

Initial Environmental Examination

Document Stage: Draft
Project Number: 53262-001
November 2020

IND: Agartala City Urban Development Project – Upgradation of Major Roads in Agartala City PART A

Prepared by Project Management Unit, Agartala Smart City Limited, Government of Tripura for the Asian Development Bank.

CURRENCY EQUIVALENTS

(as of 15 July 2020)

Currency unit	—	Indian rupee (₹)
₹1.00	=	\$0.0133
\$1.00	=	₹75.158

ABBREVIATIONS

ADB	—	Asian Development Bank
AMC	—	Agartala Municipal Corporation
ASCL	—	Agartala Smart City Limited
ACUDP	—	Agartala City Urban Development Project
CTE	—	Consent to Establishment
CTO	—	Consent to Operate
EIA	—	Environmental Impact Assessment
EMP	—	Environmental Management Plan
EPA	—	Environmental Protection Agency
EC	—	Environmental Clearance
GAPA	—	Greater Agartala Planning Area
GRM	—	Grievance Redress Mechanism
GRC	—	Grievance Redress Committee
Gol	—	Government of India
H&S	—	Health and safety
IRC	—	Indian Road Congress
IEE	—	Initial Environmental Examination
IA	—	Implementing Agency
INR	—	Indian Rupee
MOEFCC	—	Ministry of Environment and Forests and Climate Change
NAAQS	—	National Ambient Air Quality Standards
NGO	—	Nongovernmental organization
NOC	—	No Objection Certificate
O&M	—	Operation and maintenance
OFC	—	Optical Fiber Cables
PMC	—	Project Management Consultant
PIU	—	Project implementation Unit
PPE	—	Personal Protective Equipment
RCC	—	Reinforced cement Concrete
RoW	—	right-of-way
SEIAA	—	State Environment Impact Assessment Authority
SWD	—	Storm Water Drain
SPS	—	Safeguard Policy Statement
SEMP	—	Site Environment Management Plan
TDS	—	Total dissolved solids
TSPCB	—	Tripura State Pollution Control Board
ULB	—	Urban local body

WEIGHTS AND MEASURES

°C	–	Degree Celsius
km	–	kilometer
m	–	meter
nos.	–	numbers
m ²	–	square meters
km ²	–	square kilometer
Kmph	–	kilometer per hour
cum	–	cubic meter

NOTE

In this report, "\$" refers to United States dollars.

This draft initial environmental examination is a document of the borrower. The views expressed herein do not necessarily represent those of ADB's Board of Directors, Management, or staff, and may be preliminary in nature. Your attention is directed to the "terms of use" section of this website. Your attention is directed to the "terms of use" section of this website.

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

CONTENTS

	Pages
I. INTRODUCTION	1
A. Project Background	1
B. Impact and Outcome of the Project	1
C. Purpose of the Initial Environmental Examination	2
D. Report Structure	3
II. DESCRIPTION OF PROJECT COMPONENTS	3
A. Subproject Location	3
B. Present Status of the Roads	4
C. Proposed Subproject Components	7
D. Other features:	20
E. Design Concept	37
F. Construction Methodology	48
G. Implementation Schedule	52
III. ANALYSIS OF ALTERNATIVES	53
IV. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK	54
A. ADB Policy	54
B. National and State Laws	57
C. International Conventions and Treaties	67
D. Clearances / Permissions to be Obtained	69
V. DESCRIPTION OF ENVIRONMENT	70
A. Physical Resources	70
B. Ecological Resources	85
C. Economic Development	89
D. Social and Cultural Resources	92
E. Physical Cultural Resources	93
F. Environmental Settings	109
VI. ANTICIPATED ENVIRONMENTAL IMPACTS & MITIGATION MEASURES	114
A. Introduction	114
B. Design Impact	114
C. Pre-Construction Phase Impacts	115
D. Construction Phase Impacts	123
E. Guidelines for COVID -19	133
F. Workers Camp	133
G. UPDATES ON COVID-19	134
H. Training	134
I. Emergency contact	134
J. Operation Phase Impacts	134
VII. PUBLIC CONSULTATION, PARTICIPATION AND INFORMATION DISCLOSURE	137
A. Overview	137
B. Public Consultation	138
C. Public Participation During the Preparation of the IEE	138
D. Consultation & Disclosure	139
E. Future Consultation and Disclosure	141

VIII.	GRIEVANCE REDRESS MECHANISM	143
A.	Common Grievance Redress Mechanism (GRM)	143
IX.	ENVIRONMENTAL MANAGEMENT PLAN	147
A.	Environmental Management Plan	147
B.	Institutional Arrangement	246
C.	Safeguards Implementation Arrangement:	246
D.	Training Needs	254
E.	Monitoring and Reporting	256
F.	EMP Implementation Cost	257
X.	CONCLUSION AND RECOMMENDATIONS	268

APPENDICES

1.	REA Checklist
2.	No Mitigation Checklist
3.	Applicable Ambient Air Quality and Noise Standards National Ambient Air Quality Standards
4.	NOC from TSECL for storage and reuse of Electric poles and Transformers
5.	Spoils Management Plan
6.	Environmental Audit Report of Existing C&D Waste Management Site in Agartala
7.	NOC from AMC for disposal of construction and Demolition waste, excavated earth and drain silt
8.	Sample Traffic Management Plan (TMP)
9.	Record of Public Consultation
10.	Sample Grievance Redressal Form
11.	Sample Chance find Protocol
12.	Sample Environmental Site Inspection Checklist
13.	Semi-annual Environmental Monitoring Report Template
14.	Summary of IBAT Proximity Analysis Reports
15.	ASCL Letter to Forest Department on Tree Cutting and Compensatory Plantation
16.	Forest Department Letter on Tree Species and Girth Size
17.	Forest Department Letter on Tree Cutting and Compensatory Plantation Cost
18.	Strip Plan of Smart Roads
19.	WHO Interim Guidance on Water, Sanitation, Hygiene and Waste Management for the COVID19 virus
20.	ADB's Interim Advisory Note on COVID-19

EXECUTIVE SUMMARY

Project Background. The proposed project is aligned with Government of India's Smart Cities Mission (SCM), launched in 2015 with the aim of making urban areas more livable, citizen-friendly, sustainable and resilient, improving urban equality and living conditions with a focus on creating 100 "smart cities". The project aims to support; (i) urban development: by making the city more livable; (ii) economic development: by promoting the city as an economic and commercial hub in the region; (iii) environmentally sustainable development; and (iv) capacity development of implementing institution. The project is aligned with India CPS 2018–2022, which emphasizes support to national flagship programs including SCM, inclusive urbanization, and development of competitive cities.¹

The project is aligned with the following impact: Agartala established as an economic-commercial hub in the northeast India with improved quality of life.

