Gidh** (*Gyps bengalensis*).

A detailed site specific conservation plan for these faunal species will be prepared and submitted with the final EIA-EMP report. However, care will be taken during the developmental activities if any other wildlife species will be found.

CHAPTER 5: ANTICIPATED ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

5.1 INTRODUCTION

This section identifies and assesses the potential impacts on different environmental parameters due to planning and design, construction and the operation of the proposed green field road development. After studying the existing baseline environmental scenario, analyzing project activities, initial field surveys, reviewing the process and related statutory norms, the anticipated potential adverse impacts have been identified and assessed for design, construction and the operation phases. Potential positive impacts or improvements have also been reviewed. The appropriate mitigation measures have been formulated to limiting the anticipated potential adverse impacts to acceptable levels for each stage of the project. The potential impacts and their suitable mitigation measures are described here.

5.1.1 PROJECT INFLUENCE AREA

Direct Corridor of Impact (COI) is within toe lines, except for noise sensitive receptors such as education and health institutes which is considered up to 100 m on either side. General corridor of impact is up to 300 m on either sides of the project road, where in ecologically sensitive areas such as national park, wildlife sanctuary, reserve and protected forests, major water bodies (including downstream water quality of flowing water bodies) etc. have been observed. Ancillary sites such as borrow area, quarry site, waste disposal sites and construction camp sites.

5.1.2 IMPACTS IDENTIFICATION

5.1.2.1 POSITIVE IMPACTS

Development of the Greenfield highway project will have following positive environmental impacts:

- Reduction of travel time for traffic along other major route;
- Reduction of vehicle operating cost including fuel cost, and saving national economy;
- Improved drainage condition, and reducing flooding at submergence section; and
- Stimulating economic development by providing better accessibility between remote part of the State and the State capital.

5.1.3 ADVERSE ENVIRONMENTAL IMPACTS

Development of Greenfield highway related adverse impacts occur at three stages of the project:

- Planning and Design phase
- Construction phase
- Operation phase

Planning and Design covers the road alignment, drainage provision, materials of construction, roadside amenities etc. that ultimately decides the impact during later phases. Most of the anticipated impacts are expected during construction and operation phase. While some of the construction phase impacts will be temporary, some are expected to be of longer term or permanent. Operation phase impacts will be continuous in nature or long term.

Environmental impacts were identified and screened during screening stage of this project. Environmental parameters for road sector project, “non-significant impacts” have been screened out from those with significant adverse impacts (if any).

Various environmental impacts identified for this highway are mentioned below:

Physical Environment

- Impact on land use
- Impact due to collection of construction material
- Impact due to soil erosion and sedimentation
- Impact on drainage and water logging
- Impact on water resources
- Impact on ambient air quality
- Impact on noise environment

Ecological Environment

- Impact on ecologically sensitive area
- Impact on flora and fauna

Socioeconomic Environment

- Impact on cultural properties
- Impact on common property resources (CPRs)
- Impact on residential properties
- Impact on commercial properties
- Impact on agricultural land

The environmental impact issues or attributes as mentioned above were identified based on the existing environmental conditions in the project areas and project interventions under the project. The actual and potential impact on above attributes due to this subproject is discussed subsequently in this section.

Table 5-1: Checklist of Impacts due to the Proposed Project

Project Phase / Environmental Impact	Impact		No Change	Short Term	Long Term
	+ve	- ve			
Impacts due to Project Location					
Loss of Land and Trees				*	
Loss of Infrastructure				*	*
Public Utilities			*		
Cultural Properties			*		
Risk Due to Earthquake			*		
Impacts due to Construction					
Change of land use					*
Soil erosion at construction sites				*	
Pollution by construction spills			*		
Health risks & Cultural Hazards			*		
Dust Problem		*		*	
Noise Pollution		*		*	*
Disturbance to traffic		*		*	
Effect on Economic Activities	*			*	*
Impacts due to Project Operation					
Noise Pollution		*			*

Project Phase / Environmental Impact	Impact		No Change	Short Term	Long Term
	+ve	- ve			
Traffic Disturbance	*				*
Odour Problem			*		
Release of Treated Effluent			*		
Agricultural Output		*			*
Positive Impacts					
Health Benefits	*				*
Improved Aesthetics	*				*
Better infrastructure facilities	*				*
Increased Socio-economics	*				*
Employment Opportunity	*				*

5.1.4 APPROACH TO MITIGATION MEASURES

The road design, construction activities and operation can have various levels of environmental impacts and corresponding mitigation measures could be formulated. The approach to mitigation measures has been in the following order:

- Avoiding adverse impacts by integrating environmental issues into project design;
- Minimising adverse impacts by design modification and adopting mitigation measures;

Compensating adverse impacts for those which could neither been minimized nor avoided

The anticipated potential adverse environmental impacts and corresponding mitigation measures, for each stage of the project, are discussed in the following paragraphs.

5.2 AIR ENVIRONMENT

Besides, direct impacts of three phases of any road development project, the growth of towns or cities taking place along the main national or state highway also results in impacting the ambient environment along the road. Such ribbon development on one hand adds to the pollution load all along the corridor and on the other, its impact proves being abject to receptors the road.

Motor vehicles have emerged as one of the most important source of vehicular air pollution especially in urban area. The green field road development projects like this are aimed at to enhance the connectivity of road transport system and there by the introduction of new traffic, so impact assessment on ambient air environment is among the most significant impacts of all such projects.

Air quality all along the project corridor will be impacted during all the three phases of the project i.e., pre-construction, construction and post construction (operational) phase. The operational stage impacts though may not be as serve terms of PM level as that of construction phase impacts, which are localized and temporary. The impacts during this phase will be of a long term nature and the intensity will be confined to the band of width of 75m to 100m from the edge of RoW on the both side of the corridor depending up wind direction. However, both the construction and operational stage impacts can be effectively mitigated if the impacts are correctly assessed at the design stage itself and adequate mitigation measures are delineated and also properly implemented. Impacts due to the construction activities will be higher nearer to the construction sites and asphalt mixing plants. Movement of vehicles carrying construction materials are also a source of air pollution and it is severe because their movement will be mostly on unpaved roads.

Particulate Matter levels at the various settlements locations could be of concern if they cross the standards for residential areas. Mitigation measures have to be worked out to decrease the Particulate Matter concentrations near sensitive areas.

5.2.1 NATURE AND CHARACTERISTICS OF POLLUTION SOURCES

A. Pre-construction Phase

The pre-construction stage activities include site clearance, shifting of various obstruction including trees falling within proposed carriage way, transportation of men and material, construction of labour colonies, offices, material storage and maintenance yards etc. Besides it also focuses on the proper selection of borrow pits and other sources of raw materials for (aggregates) supplier and establishment of transport roads etc.

Typical pre-construction tasks during this phase include:

- Use of heavy vehicles and machinery etc. during site clearance and for trees obstruction and shifting of centre.
- Men and material transportation to the construction sites and installing camps and yard.

- Organization and construction of approach road for transport of earth from borrow pits/ quarries to construction site in the pre-construction phase.

Use of Fly Ash

Fly ash is available from Raghunath Super Thermal Power Station which is close to the proposed project and located within 50 km.

For replacing a part of OPC in Concrete pavements, paving blocks, kerb stones etc. Embankments and backfills – Reinforced or unreinforced. Stabilization of sub-grade, sub-base and base course.

Table 5-2: Details of Fly Ash

S No.	Village	Dist. From project road (Km)
1	Raghunath Super Thermal Power Station	50

Use of Aggregate

A reconnaissance survey was carried out along the entire stretch of highway and identified 01 stone metal quarry are listed in **Table 5-3**, samples of these quarries have been collected from their respective crushers. Samples of various sizes of aggregate dust have been collected from each of the crusher separately.

Table 5-3: Details of Aggregates Quarries

S No.	Village	Dist. From project road (Km) (camp area)
1	From Sharirampur	Average distance of quarry site from mid-point of project road 2 km.
2	From Khendbani	Average distance of quarry site from mid-point of project road 32 km.

Use of Sand

River is the main source of natural Sand. Sand source locations are tabulated below **Table 5-4**. One sample from each source was collected during the material investigation work and the following tests have been conducted in the laboratory: Sieve Analysis and calculation of Fineness Modulus.

Table 5-4: Details of Sand Quarries

S. No.	Village	Dist. From project road (Km)
1	From Jaipanda Nadi	Average distance of quarry site from mid-point of project road 10 km
2	From Shilabati River	Average distance of quarry site from mid-point of project road 25 km

Dust during such activities would be the predominant pollutant during pre-construction stage and particularly so in case the pre-construction tasks are performed during dry summer or during pre-monsoon season.

But the impacts will be confined to specific location of stockyards labour colonies, width of RoW. Thus, the magnitude of impacts cannot be quantified because they will be location specific.

It may be pertinent to mention that such impacts could be significant on the proposed highway because disturbance and these activities without precaution can become adverse impacts because virgin area and agricultural fields are involved.

Use of Soil

Borrow Areas

The soils to be used, as sub-grade, select sub-grade and shoulder materials need to be hauled from designated borrow areas. The borrow area along the project section with relevant consent/NOC from individual land owner will be obtained before operation of borrow area during construction stage. Location Chart from showing Borrow Areas between Km 387+200 to Km 622+500 is given in below **Table 5-5** and shown in **Figure 5-1**.

Table 5-5: Details of borrow areas

BA No.	CHAINAGE	SIDE	LEAD (KM)	VILLAGE
1	389+000	RHS	0.400	Sulung Lahar
2	393+100	LHS	0.500	Bara Metyala
3	398+700	LHS	0.800	Hargara
4	403+100	RHS	0.750	Agharpur
5	409+000	RHS	0.800	Rudra
6	414+500	LHA	0.550	Bhuinadi

7	420+100	RHS	1.0	Shyampur
8	423+000	LHS	0.5	Dumdumi
9	426+000	LHS	0.85	Podlara
10	431+700	RHS	0.8	Shitalpur
11	444+500	LHS	0.8	Dumkadi
12	452+500	RHS	1.1	Dandudi
13	461+500	RHS	1.1	Haridi
14	472+000	LHS	0.6	Chandbandi
15	483+000	LHS	0.9	Bansidi
16	491+000	LHS	0.6	Shalkap
17	502+200	LHS	1.2	Jugda
18	509+000	LHS	0.9	Harakona
19	517+500	RHS	1.7	Rambandh
20	528+400	LHS	1.2	Kaniari
21	537+500	LHS	1.3	Molunia
22	547+700	RHS	0.8	Pathar Teria
23	556+500	RHS	2.3	Kamarkhali
24	567+000	LHS	1.3	Panch Mahar
25	577+400	LHS	0.8	Beurgram
26	590+000	LHS	1.4	Purba Thakuranichak
27	602+300	LHS	9.5	Mostafapur
28	612+000	LHS	10.8	Chaksadar
29	622+500	RHS	2.5	Santoshpur

Mitigation Measures

- However, preventive action measures such as proper sprinkling of water on ROW around sites where pre-construction activities concerning site clearances are being undertaken,
- Covering all the material being transported in trucks especially carrying filling materials such as earth aggregates, sand, should be adequate to mitigate the impacts during pre-construction. All such

activities may generate dust but the level of activities at a single location will not be intensive to cause any significant adverse health impact.

B. Construction Phase

During construction stage the most predominated air pollutant would be:

- Particulate matter along with various other gaseous pollutants due to different type of fuels used (in different types of vehicles, and in toxic construction equipment, domestic fuel in construction/labours camps etc.) along with certain other hazardous emission which are highly toxic pollutants from hot mix plants and leakage/ spillage of hazardous chemical used during construction.
- Dust and other pollutants generation will be high on the road stretches (under construction), and around construction yards/ plants etc. due to different construction activities including:
- Asphalt mix plant generating emission of various hazardous toxic pollutants due to heating and mixing of aggregate with bitumen.
- Material storage, transportation and handling (loading/unloading) of different construction materials such as sand, fly ash, earth from borrow pits, aggregate from stone quarries etc.
- Stone-crushing operation in the aggregate yards.
- Construction and other allied activities particularly more intensive on new bypass (new alignments for borrow pits).
- Concrete batching plants.

Mitigation Measures

- Road has been designed in such as manner that no traffic congestion in the populated area along the proposed road.
- Vehicles carrying loose particles like sand and fine aggregates shall be covered to reduce spills on existing road.
- Water may be spread on earthworks, on a regular basis.
- During and after compaction of the sub-grade, water will be sprayed at regular intervals to prevent dust generation.
- All slopes and embankments will be turfed to minimize dust generation during operation of the road.
- Sprinkling water will control fugitive dust emissions. Regular maintenance of machinery and equipment will be carried out.

C. Operational Phase

However, during construction phase, the major air pollutant of concern was particulate matter, but during operational stage:

- Dust generation from vehicular movements on highway roads are primarily confined to diesel powered vehicles besides toxic dust emission for vehicular tyres.
- Further road side dust will have minor impact on surrounding environment as road shoulder has been proposed unpaved.
- The toxic dust emission from diesel vehicles as well as due to abrasive action of tyres on roads shall continue to pollute the project corridor.
- The severity of impact of gaseous pollutants due to vehicles plying on the highway at any given time shall depend upon the traffic volume emission rates of auto exhausted pollutants and prevailing meteorological condition within the project corridor. However, such emission is a part and parcel of an overall infrastructural (roads and transport system) development process and efficiency augmentation of transport system.

5.2.2 PREDICTION OF IMPACT ON AMBIENT AIR QUALITY

5.2.2.1 ATMOSPHERIC DISPERSION MODELING

Atmospheric dispersion modeling is the mathematical simulation of how air pollutants disperse in the ambient atmosphere. It is performed with computer programs that solve the mathematical equations and algorithms which simulate the pollutant dispersion. The dispersion models are used to estimate or to predict the concentration of air pollutants by using various inputs such as meteorological parameters viz. temperature, wind speed and direction, mixing depths, inversion level, etc. and source emissions emitted from sources on the desired area. Such models are helpful to the government agencies for protecting and managing the ambient air quality. The models are typically employed to determine whether the ambient air quality level due to proposed project will comply with the National Ambient Air Quality Standards (NAAQS) or not. Over and above the prediction of the concentration of pollutant at a particular area / locations, it also assists in the designing of effective control measures / strategies to reduce emissions of harmful air pollutants during operation.

CALINE pro is based on steady-state Gaussian plume models specifically designed to calculate air quality impacts from vehicle emissions near highways. Given source strength, meteorology and site geometry, the model can predict pollutant concentrations for receptors located within 500 meters of the roadway. It also has special options for modelling air quality near intersections, bridge and parking facilities.

The model is based on CALINE3's algorithm. It divides individual highway links into a series of elements from which incremental concentrations are computed and then summed to form a total concentration estimate for a particular receptor location. Downwind concentrations from the element are modelled using the crosswind FLS (Finite Line Source) Gaussian formulation, but σ_y and σ_z are modified to consider the mechanical turbulence created by moving vehicles and the thermal turbulence created by hot vehicle exhaust in the region directly over the highway, region considered as a zone of uniform emissions and turbulence.

Terminology used in CALINE3 models

The model is broadly divided into five screens such as Job Parameters, Link Geometry, Link Activity, Run Condition, and Receptor Positions.

Job Parameters: contains general information that identifies the job, defines general modelling parameters, and sets the units (feet or meters) that will be used to input data on the Link Geometry and Receptor Positions Screens.

Run Type: determine averaging times and how the hourly average wind angle(s) will be determined. In the present case modeling exercise were made to predict the impact on worst case scenario. Multi-Run/Worst Case Hybrid type was used for CO impact modeling.

Aerodynamic Roughness Coefficient: determine the amount of local air turbulence that affects plume spreading. CALINE offers the 4 choices for aerodynamic roughness Coefficient namely; Rural, Suburban, Central Business District and Other. For the present modelling rural roughness options have been considered.

Altitude above Sea Level: Define the altitude above mean sea level. This input is used to determine the rate of pollutant spreading. The project corridor has an average altitude of 86.86 m above MSL.

Link Type: 5 choices available such as At Grade, Fill, Depressed, Bridge and Parking lot. In this particular model study At Grade link type is used.

Link Height: For the project link height is being considered as zero. Mixing Zone Width- Mixing zone is defined as the width of the roadway, plus 3m on either side.

Traffic Volume: The hourly traffic volume anticipated to travel on each link, in units of vehicles per hour.

Emission Factor: The weighted average emission rate of the local vehicle fleet, expressed in terms of grams / mile per vehicle.

Wind Speed - Expressed in meters per second. USEPA recommends a value of 1 m/s as the worst-case wind speed.

Wind Direction– The direction the wind has been recorded.

5.2.3 MITIGATION MEASURES:

- By having a better road surface during operational stage of this project the toxic dust from vehicular tyres shall be less.

However, compliance of future statutory regulatory requirements and policy plan with respect to emission limits, auto-technology, vehicular fuel quality (including adulteration etc.) which is a dynamic process and charges with economic development along with implementation of preventive/mitigative measures for control pollution exposure should be adequate to prevent any public health impacts of this project.