Impact and Outcome of the Project. The project will have three outputs.

- **Output 1: Urban roads and drainage upgraded.** This will include (i) construction of 23 km of climate-resilient roads that will decongest the city's central and east zones, along with associated facilities including improved paved surface, geometric traffic junctions transformation, lighting, footpaths, dedicated parking, bollards, signaling, Elderly-Women-Children-Differently abled (EWCD) responsive features, and a utility corridor with shifting of electrical lines; and (ii) construction and rehabilitation of 48 km of new or existing stormwater drains.^[1] These activities will improve public health by reducing urban floods and air quality.
- ^[1] EWCD responsive features are related to adapted sidewalks, pedestrian crossings, street lightning, dedicated parking, bollards, signage, among others.
- **Output 2: Tourist places renovated and made more eco-friendly.** This will include (i) rejuvenation of 50,000 square meter (m²) within the Maharaja Bir Bikram College lake area, through upgrading of eco-park, development of a water recreation area and lakeside public area, creation of a thematic/botanical garden, garden gazebos, enhancement of the lake water quality with artificial wetlands and adequate aeration, and use of waste and effluent management strategies; and (ii) renewal of 100,000 m² of open spaces in the Ujjayanta Palace area, through beautification of garden spaces, renewal of existing water fountains, renovation of existing drainage system, development of lake side walkway with resting areas and pergolas, leisure areas, decorative lighting and dedicated parking zone. All facilities will adopt EWCD responsive features and will also increase users' safety through improved lighting zones.
- **Output 3: Public awareness on sanitation and hygiene, and capacity of urban local bodies in urban service delivery improved.** The project will provide capacity-building for technical staff of AMC, ASCL, TUDA, and UDD on project management and operation and maintenance of urban infrastructure; own-source revenue generation and financial management; climate and disaster resilient urban

¹ Smart Cities Mission. [Strategy](#). ADB. 2017. [Country Partnership Strategy: India, 2018–2022—Accelerating Inclusive Economic Transformation](#). Manila.

planning; and environmental and social safeguards. This output will also provide capacity building for increased knowledge on tourism-related matters, community mobilization, and livelihood enhancement for shop keepers, street vendors and artisans around Ujjayanta Palace. It will also increase knowledge of eligible staff of the Public Health Division of AMC on preventive healthcare. Awareness campaigns will be conducted on road safety; on water conservation, health, sanitation and hygiene; and mitigation of the transmission of communicable diseases such as the coronavirus disease (COVID-19). The project will also accomplish the preparation of at least six climate-resilient components for future investment projects.

2

The proposed smart road project is part of ACUDP, these will help decongest the city and improve mobility, aesthetics, making roads pedestrians friendly. The Environmental Assessment (Initial Environmental Examination) for the project is done as per the Asian Development Bank's Safeguard Policy Statement (SPS), June 2009 as well as EIA (Environmental Impact Assessment) Notification, 2006 by Ministry of Environment and Forests and Climate Change (MoEFCC), Government of India (GoI).

Scope of Work: The Agartala Smart City Limited (ASCL) proposes Improvement of Roads, Footpaths and Storm Water Drain. Upgradation of total length of 23.562 km roads under the assistance of Asian Development Bank (ADB) funding. The project includes up gradation of roads, footpaths of 15 existing roads in Agartala within the available ROW given in Table I below:

Table 1: List of Roads for upgradation

Sr. No.	Name of Road	Available ROW (m)	Road Section		Road Length (km)	Drain Length (km)	Footpath length (km)	Utility trench length (km)
			From	To				
1.	Hariganga Basak Road	15.50 to 20.80	Battala Chowmuhani	Ashram Chowmuhani	3.48	6.96	6.96	6.96
2.	Akhaura Road	26.80	Fire brigade Chowmuhani	Jackson Gate Chowmuhani	1.33	1.33	2.66	1.33
3.	Mantribari Road	16.20	Post Office Chowmuhani	RMS Chowmuhani	0.258	0.516	0.516	0.516
4.	VIP Road	15.00 to 21.00	Radhanagar Motorstand	Lichubagan	3.18	6.36	6.36	4.76
5.	Thakurpalli Road	12.70 to 15.00	Ker Chowmuhani	Purbasa Chowmuhani	2.117	1.61	4.234	1.61
6.	Sakuntala Road	17.50 to 19.90	Surya Chowmuhani	Rabindra Bhawan	0.500	0.4	1.0	0.4

² The subprojects include (i) Storm water drains, (ii) Sewerage, (iii) Urban Roads, (iv) Water Supply, (v) Open spaces and water bodies, and (vi) Housing for Economically weaker sections

Sr. No.	Name of Road	Available ROW (m)	Road Section		Road Length (km)	Drain Length (km)	Footpath length (km)	Utility trench length (km)
			From	To				
7.	GB Road	9.00 to 11.70	GB chakra	Ram Thakur Club Chowhumani	4.050	6.81	8.1	6.81
8.	Barjala Road	12.00 to 16.00	Durga Chowmuhan	Barjala Chowmuhan	4.050	7.592	8.1	7.592
9.	Ronaldsay Road	17.00	Durga Chowmuhan	Ker Chowmuhan/ Fire Brigade Chowmuhan	1.100	2.2	2.2	2.2
10.	Jail Ashram Road	11.00	Ashram Chowmuhan	Lalbahadur Junction	1.547	3.094	3.094	3.094
11.	Jail Road	10.30	Old central jail	Math chowmuhan	0.500	0.5	1.0	0.5
12.	BT Road	13.00	From Jail Ashram	Old Jail Tri-Junction	0.280	0.28	0.56	0.28
13.	Road Surrounding the proposed IT Hub Site (3 sides)	11.00	Jail Ashram Road	B.T. Road	0.570	0.883	1.14	0.883
14.	ITI Road	11.10 to 12.00	G.B. Chakkar	Proposed ICC building	0.390	0.78	0.78	0.78
15.	Lankamura Road	11.10 to 15.00	Akhaura Channel	Proposed EWS site	0.210	0.42	0.42	0.42
TOTAL LENGTHS					23.562	39.735	47.124	38.135