- Project road will be designed in such a manner that there is no traffic congestion in the populated area along the project road.
- Road will be designed in such a manner that there is no bottlenecks.
- All slopes and embankments will be turfed to minimize dust generation.
- Plantation of pollutants adsorbing fast growing trees species along the project road.

5.3 NOISE ENVIRONMENT

Noise impacts are perceived in both construction and operation stages of the project. Noise generated from the construction activities will be of high intensity and the construction workers and the residents in settlements around the construction sites will be adversely impacted due to continuous exposure to high noise levels due to the construction activities. Due to the various construction activities, there will be temporary noise impacts in the immediate vicinity of the project corridor. The construction activity will include the excavation for foundation and grading of the site

and construction of structures and facilities. Noise levels exceeding the norms at all places, especially around the settlement stretches along the corridor have to be attenuated at least to the daytime noise criteria for residential areas.

5.3.1 NATURE OF IMPACTS AND SOURCE CHARACTERISTICS

From an acoustical point of view, environmental noise particularly highway traffic noise is a complex phenomenon because its intensity and characteristics varies with time depending upon the frequency as well as type of vehicle that passes on the road.

- A large number of vehicles on road will make the exposure situation of the road side receptors one of almost continuous nature of noise exposure, fluctuating between the high levels generated by typical noisy vehicles such as trucks/ buses and the lower noise generated by cars. A few events with a high noise levels will have the same Leq as a large number of exposure events but at a lower noise levels. But from biological point of view, it is unlikely that these two noise scenario's sharing same Leq but different exposure character will cause an equal effects on the exposed pollution.
- So main problems in road side traffic noise exposure is the question of to what extent is the number of different exposure events related to the human perception of environmental stimulation. The health effects are measured in the exposed population may be discrete physiological reactions particularly of certain complex human responses, such as sleep disturbance or an effect on work performance efficiency. For human responses, those appearing after a single but a rare high exposure as well as those accruing after repeated low noise exposures (Chronic exposure) need to be evaluated carefully.

Noise emission characteristics the mean noise levels in major urban locations of India of four different categories are presented in the following table 4.4. This table shows that actual noise emission from automobiles in Indian cities is higher than the CPCB standards (at manufacturing stage) in use.

Table 5-6: Mean Noise Emission Levels from Vehicles

Type	Mean Sound Pressure level Emission (dBA)	CPCB*(Std) dBA
2 Wheeler (2 Stroke)	82 dBA	80
3 Wheeler (2 Stroke)	87 dBA	80

Type	Mean Sound Pressure level Emission (dBA)	CPCB*(Std) dBA
Motor Car (Taxi Private Car)	85 dBA	82
Heavy Vehicles (Trucks)	92 dBA	85

Auto noise emission on roads depend on many factors such as traffic density, the type and condition of the vehicles plying on the road, vehicle operational changes (acceleration/deceleration/gear changes) depending on the level of congestion and smoothness of road surface (IRC: 104-1988). As far as impact assessment of road development project such as this are concerned, the impacts of noise pollution generated are associated with all the three phases of the project; pre-construction phase, construction phase and operational phase.

A. Pre – construction Phase

The typical on site pre-construction phase activates include:

- Man and material movements, ROW clearing of obstructions and trees and establishment of labour camps, on-site offices, stock yards, construction material plants and maintenance yards etc.
- Among all these activities perhaps ROW clearing involve use of heavy machine and equipment otherwise all other activities will prevail for a short duration and also shall be localized in nature; besides this they are not likely to generate high noise pollution. The impacts of even such noise generating activities can be mitigated by not placing such project site infrastructure near to any residential or commercial activities or even labour colonies. Whereas the other activities during this phase will prevail only for a short duration during the pre-construction phase and therefore are not likely to be of significance.

B. Construction Phase

The impacts on community noise exposure during construction stage will be quite significant and characteristics of exposure to different receptors shall also be varying widely. But all such impacts shall again be of temporary in nature as the construction site will go on changing with the progress of the road development along different road stretches. The construction phase activities at during this phase can be broadly divided into two categories;

- one type include the excavation for foundation and grading of the site (including large scale material transportation and its handling using heavy vehicles), and

- Second is construction of structure and facility along with road development. Besides such construction site specific activities, the other types of construction phase activities which emit noise include stone crushing, asphalt production plant and batching plants, etc.
- The activities of such plant operations shall relatively prevail for longer than other on-site activities and shall produce significantly high noise levels.

Mitigation Measures

Construction camp shall be established at least 1000 m away from nearest habitation and forest area. Temporary noise barriers should be provided surrounding the high noise generating construction equipment during work near to settlement area. Stationary noise source like generator sets shall be provided with an acoustic shield around them. The plants, equipment and vehicle used for construction should strictly conform to CPCB standards. Vehicles and equipment should be fitted with silencer and maintained accordingly.

Noise generating activities should be scheduled based on community welfare. Noise level should regularly be monitored as per monitoring plan and if the noise level at any time found to be higher, then immediate measure to reduce noise in that area should be ensured. The following mitigation measures as given in table below need to be worked out for the noise impacts associated with the various construction activities.

Table 5-7: Summary of Mitigation Measures for Construction Stage

Source of Noise Pollution	Impacts	Generic Mitigation Measures
Utilization of heavy construction machinery; Construction of structures and facilities; Crushing plants, asphalt production plants; and Loading, transportation and	Increased Noise Levels causing discomfort to local residents and workers	All construction equipment, plants, machinery and vehicles will follow prescribed noise standards. All construction equipment used for an 8 hour shift shall conform to a standard of less than 90 dB (A). If required, machinery producing high noise as concrete mixers, generators etc. must be provided with noise shields; At construction sites within 500 m of human settlements, noisy construction activities

Source of Noise Pollution	Impacts	Generic Mitigation Measures
unloading of construction materials		shall be stopped between 9.00 PM and 6.00 AM; Vehicles and construction machinery shall be monitored regularly with particular attention to silencers and mufflers to maintain noise levels to minimum; Workers in the vicinity of high noise levels must wear ear plugs, helmets and should be engaged in diversified activities to prevent prolonged exposure to noise levels of more than 90 dB (A) per 8 hour shift; Hot mix plant, batching or aggregate plants shall not be located within 1000 m of sensitive land use and settlements; The proposed corridor will take away traffic pressure from existing highways passing through various cities hence it will reduce traffic congestion as well as Noise emission due to traffic.

C. Operation Phase

Uninterrupted movement of heavy and light vehicles at high speeds will give rise to increase in ambient noise levels along the proposed roadway. It may have negative environmental impacts on the sensitive receptors located within the zone of influence. Some of sensitive receptors like hospitals (Muskan Hospital), schools (Hathibari Primary School) and temples (Durga Mandir) has been indentified within the zone of influence of the project. In the period of operation of the proposed road the residential areas on either side of the highway are likely to experience high day as well as night time noise levels. Noise propagation from a road is influenced by distance, ground

surface meteorological conditions (wind and temperature), reflecting obstacles and increasing through barrier.

5.3.2 PREDICTION OF NOISE IMPACT ON NOISE LEVEL

5.3.2.1 NOISE MODELLING

Impact due to construction operation and Vehicular emission

As this is a highway project so the main sources of noise pollution are Vehicular movements or transportation activities.

Equivalent sound pressure level, 8 hrs average, (Leq 8 hrs), is used to describe exposure to noise from traffic. The damage risk criteria for hearing, enforced by Occupational Safety and Health Administration, (OSHA), USA is that noise levels up to 90 dBA are acceptable for eight hour exposure per day. Ministry of Labour, Government of India has also recommended similar criterion vide factories Act, Schedule No. XXIV (Government Notification FAC/1086/CR-9/Lab- 4, dated 8/2/1988). However, the proposed green belt will help to reduce noise.

For computing the noise levels at various distances with respect to the place in the highway where maximum daily noise is envisaged. Noise levels are predicted by a user friendly model the details of which are elaborated below.

5.3.2.2 Model for Sound Wave Propagation

For an approximate estimation of dispersion of noise in the ambient air from the source, a standard mathematical model for sound wave propagation is used. The noise generated by equipment decreases with increased distance from the source due to wave divergence. An additional decrease in sound pressure level with distance from the source is expected due to atmospheric effect or its interaction with objects in the transmission path.

For hemispherical sound wave propagation through homogenous loss free medium, one can estimate noise levels at various locations, due to different source using model based on first principles, as per the following equation:

$$L_{P2} = L_{P1} - 20 \log(r_2 / r_1) - AE \dots\dots\dots (1)$$

LP2 and LP1 are the Sound Pressure Levels (SPL) at points located at a distances of r2 and r1 from the source. AE is attenuations due to Environmental conditions (E). The combined effect of the entire source can be determined at various locations by the following equation.

$$L_p(\text{total}) = 10 \log(10^{(L_{pa})/10} + 10^{(L_{pb})/10} + 10^{(L_{pc})/10} + \dots\dots\dots (2)$$

Where L_{pa} , L_{pb} , L_{pc} are noise pressure levels at a point due to different sources.

5.3.2.3 ENVIRONMENT CORRECTION (AE)

The equivalent sound pressure level can be calculated from the measured sound pressure level (L_{eq} measured) averaged over the measurement surface area 'S' and from corrections K_1 and K_2 and is given by; (L_{eq} measured)

$$= (L_{eq} \text{ measured}) - K_1 - K_2 \quad (3)$$

Where,

K_1 = Factor for the background noise correction. The correction was not applied in this modeling exercise, as it was not possible to measure the background noise levels by putting off machines hence it was considered as zero.

K_2 = Environmental correction

In the present study dhvani PRO Version 3.6, a noise propagation modelling software developed by Envitrans Info solutions Pvt. Ltd. to undertake construction, industrial and traffic noise propagation studies. A variety of scenarios can be created quickly in dhvani PRO, allowing the user to determine the impact of changing the source, layout and adding /removing the effects of shielding due to noise mitigation devices such as barriers.

Input for the model

Base Map, Point Source and Receptors

Base map identifying the location of the site, noise sources, receptors and other important characteristics of the surrounding area is the foremost requirement. In this study *.jpeg raster maps created in Google map showing the locations of the project site where the maximum noise is to be achieved has been captured and imported for registering the map and setting up of the scale. The source is the location is one point of bridge to predict the noise.

Hourly noise level

Hourly noise levels observed for 8 hours at the location of bridge have been observed and adopted in studies. The noise levels to be generated intermittently due to running of vehicles for different hours have also been incorporated. Besides this, the background level at the receptors has been entered into the corresponding windows.

Model outputs

After running the model the graphical results in the form of noise level contours (Figure 1-1) have been produced which has been captured and exported. Besides this the output in the tabular form showing the estimated noise levels at different receptors owing to the impact of running of mining machinery has been generated. (Table 5-16).

Mitigation Measures

The following are the mitigation measures to reduce noise pollution:

- Noise standards will be strictly enforced for all vehicles, plants, equipment, and construction machinery. All construction equipment used for an 8-hour shift will conform to a standard of less than 75dB (A). If required, high noise producing generators such as concrete mixers, generators, graders, etc. must be provided with noise shields.
- Machinery and vehicles will be maintained regularly, with particular attention to silencers and mufflers, to keep construction noise levels to minimum.
- Workers in the vicinity of high noise levels will be provided earplugs, helmets and will be engaged in diversified activities to prevent prolonged exposure to noise levels of more than 75 dB(A) per 8 hour shift.
- During construction vibratory compactors will be used sparingly within the urban areas. In case of complaints from roadside residents, the engineer will ask the site engineer to take suitable steps of restricting the work hours even further or use an alternative roller.
- Proposed tree and shrub plantations planned for avenue plantation especially close to settlements, may form an effective sound buffer during the operation stage.
- The noise barrier will be provided below mentioned sensitive locations-

5.4 WATER RESOURCES

Road development can lead to three types of modifications to the natural hydrological environment. These are:

5.4.1 MODIFICATION OF THE SURFACE WATER FLOW

Impacts

- Alteration of the surface water regime is expected due to proposed bypass construction
- Surface water bodies along the project road might be subject to adverse impacts due to the various construction activities

- Project section is crossing, 10 Rivers, 2 Canals / Nala & 1 Distributary.

Mitigation Measures

- Cross drainage structures are designed to avoid any compromise on the flow part.
- Cross drainage structures are proposed at ponds to limit the affected area and to maintain the catchment unaffected. Compensatory digging is proposed to maintain the storing capacity of the ponds.
- Continuous both side drains has been proposed along the proposed bypass. Surface runoff shall be drained to the nearest cross drainage structure. The engineering design includes design of cross drainage structures, which should take care of the extra flow.
- Structure on the Irrigation Canals and Minors shall be designed in concurrence of Irrigation dept.
- No local water supply will be used for construction purposes. Water will be taken from nearby surface water sources such as canals etc. which are available at regular interval of the proposed highway. Water sources have been identified along the project stretch in form of rivers and Canals, are listed.
- To avoid flooding of rivers and canals, the height of the bridge has been kept significantly more than the maximum level of water flow during monsoons.

Table 5-10: Details of Water Resource

S.No.	Name of Type of water bodies
1	Parga Nadi
2	Patloi Nadi
3	Silai Nadi (Bishanpur Branch Canal)
4	Disty No 11
5	Jaipanda Nadi
6	Purundar Nadi
7	Silai Nadi
8	Ghatal Branch Canal
9	Sinkri Nadi
10	Rupnarayan River
11	Mundeshwari River

12	Damodar Kata River
13	Damodar River

5.4.2 MODIFICATION OF THE GROUNDWATER FLOW

The water level fluctuation varies from 1.40 and 10.09 m bgl. The overall composition of ground water indicates that it is moderately alkaline and predominantly CaHCO₃ type (calcium bicarbonate).

5.4.3 RAIN WATER HARVESTING

This is a green field alignment project. The proposed project will increase of surface run-off due to more paved road surface. It will have adverse impact on ground water recharging if measures are not taken during the design. Therefore, compensation is required to recharge ground water.

The Contractor will construct Rain water harvesting pits at an average distance of 500 m on either side of the highway which will be connected with longitudinal drains.

- The pits should be at least 5 m above the highest ground water table.
- The Contractor shall submit a detailed layout plan for all such sites in consultation with Central Ground Water Board and approval of the PMC shall be necessary prior to their establishment.
- The schematic diagram of Rain water harvesting pit is presented as

Rain Water Harvesting Structure along the Project road total no.s = 60 nos.

Cost of each Rain Water Harvesting Structure = 40,000

Total cost of Rain Water Harvesting Structure = 24,000, 00 Rs.

IMPACTS:

- Loss of ground water table due to withdrawal of ground water for construction.
- Increase of surface run-off due to more paved road surface.

MITIGATION MEASURES:

- Detailed hydrological survey will be conducted and adequate drainage facilities provided to discharge the run-off to existing catchments area.
- Provision of recharge pits, in the design to recharge ground water, in the urban area.
- Longitudinal road-side drains on both sides of the highway and out fall should be nearby culverts/ bridges on Nalas/ rivers/ drains.
- All the construction preparatory activities for culverts, bridges and other structure will be carried out during dry seasons.

- Water for construction will be arranged by the contractor from the existing sources.
- Minimum use of water from existing sources for construction purpose will be ensured promoted at construction site/camps to minimize likely impacts on other users.
- Rainwater harvesting structures shall be provided near the disposal point of the side drains as prescribed by CGWB guidelines. The typical rain water harvesting structure has been shown in

Figure 5-2.

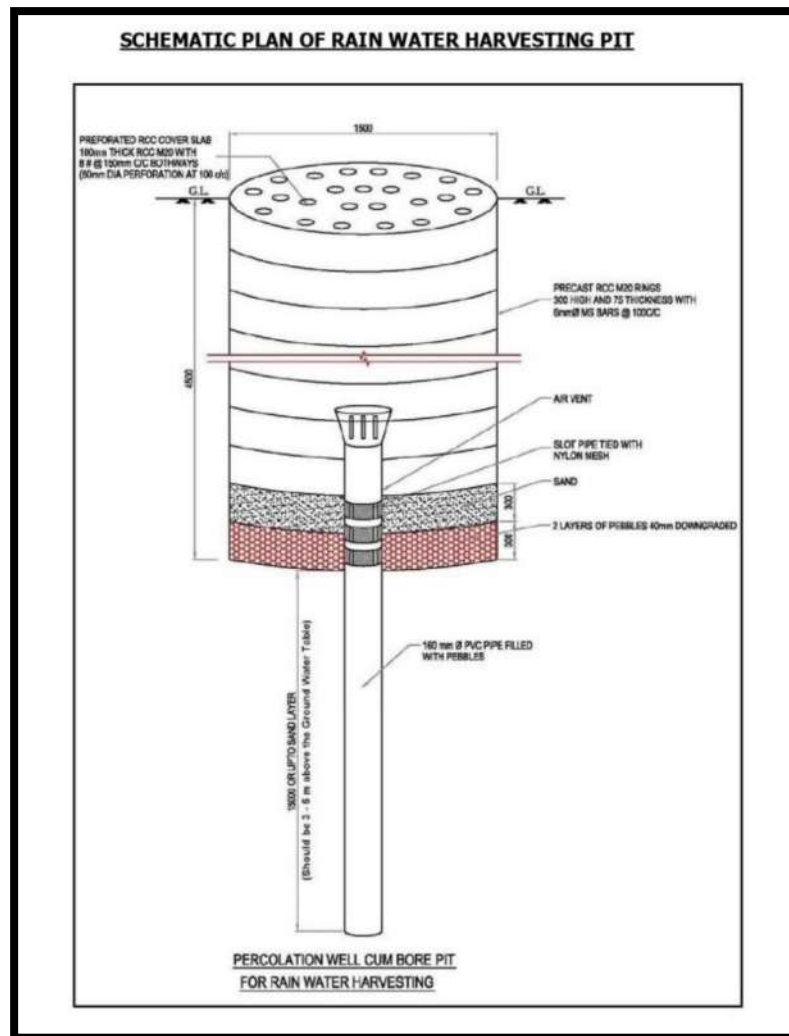


Figure 5-2: Rain water harvesting structure

- **Oil interceptor:** Oil and grease from road run-off is another major concern during construction as well as operation. During construction, discharge of oil and grease is most likely from workshops, oil and waste oil storage locations, and vehicle parking areas of construction camps. Waste having hazardous properties will be stored in designated area only. 1 nos. each construction package site of

oil interceptors shall be provided at camp sites to arrest oil and grease, as per below figure. The arrested products shall be disposed as per MoEF&CC and SPCB guidelines. The location of fuel storage and vehicle cleaning area will be at least 500 m from the nearest drain / water body.