The project will decongest the city's central and east zones by developing 23.562 km of roads with improved paved surface, geometric traffic junction's transformation, signaling, access to pedestrian friendly footpaths, street lighting, traffic signs, road marking and a utility corridor with shifting of electrical lines and provision for laying OFC cables. The project will also (a) improve drainage infrastructure to reduce urban floods; (b) improve public health by providing 48.2 km of new or rehabilitated stormwater drains; (c) visual improvement elements including dedicated footpaths with street furniture, tree belt and landscaping. The proposed scope of works for the project are:

- Site clearance, demolition works, earthworks, temporary works, traffic diversion, barricading the construction site, utility shifting, and all ancillary works deemed necessary for the carrying out of temporary & permanent construction works.
- Widening/ re-cambering/ raising/ milling down & overlaying of existing carriageways, flexible/ rigid pavement at grade road intersections & accesses to adjoining developments. Work also includes removal of street furniture, exiting foot path, existing median, exiting signage, trees if any way of revised ROW, existing structures that obstruct the revised ROW as per instruction of ASCL.
- Cutting of around 520 trees.

- Construction of Electrical ducts (38.135 km), Storm water Drains (39.735 km), cross drains as per approved drawing.
- Retrofitting the existing roads as per the proposed road sections w.r.t carriageways, provision of footpath, services lanes.
- Installing RPM, making road markings along the road edge, road centre line & as per IRC guidelines, bus stop marking, construction of medians & speed breakers, & junction improvements as per the drawings & in accordance with the Employer's requirements and to the satisfaction of the Engineer in charge.
- Construction of footpaths, kerbs, railings, vehicular impact guardrails and other road related facilities as per the guidelines of IRC in accordance with the Employer's requirements and to the satisfaction of the Engineer in charge.
- Supply and installation of new traffic signage, directional signage, street name signs & re-sitting of such existing signs & other road signs to be retained, inclusive of support & foundation as per Employers Requirement.
- Design, supply, erection, installation, testing and commissioning of Street lighting system including Street light pole, LED fixture, Smart CCMS system on cloud server including all the necessary accessories.
- Conversion, design, supply, installation, testing and commissioning of existing 33 KV, 11 KV and LT Overhead Lines into Under Ground Cable Lines in the Distribution System including Service Mains to Consumers, Protection, Feeder Pillars and associated Terminations including any other items necessary for completion of entire work.
- Supply & installation of street furniture seating bench, planter box, bollards, cycle hoops, advertisement/ branding/ way finding boards & poles in accordance with the Employer's requirements and to the satisfaction of the Engineer in charge.
- Planting of trees, shrubs and installation of lawns as a part of Landscape work & installation of services for the same, as per the drawing in accordance with the Employer's requirements and to the satisfaction of the Engineer in charge.
- All other works and services ancillary or related to the full completion of the Works in accordance with the employer's requirements.
- Proposed smart elements are:
 - (a) Road markings
 - (b) Zebra crossings
 - (c) Footpath pavers
 - (d) Tactile pavers (for footpath) Railing (at median)
 - (e) Pedestrian light signals
 - (f) Traffic signals
 - (g) Street light & other fixtures
 - (h) Reflectors
 - (i) On-street parking bays
- Visual Improvement of Roads include smart elements listed below will enhance the functional and visual dimensions of the intervention area.
 - (j) Benches
 - (k) Dual System Dustbins
 - (l) Pots & Planters
 - (m) Bollards
 - (n) Decorative Lamp Post
 - (o) City information panel
 - (p) Landscaping (Trees, planters, shrubs).

Screening and assessment of potential environmental impacts: ADB requires the consideration of environmental issues in all aspects of the Bank's operations, and the requirements for environmental assessment are described in ADB's Safeguard Policy Statement (SPS), 2009. This states that ADB needs environmental assessment of all project loans, program loans, sector loans, sector development program loans, and loans involving financial intermediaries, and private sector loans. Accordingly, this Initial Environmental Examination (IEE) has been conducted to assess the environmental impacts of the infrastructure components proposed under Upgradation of Major Roads in Agartala City Urban Development Project.

Initial Environmental Examination (IEE): This IEE aims to (i) provide critical facts, significant finding, and recommended actions; (ii) present the national and local legal and institutional framework within which the environmental assessment has been carried out; (iii) provide information on existing geographic, ecological, social and temporal context including associated facilities within the subproject's area of influence; (iv) assess the subproject's likely positive and negative direct and indirect impacts to physical, biological, socioeconomic, and physical cultural resources in the subproject's area of influence; (v) identify mitigation measures and any residual negative impacts that cannot be mitigated; (vi) describe the process undertaken during project design to engage stakeholders and the planned information disclosure measures and the process for carrying out consultation with affected people and facilitating their participation during project implementation; (vii) describe the subproject's grievance redress mechanism for resolving complaints about environmental performance; (viii) present the set of mitigation measures to be undertaken to avoid, reduce, mitigate, or compensate for adverse environmental impacts; (ix) describe the monitoring measures and reporting procedures to ensure early detection of conditions that necessitate particular mitigation measures; and (x) identify who is responsible for carrying out the mitigation and monitoring measures.

The IEE is prepared after detailed design and no major design changes are expected in the subproject during implementation. However, the IEE will be updated/ revised if there are any changes in site/ locations and design of components during preconstruction phase. It will also be updated/ revised based on review of draft IEE and conditions of consents/ approval from other departments. The updated/ revised IEE will be submitted to ADB for review and disclosure. No works will be conducted until ADB has cleared the updated/revised IEE. The revised IEE shall supersede the earlier version of IEE and shall be contractually applicable to the contractor after approval from Agartala Smart City Limited (ASCL) and ADB.

Categorization. Potential negative impacts were identified in relation to pre-construction, construction and operation of the improved infrastructure, but no permanent environmental impacts were identified as being due to either the subproject design or location. Accordingly, Agartala upgradation of roads subproject is classified under environmental Category B as per the SPS as no significant impacts are envisaged. Further mitigation measures have been developed to reduce all negative impacts to acceptable levels. These were discussed with specialists responsible for the engineering aspects, and as a result some measures have already been included in the designs for the infrastructure.