- No contamination of any water source is envisaged during the operation period. However, water quality may be impacted due to washing of the vehicles near the water bodies, run-off from the oil spillage area due to wear and tear of vehicles, etc. Road run-off can contain oil, which may end up reaching into local water bodies.

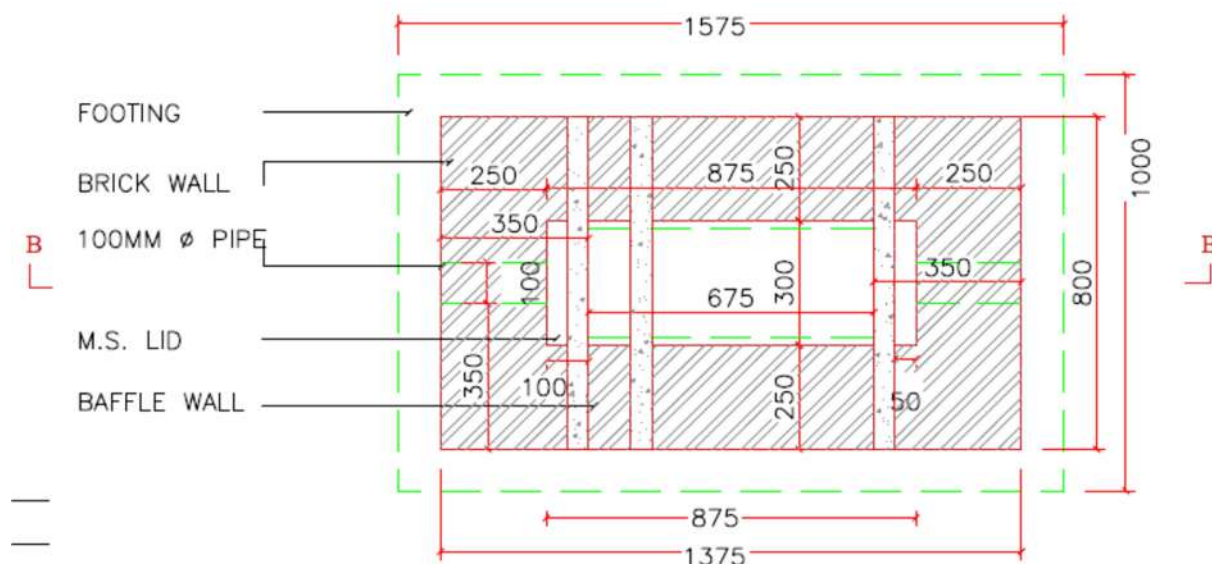


Figure 5-3: Oil Interceptor

5.4.4 WATER QUALITY DEGRADATION

Some important parameters like pH; Chlorides, alkalinity etc. were compared with the acceptable standard for drinking water. No direct impact on water quality is predicted.

5.5 LAND ENVIRONMENT

5.5.1 PHYSIOGRAPHY

The impact of road construction on physiography is a function of the terrain of the area. Since entire length of bypass passes through plain areas and the main carriageway will be raised, therefore, there will be visible and significant impact on physiography of the region.

A. Preconstruction Stage

No significant impact on topography is envisaged during the pre-construction stage.

B. Construction Stage

The impacts on the local topography will be significant. Digging for the borrow materials would bring about significant changes in the existing topography around the borrow areas. Similarly stone quarrying, fill and cuts for widening, provision for construction, yard for material handling and building of project related structures can further alter the local topography of the project direct influence area.

C. Operation Stage

No significant impact is envisaged on topography during the operation stage.

5.5.2 LOSS OF PRODUCTIVE SOIL

Loss of productive soil, although during the construction stage only, is envisaged at locations of workers camps, stockyards, storage godowns etc. if these are located on cultivated areas. Provision has been made in EMP to ensure that no productive areas are used for these purposes. In any case, though it would be a direct impact, it would be reversible and low in nature.

Land Use

The land use in the entire alignment will be converted into pavement permanently due to construction of the road. Thus fertile agriculture land coming within the RoW will be lost permanently. During the construction period there will be temporary land acquisition for access road for construction site,, location of crushers, hot mix plants and workers camp for the project road.

Soil Erosion

Loss of productive soil due to road construction is direct, adverse and long term. It is therefore necessary to ensure that this top soil is replaced or rehabilitated for plantations or agriculture after construction. The loss of productive soil especially in irrigated areas can be considered a long-term residual impact. As the project involves the acquisition of some productive agricultural lands, the impact will be mitigated with the help of appropriate measures.

Contamination of Soil

A. Pre – construction Stage

The loss of topsoil and the contamination of the soil will be negligible in the pre-construction stage, as the site clearances activities do not involve stripping the site. However, the movements of heavy clearing machines will result in temporary compaction of the soil.

B. Construction Stage

During Construction Stage, the soil is likely to be impacted due to various construction activities. Spilling of Construction materials and the residual waste will result in soil pollution. The topsoil is rich in nutrient value and supports rich bio-diversity. Location with this thin soil and soils already under erosion are susceptible to high impacts even with slight modifications in the area. Intense construction activities in these areas lead to erosion and loss of productivity. Impact will be more pronounced in this area due to lower permeability of the black cotton soil and hence higher retention time of the runoff from construction activities as well as the residential wastes.

Road construction activity will involve stripping all the top soil, however that is restricted within the direct influence zone i.e., RoW itself. The locations identified as borrow areas will experience the loss of productive soil cover. The EMP thereby ensures proper utilization of this soil into landscaping activity and adequate trimming and dressing of the borrow areas. Spillage, leakage and disposal of construction materials, setting up of the construction camps and improper waste disposal will lead to short term contamination of the soil.

C. Operation Stage

No loss of topsoil is envisaged during the operation stage of the road. However, the commuters along the road envisage contamination of the soil due to accidental leaks, spills and waste disposal during the operation stage. These impacts are reversible and short term.

Table 5-19: The Type and Scale of Soil Impact

Location	Type of Impact		Scale of Impact	Mitigation measures suggested
	Loss of productive soil	Erosion/ Contamination		
Road side open stretches	No Loss; Beneficial	Very less	May be negative impact during construction	More trees plantation to enhance environment and for soil conservation.
Market and congested areas	No Loss; Beneficial	No	May be negative impact during construction	Not needed

Borrow pit area	No Loss of productive soil; Beneficial	No	-	Can be developed into pond for fisheries
Near Bridges	No significant Loss of productive soil	Soil erosion due to high embankment	-	By turfing, slope should be gradual

5.6 IMPACTS ON FLORA, FAUNA AND ECOSYSTEM

5.6.1 FOREST AREA

Need for diversion of forest land has been envisaged for this project. Hence Forest Clearance under the purview of Forest (Conservation) Act, 1980 is applicable. Approx. 108 ha of forest land is proposed to be diverted for the proposed project. The application for the same has already been done to the forest department.

National Park/ Ecological Sensitive Areas

The 10-km buffer zone of the project area is not having any

- National Park
- Biosphere Reserve
- Tiger/ Elephant Reserve
- Wildlife Sanctuary

There is a scope of slight impact to local domestic animals, which graze in the area especially after the road is constructed. Increased vehicle movement in the area might lead to accidents involving animals. Apart from this, micro-ecosystems developed on the roadside with the birds, animals and insects using the plantation over the years would be lost due to loss of their habitat.

5.6.2 Removal of Trees

Approximately 32000 (20000 no. of forest trees and 12000 no. of non-forest trees) recorded in proposed RoW. The impacts of tree cutting on the environmental quality will be as follows.

- The loss of trees will lead to higher degree of soil erosion. This has to be compensated by re-plantation of trees in the first priority, at the pre-construction stage.

- The loss of trees will reduce the ambient air quality since trees act as adsorbent of air pollutants thereby improving the air quality.

The reduction in number of trees, especially in or near congested market places will enhance the raising of noise level.

- The other benefits of such trees such as shade, availability of fruits etc. will be worst affected till the new trees grow up and compensate.

However, a careful and proper planning of re-plantation of trees right at the commencement of construction and the phase wise removal of existing trees will mitigate the negative impacts.

Conservation and Mitigation Measures

Assessment of habitat quality, extent and analysis of usage and problems are essential prerequisite for Environmental Management Plan. Predicting barriers caused by local and state activities is critical. The following measures could be essentially practiced for the environmental and biodiversity conservation in the project area:

1. Management of Activities: A collaborative management approach involving the Forest department, Wildlife wing, Park personnel, local people and knowledge partners, such as, academia and research, and interface institutions like non-profit organizations and trusts would be appropriate for this purpose: for maintenance of wildlife habitat, habitat improvement and awareness generation. The establishment of industry must be discouraged in those areas nearby to Park and Eco sensitive zone.

2. Awareness Generation: It is, therefore, suggested that the information in regard to species of plants and animals existing in the project site, importance of these species for human beings and conservation of food chain organisms and ecological processes essential for ecological balance at the site, threats for their survival and suitable package of practices for conservation of biodiversity need be made available to the local people and other stakeholders through print and electronic media, street plays (nukkar natak) and exhibitions. Local festivals and fairs (mela) can be better opportunities for awareness generation.

3. Promotion of Eco development and Ecotourism: In order to reduce the dependency of local people on the forest, savannah, grassland and natural biodiversity for different socio-economic needs, such as, fire-wood, small timber, leaf fodder and medicinal species, etc., the eco-development programme focusing on the cultural and socioeconomic and environmental dimensions specific to

the project site need be encouraged utilizing local knowledge and practices. The existing Wildlife Sanctuaries (Dalma wildlife sanctuary) and development of the proposed highway will further promote tourism activities in the area, therefore, the local people centric-ecotourism focusing on savannah, grasslands, wetland and organic-agriculture (agro-tourism), and rural life-style (rural-tourism) need be strengthened and popularized in order to promote availability of natural resources indigenously, employment opportunities and income of the local inhabitants at their own location. Such an activity will also promote respect for local culture among the tourists and park visitors, besides supporting conservation through measures like zero-waste activities, organic farming, sustainable-harvest, green sanitation and green economy.

4. Control of Population Influx around the Highway: The construction of proposed Highway will lead to increase in human population from outside the project area also. This will adversely affect the carrying capacity of the project site (at least temporarily) as far as the space and livelihood needs are concerned. This needs to be regulated through development of well managed habitation and growth centers accordingly.

5. Promotion of Farm Forestry, Agro-Forestry and Silvo-Pasture: The multi-species land uses, such as, agro-forestry and farm forestry in the farm land, horti-pastoral and silvo-pastoral practices on the barren lands and wasteland need be given priority to achieve soil conservation and to obtain economic goods, such as, fire-wood, small timber, fodder and fruits simultaneously. For this purpose, locally-preferred species should be considered on priority.

6. Habitat Management for Wildlife: The landscape approach following decentralized collaborative management need be adapted for this purpose. The habitat management practices such as, road-side plantation, rain water harvesting, fencing along road-side habitats specially near the Wildlife Sanctuary, eradication of invasive species regulated grazing by domesticated livestock at selected site (away from wild animal foraging and nesting grounds) and making roads less attractive to birds can be adopted.

For good governance in the interest of wildlife conservation and sustainable economic development, the following regulatory measures need be practiced equitably in case of common citizens, authorities and very important persons:

- Wildlife (Protection) Act 1972 and amendments
- The Forest Conservation Act 1980

- The (Prevention and Control of Air Pollution) Act 1981
- The (Prevention and Control of Water Pollution) Act 1974
- The Environment (Protection) Act 1986
- The Biodiversity Act, 2002
- Discharge of effluents as per EPA, 1986
- Noise Pollution and Control Rules, 2000
- Construction and Demolition of Waste Management Rules, 2016
- Solid Waste Management Rules, 2016
- Plastic Waste Management Following Plastic Waste Management Rules, 2016.

7. Measures Taken For Pedestrian Safety

17 no.s of Major Bridges, 191 no.s of Minor Bridges and 11 nos. MNB at Interchange, 11 no.s of VUP, 11 no.s of VOP, 71 no.s of LVUP, 51 no.s of SVUP, 16 no.s of Wildlife Underpasses, 04 no.s of ROB, 2 no.s of Structure over Gas Pipe Line, 16 nos. (Flyover) at MCW and 2 nos. flyovers at Interchange location, 8 nos. Elevated/Viaducts, 469 no. of Box Culverts at MCW and 13 no. at Interchange and 6 no.s of Elephant Corridors has been provided in proposed project for safety of pedestrian and as well as animals.

5.6.3 PLANTATION

A. Pre-Construction Stage

This is a Greenfield project so no question of damage of the road side plantation.

B. Construction Stage

32000 (20000 no. of forest trees and 12000 no. of non-forest trees) are planned to be felled for which the compensatory afforestation and avenue plantation would be taken.

The detailed avenue plantation has been discussed in Chapter-9

C. Operation Stage

There would be positive impact on this front as new trees would come up.

5.7 SOCIAL ENVIRONMENT

5.7.1 LAND ACQUISITION

• Preconstruction Stage

As the proposed 4/6 laning is to acquire the land, Most of the land acquired will be agricultural land.

The preliminary baseline socio-economic survey identified that some structures are likely to be affected due to the project. The remaining included private and government structures that will be affected due to the proposed project. Most of the structures affected are of permanent nature.

The pre-construction stage demands the clearing of the site, which would result in disruption of a few community facilities. The facilities affected may be the following:

- Institutions, Bus-stops
- Electric lines and poles
- Telephone Lines and Poles
- Hand pumps, wells, tube wells.

Community Facilities

The Community Facilities like public utilities and amenities get significantly disrupted during the construction activities. All community facilities and public utilities that are to be impacted due to the project will be relocated prior to the commencement of the project construction.

A total of 535 structures are likely to be affected excluding the government and common properties resources. Most of the structures are likely to be affected belong to permanent category.

• Construction Stage

The visual quality of the construction site and temporary detours may affect the local community. During the construction stage of the project, scattering of construction debris also presents an ugly look to the corridor. These effects will be minimized to the extent possible with pre-designated transit routes for the construction vehicles.

• Operation Stage

Damage by vehicular collision if located nearer to the corridor. Overuse of the property-increased traffic will lead to commercialization of the abutting land, better communication along the corridor would also attract more visitors to these sites as rest areas, thus destroying their ambience.

5.7.2 MONUMENTS /HISTORICAL AREAS & ARCHAEOLOGICAL SITES

There is no important Archaeological resources, or sites of cultural interest within the study area that are of state or national level interest.

5.7.3 HUMAN HEALTH

A. Construction Stage

Human health is an issue of concern, especially in the construction camps. These camps if not adequately equipped for habitation will experience the outbreak of diseases. These camps are anticipated to house upto 500 people for the period of 24-30 months. Given this concentration of people, the potential for disease and illness transmission will increase. However, the guidelines laid by the MOEF&CC, if appropriately, deployed, helps maintain the health standards.

Mitigation measures

Construction workers will be fully trained and will be provided adequate safety measures such as safety helmets, safety boots, earplugs and gloves. During construction regular training will be given to construction workers in respect of safety measures as well as environmental protection measures. Construction workers will also be provided ready access to on-or-off site health care facilities to reduce the transmission of infectious diseases, and provide first aid for minor injuries.

5.7.4 ROAD SAFETY

Since there is a Greenfield road development so there is no significant impact during construction period. The activity related to operation will increase the incidence of accidents. However, the situation will be improved during the operation stage due to the improved design and providing safety signages adequately.

The Operation Stage envisages the design speed of 100 km/ hr, there is pedestrian and cattle movement. These sections become sensitive and are prone to accidents. However, due care has been taken during the design-stage to overcome such related hazards.

However, such incidents would be minimized with the help of appropriate **mitigation measures**.