Description of the Environment: Information on baseline environment was collected from primary survey for air quality, water quality, noise quality and, soil quality and ecological components conducted in December 2018- January 2019 and secondary sources of data for the macro environmental parameters like climate, physiography (geology and geomorphology), biological and socioeconomic environment of the project influence area. Agartala is the Capital of Tripura and is an urban settlement and there is no natural habitat at the sites. The project does not involve any

type of land acquisition or land use change as it is an up gradation of the existing roads within the existing RoW (Right of way). There are no mangroves, or estuaries in or near the project location. There are no forest areas within Agartala. Traffic management will be necessary during up gradation of the busy roads such as HGB Road, Mantribari Road, Thakurpalli road Ronaldsay Road, GB Road, Jail Ashram Road etc.,

Potential Environmental Impacts and Mitigation Measures. In this IEE, negative impacts were identified in relation to location, design, construction and operation of the improved infrastructure. Environmental impacts as being due to the project design or location were not significant as various measures are already included in site planning and detailed design. There are no environmentally or archeologically sensitive areas within Agartala town. The town is mostly surrounded by agricultural areas, and there are no sensitive areas like forests.

Potential impacts during construction are **expected and will be considered** but **are** temporary **in nature** and are common impacts of construction in urban areas, and there are well developed methods to mitigate the same. All other construction activities will be confined to the selected sites and the interference with the general public and community around is minimal. In these works, the temporary negative impacts arise mainly from construction dust and noise, hauling of construction material, waste and equipment on local roads (traffic, dust, safety etc.), mining of construction material, occupational health and safety (OHS) aspects. Road construction works will be conducted along already existing public roads in an urban area congested with people, activities and traffic. Therefore, these works may have adverse, but temporary impacts arising mainly from the disturbance of residents, businesses and traffic due to construction work; safety risk to workers, public; access impediment to houses and business, disposal of large quantities of construction waste etc. These are all general impacts of construction in urban areas and there are well developed methods of mitigation that are suggested in the EMP.

Environmental Management Plan. Environmental Management Plan (EMP) includes the implementation procedure of the guidelines and mitigation measures recommended to avoid, minimize and mitigate foreseen environmental impacts of the project. The implementation of environmental management plan needs suitable organization set up and the success of any environmental management plan depends on the efficiency of the group responsible for implementation of the programme. It is proposed to carryout regular environmental monitoring to provide information to the management for periodic review and alteration of the environmental management plan is necessary to ensure that environmental protection is optimized at all stages of the project. PIU is responsible for implementing all environmental monitoring and management works during implementation of Roads upgradation project Revitalization project to achieve certain level of quality in the project and ensure that all statutory requirements are met during the project implementation. The engineering staff of PIU, supervision consultancy and the contractor who would be responsible for the implementation of the EMP, need to be trained on environmental issues of Road upgradation project. EMP implementation budget for the proposed project is Rs. 1,78,55,634.

A copy of the approved EMP will always be kept on site during the construction period. The EMP has been made binding on contractor operating on the site and included in the bid and contract documents. Non-compliance with, or any deviation from, the conditions set out in this document constitutes a failure in compliance. Contractor will establish the baseline environmental conditions prior to commencement of civil works.

Institutional Arrangement. Agartala Smart City Limited (ASCL) will be the executing agency (EA) and implementing agency (IA) for the Project, responsible for management, coordination and execution of all activities funded under the loan. The PMU will be responsible for implementing the Project, while the PIUs at project level will support the PMU. The Project Management and Quality Assurance Consultant (PMQAC) and PIUs will support the PMU. The Board of Directors of ASCL will provide policy related directions and project oversight to PMU.

The PMU will be headed by a Project Director and will be responsible for: 1) approval of detailed project reports; 2) technical sanction on tender/bid evaluation; 3) overall monitoring, supervision & project implementation, and 4) any other matter related to implementation of Social and Environment Safeguard as per ADB SPS requirements from time to time. The Board of Directors of ASCL may assign any other requirements related to ADB assisted project to PMU from time to time. The PMU will have a Safeguard and Gender Cell (SGC) to oversee all safeguards and gender related activities. SGC will be headed by a safeguards officer (SO) supported by an Environmental Engineer (EE) and a Social and Gender Development Officer.

The PIUs will be headed by Deputy Project Director (DPD) who will have overall responsibility for safeguards management. An Environmental and Social Safeguards Unit (ESSU) will be established for safeguards management which will be staffed with one Assistant Engineer each for environmental and social safeguards. PMQAC will provide project implementation support to PIUs and will include an Environment Management Specialist and a Social Management Specialist for facilitating safeguards management and reporting. During Implementation, contractor team shall include an Environmental, Health & Safety (EHS) Officer and a Social Safeguard Officer

Consultation Disclosure and Grievance Redress: The stakeholders were involved in developing the IEE through discussions on-site and public consultation, after which views expressed were incorporated into the IEE and in the planning and development of the project. The IEE will be made available at public locations in the city and will be disclosed to a wider audience via the ADB and ASCL websites. The consultation process will be continued and expanded during project implementation to ensure that stakeholders are fully engaged in the project and can participate in its development and implementation. The citizens of the Agartala City will be the major beneficiaries of this subproject. During the construction stage the project will provide employment opportunity and enhance the enterprise development of locals. There will also be skill development due to the project implementation. A project specific grievance redress mechanism is described within the IEE to ensure any public grievances are addressed quickly.

Monitoring and Reporting: The ASCL and Project consultants will be responsible for monitoring. The consultant will submit monthly monitoring reports to ASCL and ASCL will send semi-annual monitoring reports to ADB. ADB will post the environmental monitoring reports on its website.

Conclusions: The citizens of the Agartala will be the major beneficiaries. The subproject is primarily designed to improve environmental quality and living conditions of Agartala town through provision of improved roads. The benefits arising from this subproject include: (a) improve drainage infrastructure to reduce urban floods; (b) improve public health by providing 48.2 km of new or rehabilitated stormwater drains; (c) visual improvement elements including dedicated footpaths with street furniture, tree belt and landscaping

The proposed subproject is unlikely to cause significant adverse impacts on either the environment or the human health and safety. The potential impacts that are associated with design, construction and operation can be mitigated to standard levels without difficulty through proper engineering design and the incorporation or application of recommended mitigation measures and procedures.

Based on the findings of the IEE, there are no significant impacts and the classification of the subproject as Category "B" is confirmed. No further special study or detailed environmental impact assessment (EIA) needs to be undertaken to comply with ADB SPS (2009) or GoI EIA Notification (2006).

Recommendations. The following are recommendations applicable to the subproject to ensure no significant impacts:

- Obtain all statutory clearances at the earliest time possible and ensure conditions/provisions are incorporated in the detailed design.
- Include this IEE in bid and contract documents.
- Conduct safeguards induction to the contractor upon award of contract.
- Strictly supervise EMP implementation.
- Ensure contractor appointed qualified EHS officers prior to start of works;
- Documentation and reporting on a regular basis as indicated in the IEE.
- Continuous consultations with stakeholders.
- Contractor to ensure immediate repair of utilities for uninterrupted services
- Contractor to ensure safe and secure access to all nearby households and commercial establishments.
- Timely disclosure of information and establishment of grievance redressal mechanism (GRM);
- Involvement of contractors, including subcontractors, in first level GRM;
- Commitment from PMU, PIUs, project consultants, and contractors to protect the environment and the people from any impact during project implementation.

I. INTRODUCTION

A. Project Background

1. The proposed project is aligned with Government of India's Smart Cities Mission (SCM), launched in 2015 with the aim of making urban areas more livable, citizen-friendly, sustainable and resilient, improving urban equality and living conditions with a focus on creating 100 "smart cities". The project aims to support; (i) urban development: by making the city more livable; (ii) economic development: by promoting the city as an economic and commercial hub in the region; (iii) environmentally sustainable development; and (iv) capacity development of implementing institution. The project is aligned with India CPS 2018–2022, which emphasizes support to national flagship programs including SCM, inclusive urbanization, and development of competitive cities.³

B. Impact and Outcome of the Project

2. The project is aligned with the following impact: Quality of life for urban Agartala inhabitants improved.⁴ The project will have the following outcome:

3. **Output 1:** Urban roads and drainage upgraded and enhanced. This will include (i) construction of 23 km of climate-resilient roads that will decongest the city's central and east zones, along with associated facilities including improved paved surface, geometric traffic junctions transformation, lighting, footpaths, dedicated parking, bollards, signaling, Elderly-Women-Children-Differently abled (EWCD) responsive features, and a utility corridor with shifting of electrical lines; and (ii) construction and rehabilitation of 48 km of new or existing stormwater drains. These activities will improve public health by reducing urban floods and air quality through reduction of Particulate Matter size less than 10 microns (PM10).

4. **Output 2:** Water supply system expanded and improved. This will include in the Chandmari service area (i) construction of one water treatment plant with 8.0 Millions of Liters per Day treatment capacity; (ii) construction of two overhead reservoirs with overall capacity of 1,850KL; (iii) construction of 2 tube wells; (iv) construction and rehabilitation of approximately 42km of water supply network; and (v) establishment of approximately 5,700 new or rehabilitated households connections. Activities under this output will benefit 26,440 people with 135 liters per capita per day of treated water and will improve public health by ensuring 100% of water quality test results in specific distribution system will meet country standards.

5. **Output 3:** Tourist places renovated and made more eco-friendly. This will include (i) rejuvenation of 50,000 m² within the Maharaja Bir Bikram College lake area, through upgrading of eco-park, development of a water recreation area and lakeside public area, creation of a thematic/botanical garden, garden gazebos, enhancement of the lake water quality with artificial wetlands and adequate aeration, and use of waste and effluent management strategies; and (ii) renewal of 100,000 m² of open spaces in the Ujjayanta Palace area, through beautification of garden spaces, renewal of existing water fountains, renovation of existing drainage system, development of lake side walkway with resting areas and pergolas, leisure areas, decorative

³ Smart Cities Mission. [Strategy](#). ADB. 2017. [Country Partnership Strategy: India, 2018–2022—Accelerating Inclusive Economic Transformation](#). Manila.

⁴ Government of India, Ministry of Housing and Urban Affairs. 2015. [Smart City Guidelines](#). Delhi

lighting and dedicated parking zone. All facilities will adopt EWCD responsive features and will also increase users' safety through improved lighting zones.

6. **Output 4:** Capacity of urban local bodies in urban service delivery strengthened. The project will provide capacity-building for the technical staff of Agartala Municipal Corporation, Agartala Smart City Limited, Tripura Urban (Planning and) Development Authority and Urban Development Department, with focus on female staff, on (i) project management and operation and maintenance of urban infrastructure; (ii) own-source revenue generation and financial management; (iii) climate resilient urban planning, gender analysis and mainstreaming, and (iv) gender-responsive budgeting in urban planning. This output will also provide capacity building for increased knowledge on tourism-related matters and livelihood enhancement for shop keepers and street vendors around Ujjayanta Palace. This output will also increase knowledge of eligible staff, with focus on female staff, of (i) the Public Health Division of AMC; and (ii) AMC and DWS on institutional reforms. Awareness campaigns will also be conducted on (i) road safety; and (ii) behavior change activities focusing on water conservation, health, sanitation and hygiene; and awareness on the spread of epidemics or pandemics such as COVID-19. The project will also accomplish the preparation of at least 6 climate-resilient subprojects for future investments projects.⁵

C. Purpose of the Initial Environmental Examination

7. ADB requires the consideration of environmental issues in all aspects of the bank's operations, and the requirements for environmental assessment are described in its Safeguard Policy Statement (SPS), 2009. The proposed projects are categorized as A, B, C or FI to determine the level of environmental assessment required.⁶ The proposed project, "Upgradation of Major Roads" will not have any significant environmental impacts during pre-construction, construction and operation phase as the proposed project involves laying of roads and drainage. Therefore, the subproject is classified as Environmental Category B as per the SPS, 2009 as no significant impacts are envisaged. ADB's Rapid Environmental Assessment (REA) Checklist was used to assess the impacts (Appendix 1) and accordingly, this initial environmental examination (IEE) report has been prepared. Further mitigation measures have been developed to reduce all potential impacts to acceptable levels. These were discussed with specialists responsible for the engineering aspects, and as a result some measures have already been included in the designs for the proposed project.

⁵ The subprojects include (i) Storm water drains, (ii) Sewerage, (iii) Urban Roads, (iv) Water Supply, (v) Open spaces and water bodies, and (vi) Housing for Economically weaker sections

⁶ Per ADB SPS, the environmental categorization and level of environmental assessment required for each category are as follows: (i) Category A: A proposed project is classified as category A if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment is required. (ii) Category B: A proposed project is classified as category B if its potential adverse environmental impacts are less adverse than those of category A projects. These impacts are site-specific, few if any of them are irreversible and, in most cases, mitigation measures can be designed more readily than for category A projects. An initial environmental examination is required. (iii) Category C: A proposed project is classified as category C if it is likely to have minimal or no adverse environmental impacts. No environmental assessment is required although environmental implications need to be reviewed. (iv) Category FI: A proposed project is classified as category FI if it involves investment of ADB funds to or through a financial intermediary.