The chances of accidents could be minimized by (1) strengthening the pavements, (2) improving upon the curves in road geometrics, (3) fly-over and grade separators (4) proposing the service lanes in market places and near schools, etc (5) providing proper median, (6) improving upon road crossings (7) putting right signals and signboards, (8) new under passes. The human diseases caused by the contamination of water, increase in air pollutants and noise may go up by 5-10% but proper mitigation can take care of the situation.

Table 5-20: Traffic Signage Detail

Sl. No.	Type of Sign	Nos.
1	One Way Object Hazard Marker (OHM)	15
2	Two Way Object Hazard Marker (OHM)	20

Sl. No.	Type of Sign	Nos.
3	Height restriction (Regulatory Sign)	35
4	Speed Limit Signs (Regulatory Sign)	5
5	Merging Traffic Ahead (Cautionary Sign)	5
6	Compulsory Keep Left Sign (Regulatory Sign)	6
7	Compulsory Ahead Sign (Regulatory Sign)	7
8	U-Turn Prohibited Sign (Regulatory Sign)	5
9	Give way sign (Regulatory Sign)	8
10	Chevron Marker	2
11	Triple Chevron Marker (At roundabout)	0
12	Reassurance Sign (Direction & Place Identification Sign)	40
13	Roundabout Sign (Cautionary Sign)	0
14	Left/ Right Hand Curve (Cautionary Sign)	5
15	Expressway Route Marker Sign	4
16	Entry/ Exit Expressway Sign (Information Sign)	6
17	End of Expressway Sign	1
18	Map type Advance Direction Sign	2
19	Flag type Advance Direction Sign	3
20	Advance Directional Sign (Overhead Cantilever/ Gantry)	4
21	Rest Area Information Sign (Overhead Cantilever/ Gantry)	5
22	Slogan Gantry	6

5.8 SUMMARY OF ENVIRONMENTAL IMPACT ASSESSMENT

The summary of Environmental Impact Assessment along with the mitigation Measures are presented in **Table 5-11**.

Table 5-11: Summary of Environmental Impact Assessment and its Mitigation Measures

Particulars	Stages	Potential Impacts	Mitigation Measures
Physiographic Environment			
Topography	Pre-construction & Construction	Changes are expected due to proposed project Impacts are marginal, but permanent.	Proper planning to keep the land reformation up to bare minimum
Geology	Pre-construction & Construction	Impacts are moderate because of extraction of sand	If quarry opening is required then Prior Environmental Clearance shall be obtained from SEIAA /

Particulars	Stages	Potential Impacts	Mitigation Measures
			MoEF&CC (if applicable) and Quarry Development Plan will be enforced.
Climate			
Temperature / Rainfall / Humidity	Pre-construction & Construction	Tree felling will have an impact of micro-climate of the area Heat island effect due to increase in paved roads. Low spatially restricted short-term impact	Compensatory afforestation of the trees to be cut as per Forest Dept. guidelines. With the proposed avenue plantation scheme, the micro climate of the project will be smoothening.
Land			
Loss of Forest	Design, Pre-construction & Construction	Diversion of forest	Compensatory afforestation Payment of NPV
Induced Development	Pre-construction & Construction	Change in the land use pattern	Civil authorities to plan and guide any induced development using the prevailing regulatory framework.
Soil			
Soil Erosion	Pre-construction, Construction & Operation	In Road slopes and spoils Erosion in excavated areas	Embankment protection through pitching & turfing. Regular water sprinkling in excavated areas.
Contamination of Soil	Pre-construction, Construction & Operation	Scarified bitumen wastes Oil and diesel spills Emulsion sprayer and laying of hot mix Production of hot mix and	Hazardous and Other Wastes (Management & Trans-boundary Movement) Rules, 2016. Oil Interceptor will be provided in storage areas for accidental spill of

Particulars	Stages	Potential Impacts	Mitigation Measures
		rejected materials Residential facilities for the labor and officers	oil and diesel. Rejected material to be laid as directed by monitoring consultant. Septic tank to be constructed for waste disposal.
Water			
Impact on Water Resource	Design, Pre-construction, Construction & Operation	Physical Impact / Partial loss of Water Bodies Depletion of ground water recharge Contamination from fuel and lubricants & waste disposal in camp area Contamination of surface water system due to run-off from road construction area	Wise design; compensatory digging. Provision of Storage / harvesting structure of water, wherever feasible. Oil Interceptor, sedimentation chambers, oils and grease separators and Septic tank in construction camp to be provided. Enforcement of Hazardous and Other Wastes (Management & Trans-boundary Movement) Rules, 2016. Both side drain facility to suitably divert the run-off from roads.
Air			
Dust generation	Preconstruction & Construction	Shifting of utilities, removal of trees & vegetation, transportation of material	Regular Sprinkling of Water Fine materials to be completely covered, during transport and stocking. Hot mix plant to be installed in down wind direction with at least 500m distance from nearby settlement. Regular monitoring of particulate matter in Ambient Air

Particulars	Stages	Potential Impacts	Mitigation Measures
Gaseous pollutants	Preconstruction, Construction & Operation	Operation of Hot mix plant and vehicle operation for material transportation.	Air pollution Norms will be enforced. Only PUC certified vehicles and machineries shall be deployed.
			Laborers will be provided with mask. Regular gaseous pollution monitoring in ambient air.
Ambient air quality	Operation	Generation of Dust Air pollution from traffic	Paving of shoulders Compliance with statutory regulatory requirements.
Noise			
Pre-Construction Activity	Pre-Construction	Man, material and machinery movements. Establishment of labour camps, onsite offices, stock yards and construction plants.	No Horn Zone sign, Speed Barriers near sensitive receptors Camps will be setup more than 500m away from settlements.
Construction Activity	Construction	Operation of high noise equipment like hot mix plant, diesel generators etc. Community residing near to the work zones.	Camp will be setup more than 500m away from the settlements, in down wind direction. Noise pollution regulation to be monitored and enforced. Provision of Noise barriers etc.
Operation Stage	Operation	Indiscriminate blowing of horn near sensitive area	Restriction on use of horns No Horn Zone sign.
Ecology			
Flora	Preconstruction, Construction	Loss of vegetation cover. Felling of trees.	Felling of only unavoidable trees Compensatory Afforestation as per

Particulars	Stages	Potential Impacts	Mitigation Measures
			Forest Dept. guidelines Plantation of trees along the project road, median and in areas realigned and maintaining the same for a fixed period.
Fauna	Preconstruction Construction & Operation	Loss of insect, avian and small mammalian species due to felling of trees Accidental run over	Compensatory Afforestation Speed breaker and limit in sensitive areas Wise selection of alignment
Social			
Socio Environment	Design, Preconstruction & Construction	Loss of livelihood Loss of CPRs, Religious Structures.	Rehabilitation Action Plan Relocation of CPRs, Religious Structures to suitable place.
Public Health and Road Safety			
Health and Safety	Preconstruction, Construction & Operation	Psychological impacts on project affected people. Migration of worker may lead to sanitation problem creating congenial condition for disease vectors. Discomfort arising of air and noise pollution. Hazards of accident.	Continued consultation with PAPs and the competent authority for speedier settlements of appropriate compensation package and resettlement. Ensuring sanitary measures at construction camp to prevent water borne disease and vector borne disease. Provision for appropriate personal protective equipment like earplugs, gloves gumboot, and mask to the work force. Safe traffic management at

Particulars	Stages	Potential Impacts	Mitigation Measures
			construction area. Drive slow sign and speed barriers near community facilities like school, hospital, etc.

CHAPTER 6: ENVIRONMENTAL MONITORING PROGRAMME

6.1 ENVIRONMENT MONITORING PROGRAMME

The Environmental Monitoring Programme provides such information on which management decisions may be taken during construction and operational phase. It provides basis for evaluating the efficiency of mitigation and enhancement measures, and suggested actions that need to be taken to achieve the desired effect. The monitoring includes:

- i. Visual observation
- ii. Selection of environmental parameters at specific locations, and
- iii. Sampling and regular testing of these parameters.

The objectives are:

- Evaluation of the efficiency of mitigation and enhancement measures
- Updating of the actions and impacts of baseline data
- Adoption of additional mitigation measures if the present measures are insufficient
- Generating the data which may be incorporated in the environmental management plan in future projects

6.1.1 AMBIENT AIR QUALITY (AAQ) MONITORING

The air quality is recommended for monitoring through an approved agency in the process of Construction of new Four/Six Lane proposed highway along from Km 387.200 (near Kamalpur village, Jharkhand/WB Border) in Purulia District to Km 622.500 NH-16, near Uluberia, Howrah District, in the state of West Bengal. The monitoring of air sampling should be conducted at the location of Crusher plant, HMP, Stockyards Batching plant, Haul roads. In addition to these, air quality should also be monitored near the storage sites having aggregates, sands etc.

The parameters recommended for monitoring during construction are:

- PM₁₀, PM_{2.5}
- Sulphur Dioxide
- Oxides of Nitrogen, and
- Carbon Monoxide
- Other parameters as included in the CPCB AAQ monitoring parameters.

6.1.2 WATER QUALITY

Water quality and public health parameters should be monitored till the end of project and two years after the completion. Monitoring should be carried-out at quarterly basis, to cover seasonal variations; by any recognized agency (NABL Accredited laboratory). Water quality shall be analyzed by applying the standard technique.

6.1.3 AMBIENT NOISE MONITORING

The monitoring of noise sampling should be conducted at the location of plant sites i.e. crusher plant, HMP and construction sites etc. In addition to these, noise quality should also be monitored near the school, hospital, other sensitive sites and residential areas exist along the 40 meter to 50 meter distance of project road or at the designated locations fixed –up by the environmental expert

The procedural details of monitoring of various components have been presented in **Table 6.1**.

Table 6-1: Environmental Monitoring Plan

Environmental Components	Monitoring			Location	Frequency	Institutional Responsibility	
	Parameters	Special Guidance	Standards			Implementation	Supervision
Air Quality	PM2.5, PM10, SO ₂ , NO _X , CO	As per CPCB guidelines	The Air (Prevention and Control of Pollution) Rules, CPCB, 1982	At sites where hot mix plant /batching plant is located	Twice in a month till the end of the construction	Contractor through approved monitoring agency	IC, NHAI-PIU
Ground and Surface Water Quality	pH, temperature, BOD, Total Hardness, COD, TDS, TSS, DO, Total coliform, Conductivity, Oil & Grease	Grab priority collected from source and analyze as per standard methods for examination of water and wastewater	Water quality standards by CPCB	River tributaries, roadside ponds and ground water at construction camp sites	Once in a season till end of construction	Contractor through approved monitoring agency	IC, NHAI-PIU
Noise Levels	Noise level for day and night	In free field at 1m distance from the	Noise standard by CPCB	At equipment yards, camp	Once in a season till	Contractor through	IC, NHAI-PIU

	on dB(A) scale	equipment to be monitored		and villages along the alignment.	end of construction	approved Monitoring agency	
Soil quality	Monitoring of NPK & heavy metals and grease		As per IRC code of practice	Ad-hoc if accident / spill locations involving bulk transport of carrying hazardous material		PIU through an approved agency	IC, NHAI-PIU
Road side plantation	Monitoring of felling of trees	It should be ensured that only marked trees are felled.	As given in the Detailed Design for the project.	All along the corridor	During the felling of trees	Forest depart Competent Agency	Developer to assist in coordination with NHAI
	Survival rate of trees, success of re-vegetation	The number of trees surviving during each visit should be compared with the number of saplings	The survival rate should be at least 75% below which replantation	At locations of compensatory afforestation	Every year for 3 Years	PIU	Developer & Forest Department

		planted	should be done				

6.2 ENVIRONMENTAL MONITORING COST

The environmental monitoring cost is estimated on the basis of the length and existing environmental scenario of the proposed project. Environmental monitoring cost of **8,43,000/-** per year has been allocated for construction and operation stages. The details have been presented in **Table 6.2.**

Table 6-2 Environment Monitoring Cost

S.No.	Parameters/Components	Particular	Guidelines	Total Cost (Rs)
1	Ambient Air Monitoring: At construction Stage: At 10 locations for three season in a year	Monitoring at Construction sites	CPCB AAQ Monitoring guidelines	52,500
	At Operation Stage: At 10 locations for three season for a year	Ambient Air Quality Monitoring	CPCB AAQ Monitoring guidelines	52,500
2	Ground Water Monitoring: At Construction Stage: At 8 locations for three season in a year	Ground water bodies	Analyze as per the standard methods for examination of water and waste water	96,000
	At Operation Stage: At 8 locations for three season for a year	Ground water bodies	Analyze as per the standard methods for examination of water and waste water	96,000
3.	Surface Water Monitoring: At Construction Stage: At 6 locations for three season in a year	Surface water resources	Analyze as per the standard methods for examination of water and waste water	72,000

	At Operation Stage: At 6 locations for three season for a year	Surface water resources	Analyze as per the standard methods for examination of water and waste water	72,000
4.	Noise Monitoring: At Construction Stage: At 10 locations for three season in a year	At equipment yards/ construction sites identified by IC	Using an integrated noise level meter kept at a distance of 15 m from the construction site	105,000
	At Operation stage At 10 locations for three season for a year	As directed by the Engineer	-	105,000
5.	Soil Monitoring: At Construction Stage: At 8 locations for three season in a year	At productive agricultural land	-	96,000
	At Operation Stage: At 8 locations where for three season for a year	At productive agricultural land	-	96,000
	Total Monitoring Cost (A)			8,43,000

CHAPTER 7 – ADDITIONAL STUDIES

7.1 PUBLIC HEARING

The details of Public Hearing will be provided at the time of Final EIA.

7.3 RISK ASSESSMENT

Risk assessment is fundamentally a management activity supported by persons familiar with risk management activities. A comprehensive risk assessment combines both qualitative and quantitative assessments. The qualitative assessment is useful for screening and prioritizing risks and for developing appropriate risk mitigation and allocation strategies. The quantitative assessment is best for estimating the numerical and statistical nature of the project's risk exposure.

Construction of highways involves various risk factors from designing and planning stages to completion of project. So risk assessment consisting of risk identification, risk classification and risk analysis or evaluation is necessary for maintaining cost and quality of the project and for scheduled completion of the project.

7.3.1 RISK CONTROL MEASURES

- General precautions to be maintained by the Contractor:
- Maintenance of safe systems and without risks to health
- Safe use, handling, storage and transportation
- Information, instruction, training and supervision for health and safety
- Maintenance of means of safe access and egress
- Safe working environment
- Provision of Safe articles for use and without risks to workers
- Necessary tests and examination for the use of articles before works
- Adequate information for the use of articles in factory
- Elimination/minimization of risks to health and safety wherever necessary
- Application of suitable methods for prevention and accumulation of dust and fumes
- Exhaust system for extracting toxic fumes and dust
- Fencing system for every dangerous and moving part; all moving parts shall be enclosed
- Striking gear and devices for cutting off power in an emergency.

7.3.2 HAZARD IDENTIFICATION RISK ASSESSMENT

- Hazard Identification Risk Assessment is a process of defining and describing hazards by characterizing their probability, frequency, and severity and evaluating adverse consequences, including potential losses and injuries
- Emergency Response Plan
- The overall objective of an ERP is to make use of the combined resources on-site and outside services to achieve the following:
 - To localize the emergency and, if possible, eliminate it
 - To minimize the effects of the accident on the people and property on-site
 - Effect the rescue and medical treatment of casualties.
 - Safeguard other people
 - Evacuate people to safe areas/assembly points
 - Informing and collaborating with statutory authorities to tackle the emergency
 - Initially contain and ultimately bring the incident under control
 - Preserve relevant records and equipment for subsequent enquiry into the cause and circumstances of the emergency, and
 - Investing and taking steps to prevent recurrence.

7.3.3 TRAFFIC MANAGEMENT

7.3.3.1 HAZARDS DUE TO EXTERNAL TRAFFIC

Hazards occur due to external traffic are as follows:

- External vehicle with other stationery objects in the side of the road
- Due to fall in excavated trenches, Construction workers hit by external vehicles while working, Collision between external vehicle and construction equipment /vehicle.
- Collision due to improper traffic management.
- Hit by construction equipment / vehicle.
- Use of carriageway due to blockage / absence of footpath, Injury to Pedestrians

7.3.3.2 ROAD SAFETY

Crash Barriers Metal Beam Crash Barriers is proposed at high embankment locations and at major bridge approaches. The barrier would be of “Thrie” beam type consisting of steel posts and a 3mm thick “Thrie” beam rail. There would be a steel spacer block between the post and the beam to prevent the vehicle from snagging on the post. The steel posts and the blocking out spacer would be channel section of 75mm x 150mm size and 5mm thick. The posts are spaced 2m centre to centre. All members of the system would be hot dipped galvanized. Crash barrier system absorbs impact of vehicle and laterally restrains a vehicle from veering off. This would ensure minimum damage to the vehicle and passengers.



Figure 7-1: Crash Barriers

7.3.3.3 TRAFFIC CONTROL DEVICES

Traffic control devices used to regulate the traffic in Road Construction Zones include,

1. Road Signs
2. Delineators
3. Barricades
4. Cones
5. Pylons
6. Pavement markings
7. Flashing lights

Table 7-1: Road Signs

Average Speed (Km/h)	Distance of first sign in advance of the first channelizing device (m)	Size of Warning Sign (mm)	Minimum no of signs in advance of the hazard
Under 50	100	600	3
51 – 60	100 – 300	750	3
61 – 80	120 – 300	900	3 or 4
81 – 100	300 – 500	1200	4
Over 100	1000	1200 to 1500	4

Cautionary / Warning Signs

In case of divided carriageways, the signs should be provided both adjacent to the shoulder and on the central median so as to be visible from all lanes.

Delineators

Delineators are devices or treatment which outlines the roadway or portion thereof. They include Safety Cones, Traffic Cylinders, Tapes, Drums, Painted lines, Raised Pavement Markers, Guide Posts, and Post-mounted Reflectors etc. They are used in or adjacent to the roadway to control the flow of traffic. Delineators are basically driving aids and should not be regarded as a substitute for warning signs or barriers for out-of-control vehicles.



Figure 7-2: Delineators

Guide Post

They are intended to delineate the edges of the midway so as to guide driven about the alignment ahead, particularly where it might be confusing. Guideposts can be of metal, concrete, cut stone, amber or plastic. The posts can be made of Circular, Rectangular or Triangular Cross-section but the side facing traffic should be at least 10 cm wide.

Drums

Drums of height 800 mm to 1000 mm high and 300 mm in diameter can be used as either channelizing or warning devices. Both plastic and metallic drums (e.g. Bitumen drums) can be used for this purpose. Drums need to be filled up with earth or sand to increase its stability. Drums should be reflective and painted as shown in the **Figure 7-7**.

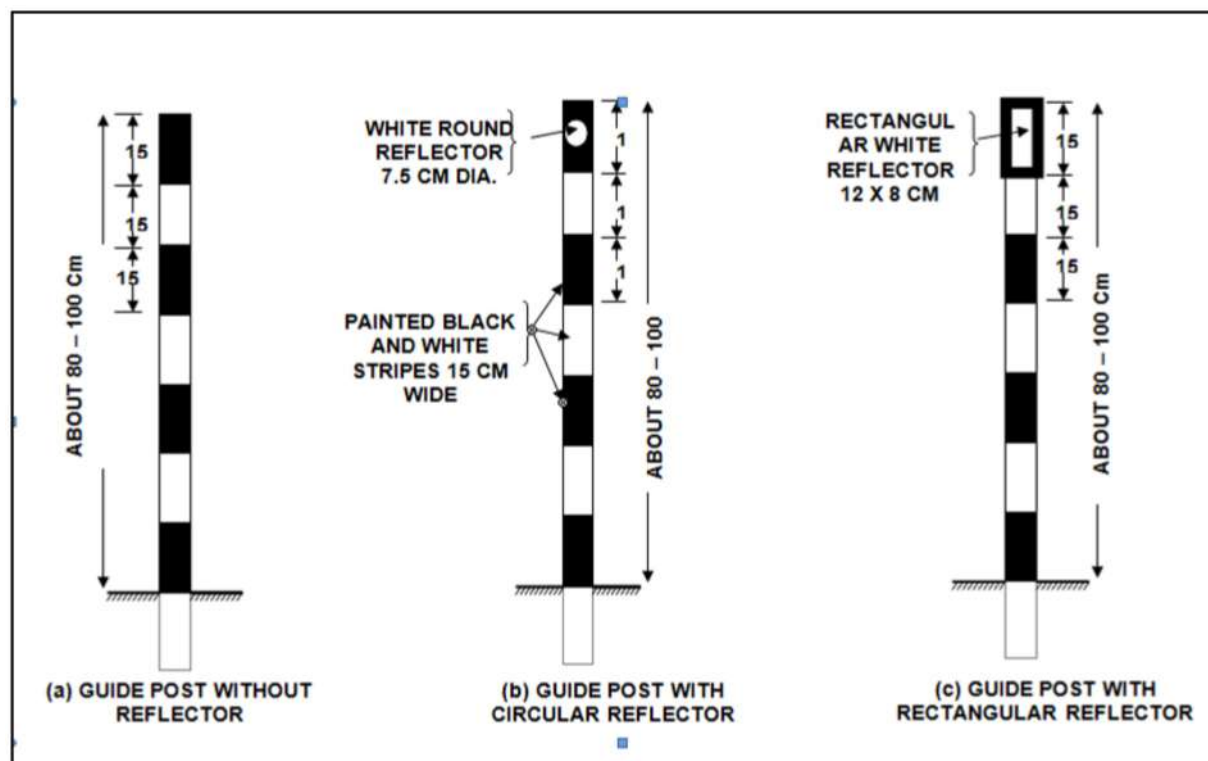


Figure 7-3: Drum Reflection

Safety Cones

Safety cones are 500 mm, 750 mm and 1000 mm high and 300 mm to 500 mm in diameter. They are usually made of plastic, rubber, HDPE, PVC and have retro reflectors with red and white bands. Safety cones would be displaced or blown unless their bases are anchored or loaded with ballast. This can

be avoided by, using sand bag rings to provide increased stability. Using heavier weighted cones. Using cones with special weighted bases. Doubling the cones to provide added weight.

Barricades

CMRL prescribed standard barricades are used.

Flagmen

- An authorized personnel at least average intelligence, be mentally alert and good in physical condition be selected, since flagmen are responsible for public and workmen safety.
- Flagmen should be equipped with yellow helmet with green reflective sticker fixed around and reflective jacket along with hand signalling devices such as flags and sign paddles. The typical specification is given below.
- Flagmen need to maintain the flow of traffic continuous past a work zone at relatively reduced speeds by suitably regulating the traffic. He shall stop the traffic for a short while whenever required (e.g. for entry and exit of construction equipment in to work zone).
- Flagman should be positioned in a place where he is clearly visible to approaching traffic and at a sufficient distance to enable the drivers to respond for his flagging instructions. A flagman never leaves his post until properly relieved,
- The standard distance shall be maintained at 60 – 100 m but can be altered depending upon the approach speed and site conditions. In urban areas this distance shall be taken as 20 m to 50 m.

7.3.3.4 TRAFFIC MANAGEMENT PRACTICES

Definitions

Road traffic control involves directing vehicular and pedestrian traffic around a construction zone, accident or other road disruption, thus ensuring the safety of emergency response teams, construction workers and the general public.

Working zone:

The Plant Site, construction zone of road *etc.* at which workmen will be working.

Working space:

The space around the works area that will require storing tools, excavated material and other equipment. It is also the space to allow workmen, movement and operation of plant, (e.g. swing of jibs, excavator arms) to move around to do the job. Materials and equipment must not be placed in the zone either. Workmen will only need to enter the zone to maintain cones and other road sign.

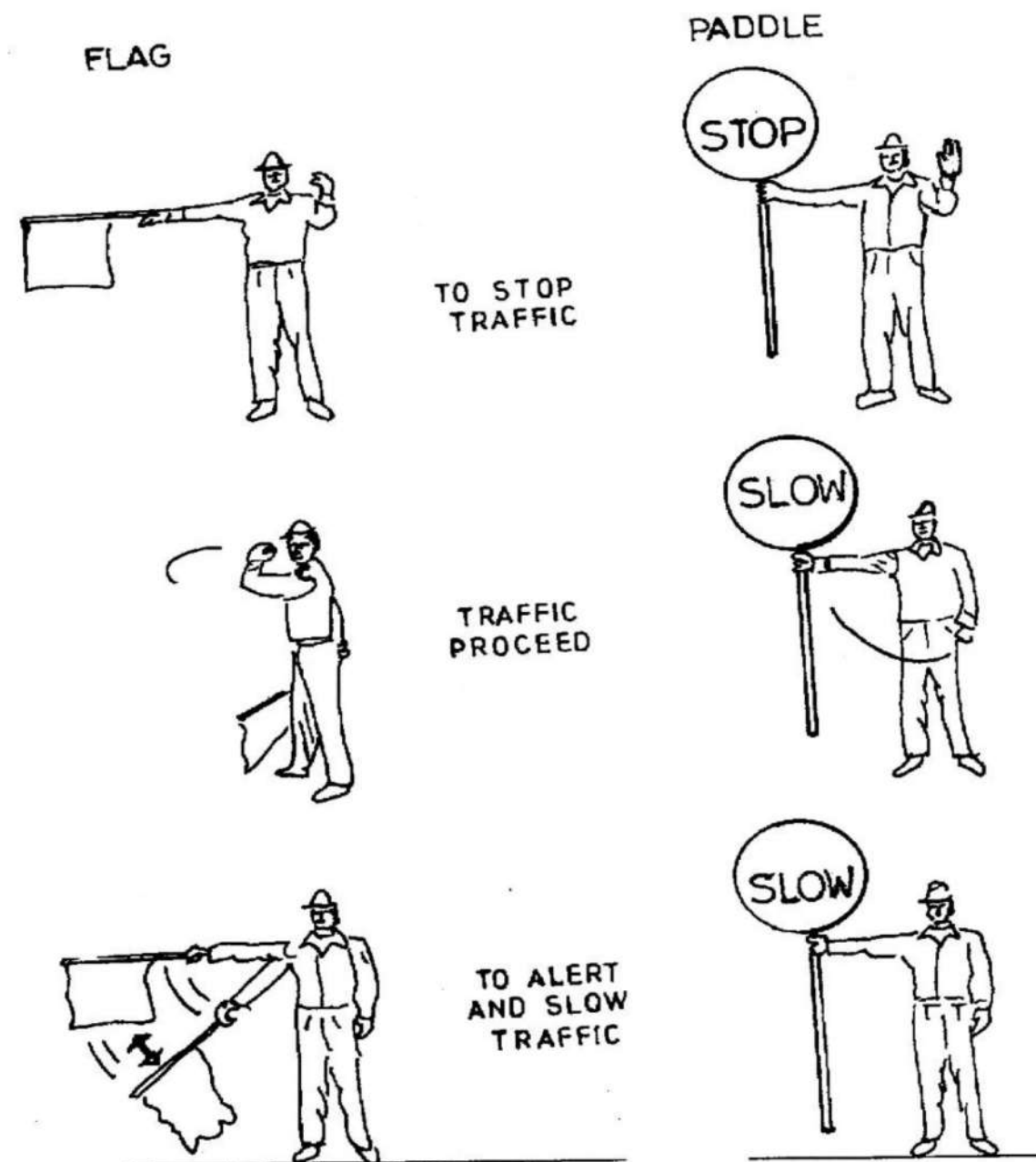


Figure7-4: Road Signals Traffic Signals

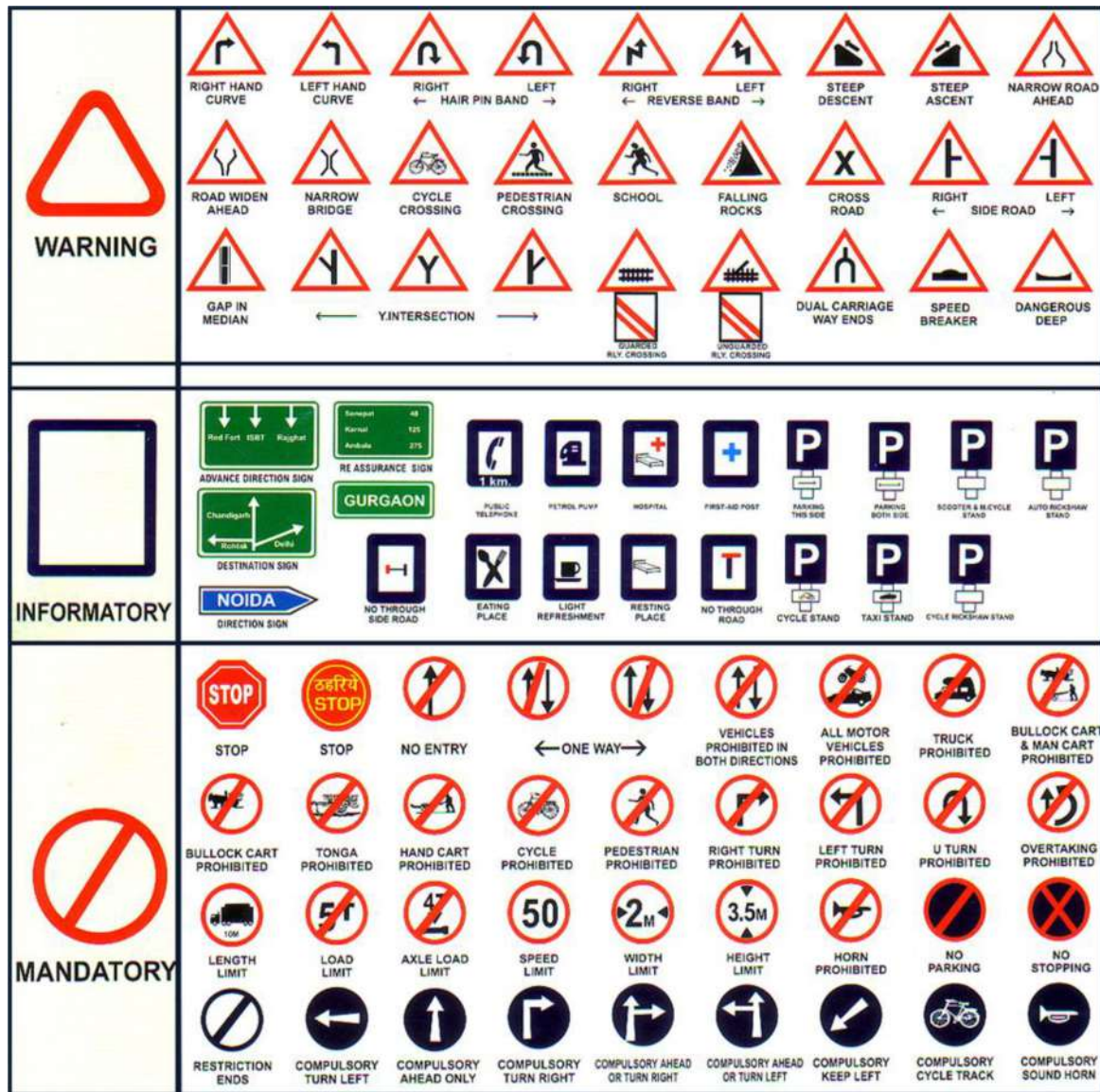


Figure 7-5: Traffic Signals

Safety zone:

The zone that is provided to protect workmen from the traffic and to protect from them.

Approach Transition zone:

This will vary with the speed limit and the width of the works as given in (diag: Traffic Control zone)

Longitudinal buffer zone:

This is the length between the end of the lead-in taper of cones (T) and the working space. It will vary with the speed limit as given in table (Traffic Control zone).

Lateral buffer zone:

This is the width between the working space and moving traffic. It will vary with the speed as given in table (Traffic Control zone). The lateral buffer zone safety clearance is measured from the outside edge of the working space to the bottom of conical sections of the cones on the side nearest to the traffic.

Traffic Management on Road Junction

Construction traffic meets live traffic from quarry/plant/borrow pit

- Where vehicles are more to the approach junction from the side road, permission shall be seek for providing speed breaker at junction from local traffic police and road-authority.
- The layout for signs and traffic control devices.
- Flag man shall be kept in the peak time provided with the traffic circle painted with red and white at the corner at a height of 500 mm, clearly visible to approaching traffic for a distance provided with while gloves and STOP, GO Paddle. And night time flagman should use LED Batons.
- All vehicles from approaching road should be STOP, LOOK and GO.
- Spillage of earth / Gravel / Aggregates / Bituminous mix from the tipper shall be cleaned on regular basis, if required 2 coolies permanently posted for booming.
- All Construction vehicles must follow lane discipline and road signs.

Activities inside Median / Island

- The traffic would discontinue from plying temporarily on the carriageway; for 2 min for reversing & dumping earth / stones / etc., , by the direction of helper and the flagman controls the traffic as shown in Picture- 01 and made continue the traffic and for the next trip repeating the same.
- The construction zone shall be barricaded with standard CMRL barricade.
- One Flagman (refer flag man clause) shall be appointed at traffic coming side of the transition zone.

No personnel are allowed to come out of the safety zone, unless flagman guidance.

CHAPTER 8: PROJECT BENEFITS

8.1 INTRODUCTION

This highway starts at Km 387.200 (near Kamalpur village, Jharkhand/WB Border) in Purulia District to Km 622.500 NH-16, near Uluberia, Howrah District, in the state of West Bengal. The length of the proposed alignment is 235.300 km approx.

Project Highway Alignment (Greenfield) of 235.300 km and the Proposed Right of Way is 70 m in non-forest Area and 60 m in Forest areas as per the requirement keeping in view the fully access controlled Highway with 4/6-lane dual carriage way configuration. This is a green field alignment, and is proposed for 4/6 Lane. The road passes through the important talukas like Jhalda-II, Jaipur, Purulia-I, Purulia-II, Hura, Pancha in District of Purulia, talukas like Indpur, Taldangra, and Simulpal in District of Bankura, talukas like Garbeta-I, Chandrakona-II, Chandrakona-I, Ghatal in District of Pashchim Medinipur, talukas like Khanakul-I, Khanakul-II, in District of Hoogli and talukas like Amta-II, Amta-I in District of Howrah in the state of West Bengal.