8. **Scope of the IEE.** The IEE is prepared based on the detailed designs considered in detailed project report (DPR) and based on secondary sources of information, field reconnaissance surveys, primary field monitoring (environmental) survey and stakeholder consultation. There are no major design changes expected in the subproject during implementation. However, the IEE will be updated/ revised if there are any changes in site/ locations and design of components during construction phase. The updated/ revised IEE will be submitted to ADB for review and disclosure. No works will be conducted until ADB clears the updated/revised IEE.

9. This IEE will be reviewed during detailed design stage and project implementation and updated if there is any change in scope of works, change in location of component and change in cost due to addition or subtraction of components which can change the environmental impacts, and revised IEE shall supersede the earlier version of IEE and shall be contractually applicable to the contractor after approval from ASCL and ADB.

10. The implementation of the subprojects will be governed by Government of India and State of Tripura and other applicable environmental acts, rules, regulations, and standards. Environmental safeguards will be followed in accordance with the ADB SPS 2009. During the design, construction, and operation of the project the borrower/client will apply pollution prevention and control technologies and practices consistent with international good practice, as reflected in internationally recognized standards.

D. Report Structure

11. This Report contains the following 11 sections including the executive summary at the beginning of the report.

- (i) Executive Summary
- (ii) Introduction;
- (iii) Description of the project;
- (iv) Analysis of Alternatives
- (v) Policy, legal and administrative framework
- (vi) Description of the environment;
- (vii) Anticipated Environmental Impacts & Mitigation Measures;
- (viii) Public consultation and information disclosure;
- (ix) Grievance Redress Mechanism;
- (x) Environmental management plan; and
- (xi) Conclusion and recommendation.

II. DESCRIPTION OF PROJECT COMPONENTS

A. Subproject Location

12. Agartala is spread over an area of 76.5 square kilometers (km²), located at 23°50'N Latitude and 91°17'E Longitude. The city lies on the bank of the Haora River although the city also extends to the low-lying hills on its northern parts. It is located 2 km away from the Bangladesh Border. It is the most important commercial hub of the state and important trade route to the north-eastern states. The border connectivity with neighboring country Bangladesh makes Agartala an important trading hub for Import and Export. The project is spread across the entire Agartala city.

B. Present Status of the Roads

13. **Existing condition:** The traffic in Agartala City limits is moderate in nature and congestion is mainly due to homogenous traffic of motorized and non-motorized category. Road inventory surveys were carried out for the road stretches identified for up-gradation and improvement proposals to assess the existing conditions. The existing scenario of major roads are described below, and the conditions are shown in Figure 1.

- (i) On street parking on busy roads is a major point of concern. It reduces the effective carriageway width, encourages hawkers to occupied pedestrian walkways leading to traffic congestion. Such occurrence can be visualized in Hari Gnaga Basak Road, Orient Chowmuhani, Battala Chowmuhani, Shakuntala Road, BT Road, Ronaldsay Road.
- (ii) The Drain cum Footpath along the arterial roads are not in use by the pedestrians as they are encroached by the hawkers, adjacent vendors and commercial outlets. Such as in Hariganga Basak Road, Thakurpalli Road, etc.,
- (iii) In some roads, there are no dedicated footpaths along the sub-arterial roads.
- (iv) Poor condition of pavement.
- (v) Some road junctions are encroached by Autos/Rickshaws parking and auto stands
- (vi) In some roads, the drainage channels are partially covered which is hazardous for the pedestrian use.
- (vii) Landscaping and visual aspects along the road are not satisfactory.
- (viii) Utilities like electric poles and wiring are exposed and visually cluttered.
- (ix) There is no CCTV Surveillance.
- (x) There is no dedicated bus bays and bus stop/stand locations.
- (xi) There is no proper traffic maneuver movement, proper lane markings and traffic signage's at junctions or at major Bus terminals.

Figure 1: Existing condition of the Roads



	
Shakuntala Road	BT Road
	
Ronaldsay Road	

	
Hariganga Basak Road	Thakurpalli Road
	
Jail Ashram Road	B T Road

Old Motorstand Chowmuhani	Battala Chowmuhani
Barjala Road	Ronaldsay Road
Thakurpalli Road	Barjala Road
Paradise Chowmuhani	Radhanagar Motorstand



14. **Existing condition analysis:** Road inventory surveys were carried out for the road stretches identified for Up-gradation and Improvement proposals to assess the existing conditions. The conclusion drawn based on the analysis of the existing system are as follows:

- (i) For the existing traffic, the roads have reached the saturation level and are operating at Level of Service "C". This situation can be improved by restrictions of on street parking and providing parking proposals; especially for HGB Road and Akhaura Roads wherein the commercial activities are more predominant.
- (ii) Lane configurations, equally divided carriageway with median proposals will guide the traffic movements in dedicated and respective directions.
- (iii) There are no footpaths, cycle track, tree lane, utility ducts/ dedicated corridor on either side of the road. Facilities shall be proposed for the same.
- (iv) Junctions are not as per standards, needs to be improved as per the standards for smooth traffic flow at junctions.
- (v) There are no pedestrian crossing facilities at junctions. Provisions to be made for crossings at the Major Junctions and at suitable locations.
- (vi) There is no road furniture present in the project stretch. Same shall be included in the project proposal.
- (vii) Bus shelters and Bus bays to be proposed at suitable locations with aesthetical and structural improvements.
- (viii) On-street parking, Auto stand, Public/ E-Toilets, Street lighting and Sign boards, etc., shall be proposed and upgraded with smart features.
- (ix) Smart street components such as Smart poles, CCTV, VMS, and other ICT components shall be included in the development of Project stretch.
- (x) The RoW of the roads in Agartala are less, trees along the shoulder of roads, gradient of road profile, retaining the existing drains and the no of utilities required per road are of less size and numbers, Pipe Conduit system shall be proposed for Overhead to Underground of Electrical, Telephone and OFC lines for these stretches of proposed roads.
- (xi) Existing storm water drains are found to be choked up with solid waste and silt, so desilting and removing of solid waste and laying continuous slab will solve this issue and provide good walkways to the pedestrians.

C. Proposed Subproject Components

15. The scope of works involves up gradation of existing infrastructure involving widening of roads, providing continuous obstacle free footpaths, pedestrian crossings etc. within the existing ROW as enumerated in Table 1.