Existing carriage away and pavement detail

This is a Greenfield alignment where there is no existing road. This road is proposed to connect from Purulia District to Howrah District which will be a part of Bharatmala Pariyojana to improve the efficiency of the Freight movement in India. The whole section is proposed to be of Flexible Pavement type confirming to IRC: 37:2018. Rigid pavement shall be constructed in the section(s) for Toll Plaza only. The configuration of the carriageway shall conform to IRC: SP: 84:2014 and the Structures shall be constructed as 4/6 lane configurations. The Proposed ROW of this road is taken as 90 m in non-forest Area and 60 m in Forest areas as per the requirement keeping in view the fully access controlled Highway. The proposed access controlled project with new alignment has been envisaged through an area which shall have the advantage of simultaneous development as well as shall result in a shorter distance to travel. The junctions with existing road will be planned in the form of interchanges and flyover to ensure uninterrupted flow of traffic.

The proposed road would act as the prime artery for the economic flow to this region. It will enhance economic development, provide employment opportunities to locals, strengthen tourist development, ensure road safety, and provide better transportation facilities and other facilities such as way side amenities. Vehicle operating cost will also be reduced due to improved connectivity. The compensatory plantation and road side plantation shall further improve the air quality of the region

The Project will further have following benefits at national and regional level:

- **High-speed connectivity and access:** The projected corridor is a proposed economic corridor. This will avoid traffic congestion and speed-up the freight movement.
- **Aiding economic growth:** The seamless connectivity will provide better access to vehicles. The Project will reduce travel time and provide boost to trade and commerce linked to the regions connected through this economic corridor.
- **Growth of backward areas:** The biggest strength of the alignment is that it plans to cover backward districts of West Bengal. As a result of connectivity and access to other parts of the country, these backward areas will be aided to integrate with rest of the world. Further, freight and passenger traffic on the economic corridor will help promoting ancillary economy of these regions.
- **Decongestion of existing Highways:** The proposed corridor will take away traffic pressures from existing highways passing through various cities. Also, long-distance traffic will shift to the proposed corridor, thereby leaving the existing NH14 for regional and local usage
- **Usage shift:** Long-distance traffic will shift from existing NH 14 to the proposed Economic Corridor, resulting in lesser congestion on these highways.
- **Improved safety:** Due to access control, the roadway & travel safety of the traffic connecting the cities will be enhanced as there will be minimum distractions & conflict zones.
- **Support to industry:** Different types of industries like Manufacturing, Tourism etc. along the proposed corridor will be facilitated in their business operation and reach ability.

8.2 ENVIRONMENTAL BENEFITS FROM THE PROPOSED PROJECT

The environmental benefits from the proposed project have been described below:

- Better level of service in terms of improved riding quality and smooth traffic flow.
- Faster transportation will ultimately lead to massive savings in the form of reduced wear and tear of vehicles, reduced vehicle operating costs and total reduction in transportation costs etc.
- With the improvement in the traffic congestion due to obstructed movement of vehicles will be minimized on existing NH 14 and thus wastage of fuel emissions from the vehicles will be reduced.
- Increased road landscaping and safety features.
- Plantation of tree all along the proposed highway will improve the tree density along the RoW which will improve aesthetics as well as trees will act as a pollution absorber.

- The compensatory plantation and road side plantation shall further improve the air quality of the region.
- Overall Environment improvement of the region.

8.3 SOCIO- -ECONOMIC BENEFIT OF THE PROJECT

- The proposed project shall generate an employment opportunity to about 500 persons during construction phase. During operation phase about 120 persons will be employed through the concerned contractor. It shall also generate additional employment opportunities in form of transportation of construction materials, greenbelt development and implementation of EMP.
- During operations phase, the Project will largely have indirect employment benefits in form of highway amenities and through economic & social hubs developed around the Economic Corridor.
- Efficient reach and connectivity to distant markets will further enhance economy of the districts and create employment opportunities.
- Enhanced connectivity between rural & urban population which will benefit all sections of the society like general population, small-medium-large scale industries, farmers, businessmen etc.
- Faster transportation will strengthen tourism opportunity in the area.
- Improved access to higher education facilities & modern health facilities.
- The project will enhance economic development in the area through industrial & commercial areas (Varanasi, Sasaram, Ranchi, Bokaro, Purliya Jamshedpur, Kharagpur, Kolkata).
- The project also connects major other city like Varanasi, Bhabhua, Sasaram, Chatra, Hazaribagh, Ramgarh, Ranchi, Bokaro, Purliya, Bankura, Jamshedpur, Kharagpur, Kolkata in the state of West Bengal .

8.4 ROAD SAFETY

Indian Road Congress (IRC) codes will be followed in proposing and designing road safety features. Pavement markings will be done for traffic lane line, edge lines and hatching. The marking will be with hot applied thermoplastics materials. The pavement markings will be reinforced with raised RR pavement markers and will be provided for median and shoulder edge longitudinal lines and hatch markings. Highway lightings including high masts will be provided at intersections in order to improve the night time visibility. All the urban locations as well grade separated structure locations will be provided lighting arrangements. The construction of green alignment of New Four/Six lane

national Highway from proposed highway starts from Purulia District to Howrah District will ensure smooth flow of the traffic. Installation of proper road safety.

8.5 REDUCTION IN VEHICLE OPERATING COST

Vehicle Operating Cost (VOC) will be reduced when the highway is constructed. Fuel consumption, wear and tear of tyres, suspension will be benefited when a geometric of the road is improved. VOC consist of the following components.

- Fuel consumption
- Lubricating oil consumption
- Spare part consumption
- Tyre consumption
- Vehicle depreciation

CHAPTER 9: ENVIRONMENTAL MANAGEMENT PLAN

9.1 INTRODUCTION

The Environmental management Plan (EMP) consists of set of mitigation, monitoring and institutional measures to be taken during the design, construction and operation stages of the project to eliminate adverse environmental impacts, to offset them, or to reduce them to acceptable levels. The plan also includes the action needed for the implementation of these measures. The summary of all activities are provided in **Table 9.1**.

The major components of the Environmental Management plan are:

- Mitigation of potentially adverse impacts;
- Monitoring during project implementation and operation;
- Institutional capacity building and training;
- Implementation schedule and Environmental cost estimates; and
- Integration of EMP with Project planning, design, construction and operation.

9.2 OBJECTIVES OF THE EMP

The main aim of the Environmental Management Plan is to ensure that the various adverse impacts are mitigated and the positive impacts are enhanced. The objectives of the EMP at various stages of the project planning and implementation are as follows:

Design Stage

- To have minimum impact on road side tree, forestation and ground cover;
- To keep land acquisition and building demolition at a minimum;
- To provide maximum safety to the road users and road side communities;
- To develop a design that incorporates environmental safeguards; and
- To provide mitigation measures to all expected environmental degradation due to the project activity.

Constructions Stage

- To prevent and reduce the adverse environmental impacts of the project by implementing mitigation measures; and
- To ensure that the provisions of the EMP are strictly followed and implemented by strengthening implementation arrangements.

Operation Stage

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

Table 9-1: Environmental Management Plan

Environmental Issue	Mitigation Measures	Reference and Authority	Implementation	Responsibility
PRE CONSTRUCTION AND CONSTRUCTION STAGE				
Land Acquisition, R&R (Throughout the Project Corridor)	The acquisition of land and private properties will be carried out in accordance with the RAP and entitlement Framework for the project. It will be ensured that all R&R activities are to be completed before the construction activity starts, on any section of project area.	District Magistrate	Project Execution Agency	NHAI
Clearance of Encroachment/ Squatters	Advance notice, as per RAP shall be given to the encroachers and squatters which need relocation. All R & R activities will be undertaken. Entitlements as per state govt’s entitlement framework for this project will be completed before construction starts.	Revenue Authorities	Project Execution Agency	NHAI
Tree Cutting (Throughout the Project Corridor)	32000 no of trees have been identified to be removed. If necessary, the trees will be cut as per guidelines of MoEF&CC and forest dept.	Forest Dept.	Project Execution Agency	NHAI

Environmental Issue	Mitigation Measures	Reference and Authority		
			Implementation	Responsibility
Relocation of Community utilities (Throughout the Project Area)	All such Community utilities, if required will be relocated as per Govt of West Bengal rules.	District administration	Project Execution Agency	NHAI
Relocation of Cultural Property Resources (Throughout the Project Area)	No relocation suggested in the planning stage.	District administration	Project Execution Agency	NHAI
Crushers, Hot-mix Plants & Batching Plants	Specifications of crushers, hot mix plants and batching plants will comply with the requirements of the relevant current emission control legislations.	West Bengal State PCB	Contractor	NHAI
Other Construction Vehicles, Equipment and Machinery	All vehicles, equipment and machinery to be procured for construction will confirm to the relevant Bureau of India Standard (BIS) norms. The discharge standards promulgated under the Environment Protection Act, 1986 will be strictly adhered to. Noise limits for construction equipments to be procured such as compactors, rollers, front loaders concrete mixers, cranes (moveable), vibrators and	RTO and State PCB	Contractor	NHAI

Environmental Issue	Mitigation Measures	Reference and Authority		
			Implementation	Responsibility
	saws will not exceed 75 dB (A), measured at one meter from the edge of the equipment in free field, as specified in the Environment (Protection) Rules, 1986.			
Identification and Selection of Material Sources				
Construction Materials	The Contractor will not start borrowing earth from any borrow area until the formal agreement is signed between landowner and Contractor.	West Bengal Mining Department and State Pollution Control Board.	Contractor	NHAI
Stone chips	The Contractor will obtain necessary permission for procurement of materials from Mining Department and State Pollution Control Board. Contractor will also work out haul road network and report to Environmental Expert who will inspect and in turn report to National Highway Division, before approval.	West Bengal Mining Department and State Pollution Control Board.	Contractor	NHAI
Arrangement for Construction Water	The Contractor will source the requirement of water essentially from water supplied by Municipal bodies and cannot use the ponds, which are in use by community.	CGWB, Contractor, and water supplying	Contractor	NHAI

Environmental Issue	Mitigation Measures	Reference and Authority		
			Implementation	Responsibility
	The Contractor will not be allowed to pump from the surface water bodies used by community. In that case, before using any pond water Contractor will inform the owner. To avoid disruption / disturbance to other water users, the Contractor will extract water from fixed locations and consult the Environmental Expert before finalizing the locations. The Contractor will need to comply with the requirements of the state Ground Water Department and seek their approval for doing so, if inevitable.	agency of the area.		
Labour Requirements	The Contractor will use unskilled labour drawn from local communities to avoid any additional stress on the existing facilities (medical services, power, water supply, etc.)	-	Contractor	NHAI.
Construction Camp Locations- Selection, Design & Layout	Siting of the construction camps to be as per the guidelines presented below Construction camps will not be proposed within 1000 m from the nearest settlements to avoid conflicts and stress	-	Contractor	NHAI

Environmental Issue	Mitigation Measures	Reference and Authority		
			Implementation	Responsibility
	over the infrastructure facilities with the local community. The waste disposal and sewage system for the camp will be designed, built and operated such that no odour is generated.			
	Unless otherwise arranged by the local sanitary authority, arrangements for disposal of night soils (human excreta) suitably approved by the local medical health or municipal authorities or as directed by Environmental Expert of National Highway Division, will need to be provided by the Contractor.			
Hot Mix Plants and Batching Plant Locations	Hot mix plants and batching plants will be sited sufficiently away from settlements and agricultural operations or any commercial establishments. Such plants will be located at least 1000 m away from the nearest village settlements preferably in the downwind direction.	West Bengal State Pollution Control Board.	Contractor	NHAI
Arrangements for Temporary Land	The Contractor as per prevalent rules will carry out negotiations with the landowners for obtaining their consent		Contractor	NHAI



Environmental Issue	Mitigation Measures	Reference and Authority		
			Implementation	Responsibility
Requirement	for temporary use of lands for construction sites/hot mix plants/traffic detours/ borrow areas etc. The Environmental Expert of National Highway Division, West Bengal will be required to ensure that the clearing up of the site prior to handing over to the owner (after construction or completion of the activity) is included in the Concession Agreement.			
Site Clearance				
Construction Wastes Disposal including Fly Ash	The pre-identified dump locations will be a part of comprehensive solid waste management plan to be prepared by the Contractor in consultation with Environmental Expert of National Highway Division.		Contractor	NHAI
	Location of disposal sites will be finalized prior to completion of the work on any particular section of the project area. The Environmental Expert of National Highway Division, West Bengal will approve these disposal sites. Contractor will ensure that any spoils of material unsuitable			

Environmental Issue	Mitigation Measures	Reference and Authority		
			Implementation	Responsibility
	will not be disposed off near any water course, agricultural land, and natural habitat like grass lands or pastures. Such spoils from excavation can be used to reclaim borrow pits and quarries, low-lying area in barren lands along the project corridors. No fly ash will be disposed in any disposal site. Contractor will take care if any residual fly ash (if used) is remain after construction work either this will be returned to the source or used in construction. National Highway Division will keep strict vigil on this aspect. All waste materials will be completely disposed and the site will be fully cleaned before handing over. The Environmental Expert of National Highway Division West Bengal will certify the site after approval. The Contractor at its cost shall resolve any claim, arising out of waste disposal.			
Stripping, Stocking and Preservation of Top	The topsoil from all areas of cutting and all areas to be permanently covered will be stripped to a specified depth of		Contractor	NHAI

Environmental Issue	Mitigation Measures	Reference and Authority		
			Implementation	Responsibility
Soils	150 mm and stored in stockpiles. At least 10% of the temporarily acquired area will be earmarked for storing topsoil and following precautionary measures will be taken to preserve them till they are used: 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.			
	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 tarpaulin sheets. 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 covering all disturbed areas including borrow areas, top dressing of the project area embankments and fill slopes filling up of tree pits, in the median, and in the agricultural fields of farmers, acquired temporarily.			

Environmental Issue	Mitigation Measures	Reference and Authority		
			Implementation	Responsibility
	The management of topsoil shall be reported regularly to the Environmental Expert of National Highway Division.			
Accessibility	The Contractor will provide safe and convenient passage for vehicles, pedestrians and livestock to and from roadsides and property accesses connecting the project area. The Contractor will also ensure that the existing accesses will not be undertaken without providing adequate provisions to the prior satisfaction of the Environmental Expert of National Highway Division, West Bengal. The Contractor will take care that the cross project areas are constructed in such a sequence that construction work over the adjacent cross project areas are taken up one after one so that traffic movement in any given area not get affected much.	RTO, Traffic dept.	Contractor	NHAI
Raw Materials	The Contractor shall obtain materials only from the approved sources after consent of the department of Mining.	Department of Mining, Govt of West Bengal.	Contractor	NHAI

Environmental Issue	Mitigation Measures	Reference and Authority		
			Implementation	Responsibility
Transporting Construction Materials and Haul Road Management	Contractor will maintain all project areas (existing or built for the project), which are used for transporting construction materials, equipment and machineries. All vehicles delivering materials to the site will be covered to avoid spillage of materials. All existing highways and roads used by vehicles of the Contractor, or any of his sub-Contractor or suppliers of materials and similarly roads, which of all dust/mud dropped by such Vehicles.		Contractor	NHAI.
	Contractor will arrange for regular water sprinkling at least thrice a day (i.e., morning, noon and evening) for dust suppression of such project areas particularly the earthen project areas. The unloading of materials at construction sites close to settlements will be restricted to daytime only.			
Water				
Construction Water	Contractor will arrange adequate supply and storage of water for the whole construction period at his own costs. Contractor will not open new bore well or extract	Ground Water Board.	Contractor	NHAI

Environmental Issue	Mitigation Measures	Reference and Authority		
			Implementation	Responsibility
	groundwater without permission from the Ground Water Board.			
	The Contractor will take all precaution to minimize the wastage of water in the construction process/ operation. Contractor will not take water from any irrigation canal or any other surface water bodies without written permission by the competent authority. If Contractor uses any existing source of water, (subject to the provision that any claim arising out of conflicts with other users of the said water body shall be dealt with entirely by the Contractor) (s) he will seek permission from the owner and Environmental Expert of National Highway Division. National Highway Division will ensure that such activity will not deprive the original user of the concern water source (s). Environmental Expert of National Highway Division will also keep a strict vigil on this aspect and it will be reflected in compliance report to MoEF&CC.			
Drainage and Flood	Contractor will ensure that no construction materials like	District	Contractor	NHAI

Environmental Issue	Mitigation Measures	Reference and Authority		
			Implementation	Responsibility
Control	earth, stone, ash or appendage disposed off so as not to block the flow of water of any water course, and cross drainage channels. Contractor will take all necessary measures to prevent the blockage of water flow. In addition to the design requirements, the Contractor will take all required measures as directed by the Environmental Expert of National Highway Division to prevent temporary or permanent flooding of the site or any adjacent area.	Administration		
Water Pollution from Construction Wastewater	The Contractor will take all precautionary measures to prevent the wastewater during construction from entering directly into streams, water bodies or the irrigation system. The Contractor will strictly follow the discharge standards promulgated under the Environmental Protection Act, 1986. All waste arising from the project is to be disposed off in the manner that is acceptable to the West Bengal State Pollution Control Board (West Bengal State PCB). Environmental Expert of National Highway Division will	West Bengal State PCB	Contractor	NHAI