Table 1: Details of Roads

Sr. No.	Name of Road	Available ROW (m)	Road Section		Road Length (km)	Drain Length (km)	Footpath length (km)	Utility trench length (km)
			From	To				
1.	Hariganga Basak Road	15.50 to 20.80	Battala Chowmuhan Latitude: 23.829240° Longitude: 91.269634°	Ashram Chowmuhan Latitude: 23.835430° Longitude: 91.301636°	3.48	6.96	6.96	6.96
2.	Akhaura Road	26.80	Fire brigade Chowmuhan Latitude: 23.832976° Longitude: 91.269589°	Jackson Gate Chowmuhan Latitude: 23.831851° Longitude: 91.282552°	1.33	1.33	2.66	1.33
3.	Mantribari Road	16.20	Post Office Chowmuhan Latitude: 23.829393° Longitude: 91.278575°	RMS Chowmuhan Latitude: 23.831898° Longitude: 91.278748°	0.258	0.516	0.516	0.516
4.	VIP Road	15.00 to 21.00	Radhanagar Motorstand Latitude: 23.845160° Longitude: 91.282726°	Lichubagan Latitude: 23.871215° Longitude: 91.285260°	3.18	6.36	6.36	4.76
5.	Thakurpalli Road	12.70 to 15.00	Ker Chowmuhan Latitude: 23.835040° Longitude: 91.270166°	Purbasa Chowmuhan Latitude: 23.833776° Longitude: 91.291371°	2.117	1.61	4.234	1.61
6.	Sakuntala Road	17.50 to 19.90	Surya Chowmuhan Latitude: 23.829851° Longitude: 91.280741°	Rabindra Bhawan Latitude: 23.834016° Longitude: 91.280871°	0.500	0.4	1.0	0.4
7.	GB Road	9.00 to 11.70	GB Chakkar Latitude: 23.859145° Longitude: 91.293974°	Ram Thakur Club Chowhumani Latitude: 23.824818° Longitude: 91.285146°	4.050	6.81	8.1	6.81
8.	Barjala Road	12.00 to 16.00	Durga Chowmuhan Latitude: 23.842852° Longitude: 91.270572°	Barjala Chowmuhan Latitude: 23.873376° Longitude: 91.271991°	4.050	7.592	8.1	7.592
9.	Ronaldsay Road	17.00	Durga Chowmuhan Latitude: 23.842852° Longitude: 91.270572°	Ker Chowmuhan/ Fire Brigade Chowmuhan Latitude: 23.832976° Longitude: 91.269589°	1.100	2.2	2.2	2.2
10.	Jail Ashram Road	11.00	Ashram Chowmuhan Latitude: 23.835430° Longitude: 91.301636°	Lalbahadur Junction Latitude: 23.836472° Longitude: 91.287361°	1.547	3.094	3.094	3.094

Sr. No.	Name of Road	Available ROW (m)	Road Section		Road Length (km)	Drain Length (km)	Footpath length (km)	Utility trench length (km)
			From	To				
11.	Jail Road	10.30	Old central jail Latitude: 23.835699° Longitude: 91.291695°	Math chowmuhan Latitude: 23.831218° Longitude: 91.290910°	0.500	0.5	1.0	0.5
12.	BT Road	13.00	From Jail Ashram Latitude: 23.835545° Longitude: 91.292905°	Old Jail Tri-Junction Latitude: 23.835822° Longitude: 91.290657°	0.280	0.28	0.56	0.28
13.	Road Surrounding the proposed IT Hub Site (3 sides)	11.00	From Jail Ashram Latitude: 23.835545° Longitude: 91.292905°	B.T. Road Latitude: 23.838507° Longitude: 91.290783°	0.570	0.883	1.14	0.883
14.	ITI Road	11.10 to 12.00	G.B. Chakkar Latitude: 23.859145° Longitude: 91.293974°	Proposed ICC building Latitude: 23.857260° Longitude: 91.296875°	0.390	0.78	0.78	0.78
15.	Lankamura Road	11.10 to 15.00	Akhaura Channel Latitude: 23.839385° Longitude: 91.255296°	Proposed EWS site Latitude: 23.841150° Longitude: 91.255286°	0.210	0.42	0.42	0.42
TOTAL LENGTHS					23.562	39.735	47.124	38.135

ROW = right-of-way

16. The project will decongest the city's central and east zones by developing 23.562 km of roads with improved paved surface, geometric traffic junction's transformation, signaling, access to pedestrian friendly footpaths, street lighting, traffic signs, road marking and a utility corridor with shifting of electrical lines and provision for laying OFC cables. The scope of work broadly includes:

- (i) Site clearance, demolition works, earthworks, temporary works, traffic diversion, barricading the construction site, utility shifting, and all ancillary works deemed necessary for the carrying out of temporary & permanent construction works.
- (ii) Widening/ re-cambering/ raising/ milling down & overlaying of existing carriageways, flexible/ rigid pavement at grade road intersections & accesses to adjoining developments. Work also includes removal of street furniture, exiting foot path, existing median, exiting signage, trees if any way of revised ROW, existing structures that obstruct the revised ROW as per instruction of ASCL.
- (iii) Cutting of around 520 trees.
- (iv) Construction of Electrical ducts (38.135 km), Storm water Drains (39.735 km), cross drains as per approved drawing.
- (v) Retrofitting the existing roads as per the proposed road sections w.r.t carriageways, provision of footpath, services lanes.
- (vi) Installing RPM, making road markings along the road edge, road centre line & as per IRC guidelines, bus stop marking, construction of medians & speed breakers, & junction improvements as per the drawings & in accordance with the Employer's requirements and to the satisfaction of the Engineer in charge.
- (vii) Construction of footpaths, kerbs, railings, vehicular impact guardrails and other road related facilities as per the guidelines of IRC in accordance with the Employer's requirements and to the satisfaction of the Engineer in charge.
- (viii) Supply and installation of new traffic signage, directional signage, street name signs & re-sitting of such existing signs & other road signs to be retained, inclusive of support & foundation as per Employers Requirement.
- (ix) Design, supply, erection, installation, testing and commissioning of Street lighting system including Street light pole, LED fixture, Smart CCMS system on cloud server including all the necessary accessories.
- (x) Conversion, design, supply, installation, testing and commissioning of existing 33 KV, 11 KV and LT Overhead Lines into Under Ground Cable Lines in the Distribution System including Service Mains to Consumers, Protection, Feeder Pillars and associated Terminations including any other items necessary for completion of entire work.
- (xi) Supply & installation of street furniture seating bench, planter box, bollards, cycle hoops, advertisement/ branding/ way finding boards & poles in accordance with the Employer's requirements and to the satisfaction of the Engineer in charge.
- (xii) Planting of trees, shrubs and installation of lawns as a part of Landscape work & installation of services for the same, as per the drawing in accordance with the Employer's requirements and to the satisfaction of the Engineer in charge.
- (xiii) All other works and services ancillary or related to the full completion of the Works in accordance with the Employer's requirements.
- (xiv) Proposed smart elements are:
 - (a) Road markings
 - (b) Zebra crossings
 - (c) Footpath pavers
 - (d) Tactile pavers (for footpath) Railing (at median)
 - (e) Pedestrian light signals
 - (f) Traffic signals