Environmental Issue	Mitigation Measures	Reference and Authority		
			Implementation	Responsibility
	certify that all liquid wastes disposed off from the sites meet the discharge standards.			
Siltation of Water Bodies and Degradation of Water Quality	The Contractor will not excavate beds of any stream/ canals/ any other water body. 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 RoW and around the stockpiles at the construction sites close to water bodies. The fencing will be provided prior to commencement of earthworks and continue till the stabilization of the embankment slopes, on the particular sub-section of the road. The Contractor will also put up sedimentation cum grease traps at the outer mouth of the drains located in truck lay bays and bus bays which are ultimately entering into any surface water bodies / water channels with a fall exceeding 1.5 m. Contractor will ensure that construction materials	Dept of Irrigation, Govt. of West Bengal.	Environmental Expert of National Highway Division.	NHAI

Environmental Issue	Mitigation Measures	Reference and Authority		
			Implementation	Responsibility
	containing fine particles stored in an enclosure such that sediment-laden water does not drain into nearby watercourse.			
Slope Protection and Control of Soil Erosion	The Concessionaire will take slope protection measures as per design, or as directed by the Environmental Expert to control soil erosion, sedimentation through use of dykes, sedimentation chambers, basins, fiber mats, mulches, grasses, slope, drains and other devices. All temporary sedimentation, pollution control works and maintenance thereof will be deemed as incidental to the earth work or other items of work and as no	Dept of Irrigation Govt of West Bengal.	Contractor	NHAI
	Separate payment will be made for them. Concessionaire will ensure the following aspects: During construction activities on road embankment, the side slopes of all cut and fill areas will be graded and covered with stone pitching, grass and shrub as per design specifications. Turfing works will be taken up as soon as possible provided			

Environmental Issue	Mitigation Measures	Reference and Authority		
			Implementation	Responsibility
	the season is favourable for the establishment of grass sods. Other measures of slope stabilization will include mulching netting and seeding of batters and drains immediately on completion of earthworks. In borrow pits, the depth of the pits shall be so regulated that the sides of the excavation will have a slope not steeper than 1 vertical to 2 horizontal, from the edge of the final section of the bank. Along sections abutting water bodies, stone pitching as per design specification will protect slopes.			
Water Pollution from Fuel and Lubricants	The Contractor will ensure that all construction vehicle parking location, fuel/lubricants storage sites, vehicle, machinery and equipment maintenance and refuelling sites will be located at least 1000 m from rivers and irrigation canal/ponds or as directed by the Environmental Expert of National Highway Division, West Bengal. Contractor will ensure that all vehicle/machinery and equipment operation, maintenance and refuelling will be carried out in such a	West Bengal PCB	Contractor	NHAI

Environmental Issue	Mitigation Measures	Reference and Authority		
			Implementation	Responsibility
	fashion that spillage of fuels and lubricants will be minimized and does not contaminate the ground. Oil interceptor will be provided for vehicle parking.			
	Contractor will arrange for collection, storing and disposal of oily wastes to the approved disposal sites. All spills and collected petroleum products will be disposed off in accordance with MoEF & CC and West Bengal State PCB guidelines.			
Air				
Dust Pollution from Batching Plants	All the plants will be sited at least 1 km in the downwind direction from the nearest human settlement Clearance for siting shall be obtained from the State PCB. Alternatively, only approved plants licensed by the West Bengal State PCB shall be used. Regular water sprinkling should be provided to ensure the dust suppression. The PM10 value at a distance of 50m from a unit located in a cluster should be less than 100 µg/m ³ . The monitoring is to be conducted as per the monitoring plan.	West Bengal State PCB	Contractor	NHAI

Environmental Issue	Mitigation Measures	Reference and Authority		
			Implementation	Responsibility
Emission from Construction Vehicles, Equipment and Machineries	Contractor will ensure that all vehicles, equipment and machinery used for construction are regularly maintained and confirm that pollution emission levels comply with the relevant requirements of West Bengal State PCB. The Environmental Expert of National Highway Division, will be required to inspect regularly to ensure the compliance of EMP.	West Bengal State PCB	Contractor	NHAI
Noise				
Noise from Vehicles, Plants and Equipments	The Contractor will confirm the following: All plants and equipment used in construction shall strictly conform to the MoEF&CC/CPCB noise standards. All vehicles and equipment used in construction will be with exhaust silencers. Servicing of all construction vehicles and Machinery will be done regularly and during routine servicing operations, the effectiveness of exhaust silencers will be checked and if found defective will be replaced. Limits for construction equipment used in the project such as compactors, rollers, front loaders, concrete mixers,	West Bengal State PCB	Contractor	NHAI

Environmental Issue	Mitigation Measures	Reference and Authority		
			Implementation	Responsibility
	cranes (moveable), vibrators and saws shall not exceed 75 dB (A) (measured at one meter from the edge of equipment in the free field), as specified in the Environment (Protection) rules, 1986. At the construction sites within 150 m of the nearest habitation, noisy construction work such as, concrete mixing, batching will be stopped during the night times between 10.00 pm to 6.00 am. Contractor will provide appropriate noise barriers to their premises. Noise barrier may be of 2 to 3 m high wall separating the sensitive building from noise or it may a green barrier of vegetation having density of minimum 5 m between sensitive location and the highway monitoring shall be carried out near construction site as per monitoring schedule. Environmental Expert of National Highway Division, West Bengal will be required to inspect regularly to ensure the compliance of EMP.			

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Chapter 9- Environmental Management Plan

Environmental Issue	Mitigation Measures	Reference and Authority		
			Implementation	Responsibility
Safety				
Personal Safety Measures for Labours	Contractor will provide: Protective footwear and protective goggles to all workers employed on mixing asphalt materials, cement, lime mortars, concrete etc. Protective goggles and clothing to workers engaged in stone breaking activities and workers	Office of the Factory Inspector	Contractor	NHAI.
	Will be seated at sufficiently safe intervals. Earplugs to workers exposed to loud noise, and workers working in crushing, compaction, or concrete mixing operation. The Contractor will not employ any person below the age of 14 years for any work and no woman will be employed on the work of painting with products containing lead in any form. The Contractor will also ensure that no paint containing lead or lead products is used except in the form of paste or readymade paint. Contractor will provide facemasks for use to the workers	Office of the Labour Commissioner		

Environmental Issue	Mitigation Measures	Reference and Authority		
			Implementation	Responsibility
	when paint is applied in the form of spray or a surface having lead paint dry rubbed and scrapped.			
Traffic and Safety	The Contractor will take all necessary measures for the safety of traffic during construction and provide, erect and maintain such barricades, including signs, marking, flags, lights and flagmen as may be required by the Environmental Expert of National Highway Division for the information and protection of traffic approaching or passing through the section of any existing cross roads. Any such activity should be reported to traffic police and a prior consent is taken.		Contractor	NHAI
Precautionary/Safety Measures during Construction	The Contractor will make sure that during the construction work: All relevant provisions of the Factories Act, 1948 and the Building and other Construction Workers (regulation of Employment and Conditions of Services) Act, 1996 will be adhered to.	Building and other Construction Workers	Contractor	NHAI
	The Contractor will comply with all the precautions as required for the safety of the workmen as per the	(regulation of Employment and		

Environmental Issue	Mitigation Measures	Reference and Authority		
			Implementation	Responsibility
	International Labour Organization. The Contractor will comply with all regulations regarding safe scaffolding, ladders, working platforms, gangway, stairwells, excavations, trenches and safe means of entry and egress.	Conditions of Services) Act, 1996		
Risk from Electrical Equipment (s)	The Contractor will take adequate precautions to prevent danger from electrical equipment i.e. no material will be so stacked or placed as to cause danger or inconvenience to any person or the public.			
	All necessary fencing and lights will be provided to protect the public. All machines to be used in the construction will conform to the relevant Indian Standards (IS) codes, will be free from patent defect, will be kept in good working order, will be regularly inspected and properly maintained as per IS provision.	Building and other Construction Workers (regulation of Employment and Conditions of Services) Act, 1996	Contractor	NHAI.

Environmental Issue	Mitigation Measures	Reference and Authority		
			Implementation	Responsibility
Risk Force Measure	The Contractor will take all reasonable precaution to prevent danger of the workers and public from fire, flood, etc. The Contractor will keep emergency arrangement so that in case of any mishap all necessary steps can be taken for prompt first aid treatment.	Building and other Construction Workers	Contractor	NHAI.
First Aid	The Contractor will arrange for a readily available first aid unit including an adequate supply of sterilized dressing materials and appliances as per the Factories Rules of West Bengal at every workplace. Suitable transport to take injured or sick person(s) to the nearest hospital. Equipment and trained nursing staff at every workplace and construction premise.	Building and other Construction Workers (regulation of Employment and Conditions of Services) Act, 1996	Contractor	NHAI.
Heritage protection and care				
Project area Plantation	The Contractor will do the plantation in their premises as per requirement of the NBCC and Industrial plant's code.	Forest Dept, MoEF&CC	Contractor	NHAI

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Chapter 9- Environmental Management Plan

Environmental Issue	Mitigation Measures	Reference and Authority		
			Implementation	Responsibility
Flora/ Fauna	The Contractor will take reasonable precaution to prevent his workmen or any other persons from removing and damaging any flora (plant/vegetation) and fauna (animal) including fishing in any water body and hunting of any animal. If any wild animal is found near the construction site at any point of time, the Contractor will immediately upon discovery there of acquaint the Environmental Expert of National Highway Division, West Bengal and report to the nearby forest office (forest range office or divisional forest office) and will take appropriate steps/ measures, if required in consultation with the forest officials.	Forest Dept, MoEF&CC	Contractor	NHAI
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 Ancient Monuments and Archaeological Sites and Remains Act, 1958.	Archaeological survey of India	Contractor	NHAI

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Chapter 9- Environmental Management Plan

Environmental Issue	Mitigation Measures	Reference and Authority		
			Implementation	Responsibility
Additional Occupational Facility				
Provision of Potable Water	The Contractor will provide, erect and maintain necessary (temporary) living accommodation and ancillary facilities for labour up to standards and scales approved by the National Highway Division, West Bengal at the location identified for such facilities in pre-construction phase. The Contractor will provide these facilities within the precincts of every	Building and other Construction Workers	Contractor	NHAI
	Workplace, latrines and urinals in an accessible place, and the accommodation, as per standards set by the Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996. The Contractor will construct and maintain all temporary accommodation in such a fashion that uncontaminated water is available for drinking, cooking and washing. The Contractor will also guarantee the followings: Supply of sufficient quantity of potable water (as per IS 10500) in every workplace/labour campsite at suitable and	(Regulation of Employment and Conditions of Services) Act, 1996	-	-

Environmental Issue	Mitigation Measures	Reference and Authority		
			Implementation	Responsibility
	easily accessible places and regular maintenance of such facilities. If any water storage tank is provided that will be kept at a distance of not less than 15 m. from any latrine, drain or other source of pollution. If water is drawn from any existing well, which is within close proximity of any latrine, drain or other source of pollution, the well will be disinfected before water is used for drinking. All such wells will be entirely covered and provided with a trap door, which will be dust proof and waterproof. A reliable pump will be fitted to each covered well. The trap door will be kept locked and opened only for cleaning or inspection, which will be done at least once in a month. Testing of water will be done every month as per parameters prescribed in IS 10500:1991.			
Sanitation and Sewage System	The Contractor will ensure that the sewage system for the camp are designed, built and operated in such a fashion that	Building and other	Contactor	NHAI

Environmental Issue	Mitigation Measures	Reference and Authority		
			Implementation	Responsibility
	no health hazards occurs and no pollution to the air, ground water or adjacent water courses take place.	Construction Workers		
	Separate latrine and urinals, screened from those from men (and marked in the vernacular) are provided for women Adequate water supply is there to all latrines and urinals All latrines in workplaces are with dry-earth system (receptacles) which are cleaned at least four times daily and at least twice during working hours and kept in a strict sanitary condition Night soil is disposed of by putting layer of it at the bottom of a permanent tank prepared for the purpose and covering it with 15 cm. layer of waste or refuse and then covering it with a layer of earth for a fortnight.	(regulation of Employment and Conditions of Services) Act, 1996		NHAI.
Waste Disposal	The Contractor will provide garbage bins in the premises and regularly emptied and disposed off in a hygienic manner as per the comprehensive Solid Waste Management plan for the labour/ Contractor's premise approved by the Environmental Expert of National Highway Division, West	Building and other Construction Workers (regulation of	Contractor	NHAI.

Environmental Issue	Mitigation Measures	Reference and Authority		
			Implementation	Responsibility
	Bengal. Contractor will follow all relevant provisions of the Factories Act, 1948 and the Building and the other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 for construction and maintenance of labour camp. The Contractor will make arrangement for disposal of night soil by composting at the workplace unless otherwise arranged by the local sanitary authority. The composting of night soil will be done as per direction of Environmental Expert of National Highway Division, West Bengal. The Contractor will also ensure that on completion of the work, all temporary structures are cleared, all rubbish are burnt, night soil or other disposal pits or trenches filled in and effectively sealed off. The site will be left clean and tidy, at the Contractor's expense, to the entire satisfaction to the Environmental Expert of National Highway Division, West Bengal.	Employment and Conditions of Services) Act, 1996		

Environmental Issue	Mitigation Measures	Reference and Authority		
			Implementation	Responsibility
Monitoring and Community Participation				
Monitoring of Environmental Conditions	The Contractor will undertake seasonal monitoring of air, water, noise, and soil quality through MoEF&CC approved monitoring agency. The parameters to be monitored, frequency and duration of monitoring as well as the locations to be monitored will be as per the monitoring plan Presented in the next section.	MoEF&CC	Contractor	NHAI
Continuous Community Participation	The Environmental Expert of National Highway Division, West Bengal will have continuous interactions with local people around the project area to ensure that the construction activities are not causing undue inconvenience to the locals residing in the vicinity of project site under construction due to noise, dust or disposal of debris etc.	National Highway Division, West Bengal	Environmental Expert of National Highway Division	NHAI
Cleaning of Construction Premises and Restoration	The Contractor will clear all temporary structures, remove or burn all rubbish, and night soils. All disposal pits or trenches will be filled in and effectively sealed off. Residual topsoil, if any will be distributed on adjoining/ proximate barren land or areas identified by Environmental	Dept of Labour, Govt of West Bengal.	Contractor	NHAI.

Environmental Issue	Mitigation Measures	Reference and Authority		
			Implementation	Responsibility
	Expert of National Highway Division in a layer of thickness of 75 mm-150 mm.			
Plantation	Avenue plantation (wherever space is available) will be implemented by Contractor. The plantation will be done as per the plantation scheme prepared for this project. The plantation will be carried by Contractor. Around 1,37,005 trees will be planted along the corridor.	Forest Dept,	Contractor	NHAI.
OPERATION PHASE				
Monitoring Operation Performance	The National Highway Division, West Bengal will monitor the operational performance of the various mitigation / enhancement measures carried out as a part of this project. The indicators selected for monitoring include the survival rate of trees, utility of enhancement provision for relocated temples and other important structures, status of rehabilitation of borrow areas and utility of double glazing for noise sensitive receptors.	National Highway Division, West Bengal.	Contractor	NHAI
Environmental Compliance Monitoring				

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Chapter 9- Environmental Management Plan

Environmental Issue	Mitigation Measures	Reference and Authority		
			Implementation	Responsibility
Pollution Monitoring	The periodic monitoring of the ambient air quality, noise level, water (both ground and surface water) quality, soil pollution/ contamination in the select location as suggested in pollution monitoring plan in EMP will be responsibility of National Highway Division, West Bengal. National Highway Division will appoint CPCB/MoEF & CC approved pollution monitoring agency for this purpose.	West Bengal State PCB	Contractor/ National Highway Division	NHAI
Atmospheric Pollution	Ambient Air concentrations of various pollutants shall be monitored as envisaged in the pollution-monitoring plan.	West Bengal State PCB	Contractor	NHAI
Ground and Surface Water Analysis	Ground and Surface water has to be analysed as per IS 10500.	West Bengal State PCB	Contractor	NHAI
Noise Pollution	Noise pollution will be monitored as per monitoring plan at sensitive locations. Noise control programs to be enforced strictly. Monitoring of the effectiveness of the pollution attenuation barriers, if there is any will be taken up thrice in the operation period.	West Bengal State PCB	Contractor	NHAI

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Chapter 9- Environmental Management Plan

Environmental Issue	Mitigation Measures	Reference and Authority		
			Implementation	Responsibility
Waste water management	Provision of Soak pit	West Bengal State PCB	Contractor	NHAI
Municipal Solid waste management	Proper disposal	West Bengal State PCB	Contractor	NHAI
Hazardous waste management	Proper disposal	West Bengal State PCB	Contractor	NHAI
Changes in Land Use Pattern	National Highway Division, West Bengal shall take initiative and act as facilitator to prepare an action plan for balanced regional development in consultation with Local Development Authority and State Government to control the ribbon development along the project area including new bypasses. A land use regulation control, if applicable need to be adopted. A separate governing body may be formed with the representation of National Highway Division, West Bengal Revenue Department and Local Civic Body (Municipal Corporation/ Gram Panchayat) with the power of taking necessary action, if required to remove un-authorized	District Administration	National Highway Division, West Bengal & Local Authorities (Revenue Department and Local Civic Bodies)	NHAI

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Chapter 9- Environmental Management Plan

Environmental Issue	Mitigation Measures	Reference and Authority		
			Implementation	Responsibility
	development along the project area. This special body will meet periodically and monitor the development along the project area.			
Orientation of Implementing Agency and Contractors	The National Highway Division, West Bengal shall organize orientation sessions during all stages of the project. The orientation session shall involve all staff of Environmental Cell, field level implementation staff of National Highway Division, West Bengal Environmental Expert and Contractor.		Contractor	NHAI

9.3 GREEN BELT DEVELOPMENT PLAN

Green belt development plan is formulated as a part of new road construction project. As a part of greenbelt development, plantation shall be carried out in entire open space on the both side of the road and median to enhance floral cover and scenic beauty as well as sink of air pollution and act as noise barrier. Plantation will be carried out as per Green Highways (Plantation, Transplantation, Beautification and Maintenance) Policy-2015 and IRC: SP: 21:2009 guidelines.

The species recommended for greenbelt development are given in **Table 9-2**.

Table 9-2: Species recommended for Avenue Plantation

S.NO.	Botanical name/Scientific Name	Local/Kannada name	Location
1	Bauhinia alba	Bauhinia sps.	Median Plantation
2	Bougainvillia	Garden glory	Median Plantation
3	Cassia biflora	-	Median Plantation
4	Cassia alata	-	Median Plantation
5	Acacia auriculiformis	Vilayati babool	Ist RoW
6	Bauhinia sps.	Kachnar	Ist RoW
7	Cassia fistula	Amaltas	Ist RoW
8	Cassia nodosa	Cassia	Ist RoW
9	Delonix regia	Gulmohar	Ist RoW
10	Jacaranda minosaefolia	Jacranda	Ist RoW
11	Peltophorum ferrugineum	Peltophorum	Ist RoW
12	Albizzia lebbek	Kala siris	2nd RoW
13	Dalbergia sissoo	Shisham	2nd RoW
14	Gravillea robusta	Slver Oak	2nd RoW
15	Malia azadiracta	Bakain	2nd RoW
16	Pongamia pinnata	Kanji	2nd RoW
17	Terminalia arjuna	Arjuna	2nd RoW

9.4 EMP Budget

Table 9-3: EMP Budget

Item	Details	No/unit	Rate (Rs)	Total (Rs)
Planning and Construction				
Land Acquisition	Land and Properties	Covered in RAP Cost		
RAP Implementation		Covered in RAP Cost		
Forest Land Diversion	Forest land involved in the project	108 Ha	13,00,000	14,04,00,000
Horticulture	Compensatory Afforestation to offset the loss of trees due to the project corridor in accordance to the relevant forest laws (Minimum of 2 trees planted for every tree cut) including plantation and maintenance at locations & as per directions of the forest department or administrative department	64 Ha (for 64000 trees)	8,00,000	5,12,00,000
	Half brick circular tree guard as per design provided by the engineer and complete in all respect as per MoRT&H Standard Data book for analysis of rates.	1,37,005	2300	31,51,11,500
	Avenue plantation on both sides of the highway.	1,37,005	400	5,48,02,000
Soil	Providing Oil Interceptors as per design and drawing at vehicle	1	30,000	30,000

Item	Details	No/unit	Rate (Rs)	Total (Rs)
	parking areas and as per directions of the Environmental Specialist / Environmental Engineer of the Engineer.			
Air	Dust Management with sprinkling of water, covers for vehicles transporting construction material	234.800	30,000	3,78,000
Ground Water Recharge	Rainwater Harvesting Structures complete in all respect and confirming to the relevant specifications as directed by the Engineer and as per drawing approved by Engineer.	60	40,000	24,00,000
Solid Waste Disposal	Disposal of Sewage and other wastes in the construction yard and labour camps as per directions of the Environmental Specialist / Environmental Engineer of the Engineer.	24	15000	3,60,000
Environmental Monitoring	Details provided in EIA report	-	-	4,21,500
	Total (A)			56,51,03,000
Operation				
Environmental Monitoring	Details provided in EIA report	-	-	4,21,500
	Maintenance of plantation			8,00,000
	Watch and ward			3,40,000

Item	Details	No/unit	Rate (Rs)	Total (Rs)
	Total (B)			15,61,500
Training				1,50,000
	Total (C)			1,50,000
Contingency		@6%		3,40,08,870
	Total (D)			3,40,08,870
	Total A+B+C+D			60,08,23,370

CHAPTER 10: SUMMARY AND CONCLUSION

10.1 INTRODUCTION

The Ministry of Road Transport and Highways (MORTH), Government of India has proposed “Bharatmala Pariyojana” an Umbrella scheme of road development project through National Highways Authority of India (NHAI), National Highway, Industrial Development Corporation Ltd (NHIDCL) and State Public Works Departments (PWD) at an estimated cost of INR 5,35,000 crores. This is the second largest highways construction project in the country after NHDP, where in almost 50,000 km of roads are targeted across the country.

10.2 DESCRIPTION OF THE PROJECT

The project is starts at 387.200 (near Kamalpur village, Jharkhand/WB Border) in Purulia District to Km 622.500 NH-16, near Uluberia, Howrah District, in the state of West Bengal. The length of the proposed alignment is 234.800 km approx.

Project Highway Alignment (Greenfield) of 235.300 km and the Proposed Right of Way is 70 m in non-forest Area and 60 m in Forest areas as per the requirement keeping in view the fully access controlled Highway with 4/6-lane dual carriage way configuration.

The road passes through the important talukas like Jhalda-II, Jaipur, Purulia-I, Purulia-II, Hura, Pancha in District of Purulia , talukas like Indpur, Taldangra, and Simalpal in District of Bankura, talukas like Garbeta-I, Chandrakona-II, Chandrakona-I, Ghatal in District of Pashchim Medinipur, talukas like Khanakul-I, Khanakul-II, in District of Hoogli and talukas like Amta-II, Amta-II in District of Howrah in the state of West Bengal.

Table 10-1: Salient features of the project

S.no.	Parameters/Issues	Description
1.	Length (km)	235.300
2.	Total land acquired (ha)	2078
3.	Govt. land (ha)	673.4
4.	Pvt. Land (ha)	1294.6
5.	Forest land(ha)*	108

6.	Area under protected/ important or sensitive species of flora or fauna/Wildlife Sanctuary	The alignment does not pass through any wild life sanctuary, protected area and its eco sensitive zone.
7.	No. of trees	32000 (20000 no. of forest trees and 12000 no. of non-forest trees)
8.	No. of structure to be impacted due to proposed alignment	535 (include Semi-puca and pucca Structure)
9.	No. of families	535
10.	No. of structure to be constructed	Major Bridges-17 Minor Bridges -191 and 11 nos. MNB at Interchange VUP-11 VOP-11 LVUP-71 SVUP-51 Wildlife Underpasses-16 ROB-04 Structure over Gas Pipe Line-2, (Flyover) at MCW-16 and 2nos. flyovers at Interchange location Elevated/Viaducts-8, Box Culverts at MCW -469 and 13 no. at Interchange Elephant Corridors-6

11.	Total water requirement	7500 KL/day. Water will be extracted from surface sources. The ground water will be abstracted for campsite after obtaining the permission from competent authority.
12.	RoW	Total length of the project is 234.800 Km (approx.). Project Highway and proposed RoW is 90 m as per the requirement keeping in view the fully access controlled Highway with 4/6-lane dual carriage way configuration.
13.	Construction material	Cement (MT) - 293600, Coarse Sand (cum)- 2840, Coarse Agg. (cum)- 1610000, Fine Agg. (cum)- 3220000, Steel (ton)- 9470, Bitumen (ton)- 5840000, Bitumen Emulsion (ton)- 3030600, Borrow Earth/Fly Ash (cum)- 15152800
14.	Connectivity	The proposed alignment will be part of Varanasi- Kolkata 4/6 lane expressway will connect city like Varanasi, Bhabhua, Sasaram, Chatra, Hazaribagh, Ramgarh, Ranchi, Bokaro, Purliya, Bankura, Jamshedpur, Kharagpur, Kolkata etc
15.	Project cost (cr.)	9250 Cr

10.3 DESCRIPTION OF THE ENVIRONMENT

The baseline data was generated during pre-monsoon season of 2024 i.e. March to May 2024. The baseline data has been provided in chapter 3 of this report which shows the values of almost all of the parameters are well within the prescribed limits.

10.4 ANTICIPATED ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

- Slight change in the micro-climate of the area is expected due to Heat Island Effect.
- There will be a marginal rise in PM levels during the construction activities, which shall again be within prescribed limit after the construction activities are over.
- The area is likely to experience a marginal increase in noise level due to increase in vehicle density after construction of the road.
- Contamination to water bodies may result due to spilling of construction materials, oil, grease, fuel and paint etc. This will be more prominent in case of locations where the project road crosses rivers, canals, nallahs, etc. Mitigation measures have been planned to avoid contamination of these water bodies.
- Diversion of forest land has been envisaged for this project. Hence, Forest Clearance under the purview of Forest (Conservation) Act, 1980 is required. The application of forest clearance is under process. Adequate compensatory afforestation has been planned as a mitigation measure. The project road doesn't cross any Protected Area. Since the project road is a green field project, acquisition of land shall be required.
- During the construction of the proposed project, the topography may change marginally due to cuts & fills for project road and construction of project related structures etc.
- Provision of construction yard for material handling will also alter the existing topography.

10.5 ANALYSIS OF ALTERNATIVES (TECHNOLOGY & SITE)

Detailed analyses of the alternatives have been conducted taking into account both with and without project. Comparative analysis of all the alternatives has also been conducted. The proposed development of the road is likely to have a positive impact on the economic value of the region. However, there are certain environment and social issues that need to be mitigated for sustainable development.

Three alternatives were studied and the first one was found out to be most suitable.

10.6 ENVIRONMENTAL MONITORING PROGRAM

Regular monitoring of important and crucial environmental parameters is of immense importance to assess the status of environment during operation of the proposed project.

With the knowledge of baseline conditions, the monitoring program can serve as an indicator for any deterioration in environmental conditions due to operation of the project and suitable mitigating steps could be taken in time to safeguard the environment. Monitoring is as important as that of control of pollution since the efficacy of control measures can only be determined by monitoring.

10.7 ADDITIONAL STUDIES

The various additional studies have been undertaken for the project including Public Consultation, Risk assessment and Social Impact Assessment/ R&R Action Plans. Public consultation is a continuous process and has been carried out at all stages throughout the project road. To ascertain the views of the affected families to be recorded and has been included in the Social Impact Assessment report.

10.8 BENEFITS OF THE PROJECT

The proposed highway starts at Km 387.200 (near Kamalpur village, Jharkhand/WB Border) in Purulia District to Km 622.000 NH-16, near Uluberia, Howrah District, in the state of West Bengal under Bharatmala Pariyojana by the Government of India. The proposed access controlled project with new alignment has been envisaged through an area, which shall have the advantage of simultaneous development as well as shall result in a shorter distance to travel. The junctions with existing road will be planned in the form of interchanges and flyover to ensure uninterrupted flow of traffic.

The proposed road would act as the prime artery for the economic flow to this region. It will Enhance economic development, provide employment opportunities to locals, strengthen tourist development, ensure road safety, and provide better transportation facilities and other facilities such as wayside amenities. Vehicle operating cost will also be reduced due to improved road quality. The compensatory plantation and roadside plantation shall further improve the air quality of the region.

10.9 ENVIRONMENT MANAGEMENT PLAN

Project specific environmental management plan have been prepared for ensuring the implementation of the proposed measures during construction phase of the project, implementation and supervision responsibilities. The cost for environmental management during construction has been indicated in EMP. The project impacts and management plan suggested thereof are summarized in the chapter.

The Environmental Management Plan (EMP) has been designed within the framework of various regulatory requirements on environmental and Socio-economic aspects aiming at the following:

- Minimize disturbance to native flora and fauna, if any.
- Prevent and to attenuate air, water, soil and noise pollution, if any.
- Encourage the socio-economic development.

The environmental management plan (EMP) would, therefore, consists of following main components:

- To integrate potential impacts (positive or negative), environmental mitigation measures, implementation schedule, and monitoring plans.
- To describe the potential environmental impacts and proposed management associated with each stage of the project development.
- To control environmental impacts to levels within acceptable standards, and to minimize possible impact on the community and the workforce of foreseeable risks during the construction and subsequent operational phases of the project.

10.10 CONCLUSION

Based on the EIA study and surveys conducted for the Project, it can be safely concluded that associated potential adverse environmental impacts can be mitigated to an acceptable level by adequate implementation of the measures as stated in the EIA Report. Adequate provisions shall be made in the Project to cover the environmental mitigation and monitoring requirements, and their associated costs as suggested in environmental budget. The proposed project shall improve Road efficiency and bring economic growth. In terms of air and noise quality, the project shall bring considerable improvement to possible exposure levels to population.

CHAPTER 11: DISCLOSURE OF CONSULTANT

Table 11-1: Contact Details

Name of the Consultant	P and M Solution
Address	C-88, Sector65, Noida-201301 – U.P
Mobile No.	91-9555548342
Name of Laboratories	Noida Testing Laboratory
Address	GT-20, Sector117 Noida

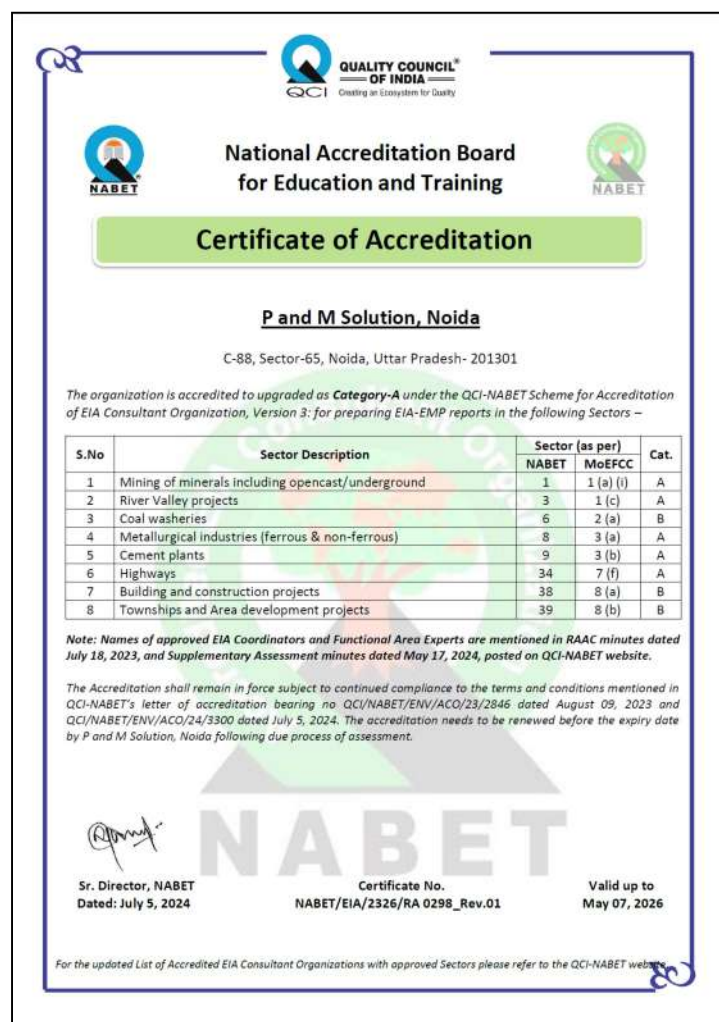
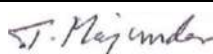
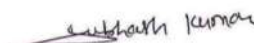
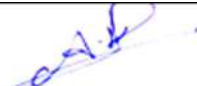
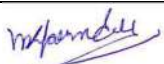
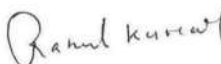
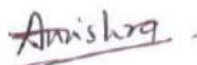
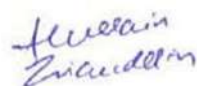


Figure 11-1: Accreditation Certificate of EIA Consultant



Figure 11-2: Accreditation Certificate of LAB

Expert Involve in this project

S No.	Name	EC/FAE	DETAILS	Signatures
1	Mayank Kumar	EC	7(f)	
2	Tapan Majumdar	FAE	HG, GEO	
3	Subhash Kumar	FAE	SC	
4	Amit Kumar	FAE	AP	
5	Manoj Kumar Pandey	FAE	EB	
6	R K Tiwary	FAE	RH	
7	Rahul Kumar	FAE	AQ, WP	
8	Sanjay Singh	FAE	NV	
9	Abhay Nath Mishra	FAE	SE	
10	Hussain Ziauddin	FAE	SW	
11	Poonam Kumari Mangalam	FAE	LU	