- (g) Streetlight & other fixtures
 - (h) Reflectors
 - (i) On-street parking bays
- (xv) Visual Improvement of Roads include the following.
- (a) Benches
 - (b) Dual System Dustbins
 - (c) Pots & Planters
 - (d) Bollards
 - (e) Decorative Lamp Post
 - (f) City information panel
 - (g) Landscaping (Trees, planters, shrubs).

17. The details of the construction work to be carried on individual roads are provided in Table 2.


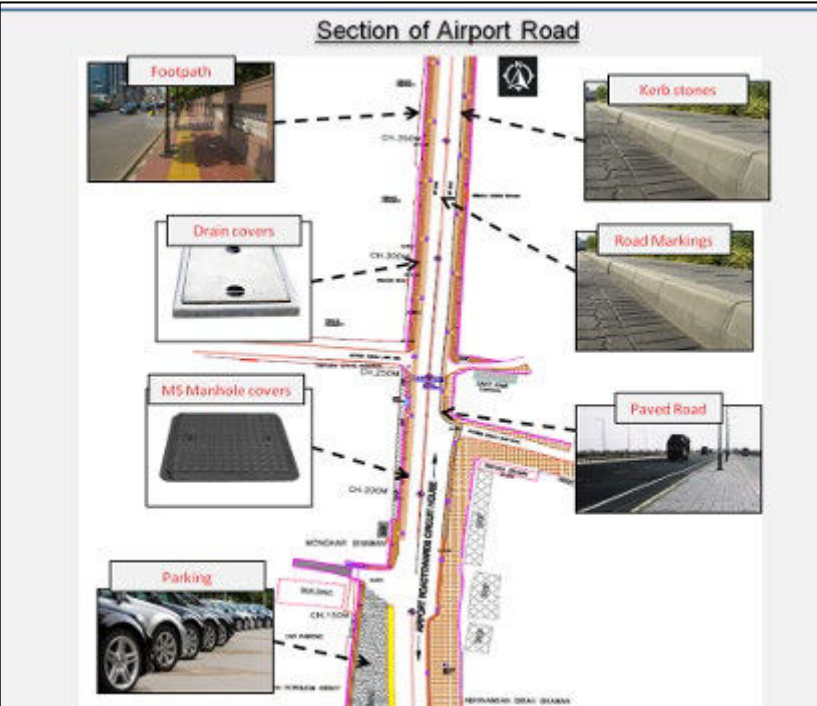
18. **Project Benefits:** The project will (a) improve drainage infrastructure to reduce urban floods; (b) improve public health by providing 39.735 km of new stormwater drains and 38.135 km of utility trenches; (c) visual improvement elements including dedicated footpaths of 47.124 km with street furniture, tree belt and landscaping.

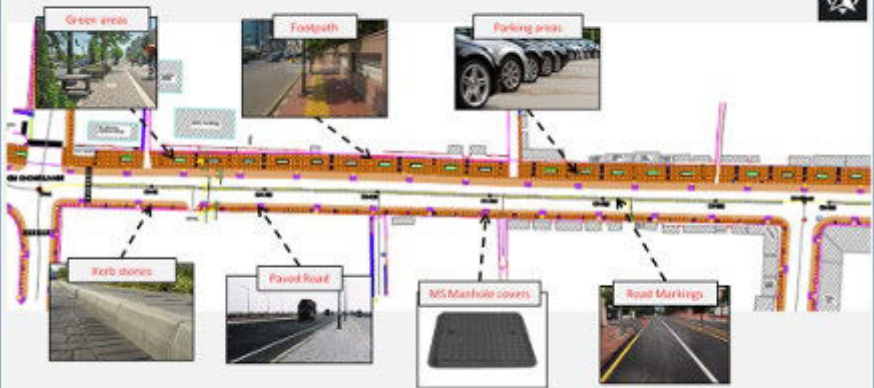
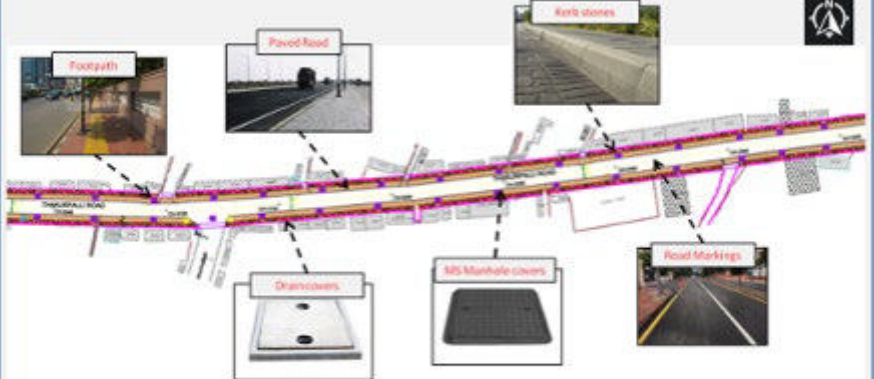
Table 2: Details of Construction Activity

Sr. No.	Item Description	Unit	Hariganga Basak Road	Akhura Road	Mantribari Road	VIP Road	Thakurpalli Road	Sakuntala Road	GB Road	Barjala Road	Ronaldsay Road	Jail Ashram Road	Jail Road	BT Road	IT Hub Road	ITI Road	Lankamura Road	Total
			(3.48 km)	(1.33km)	(0.26km)	(3.18km)	(2.117km)	(0.5 km)	(4.05 km)	(4.05 km)	(1.1km)	(1.547km)	(0.5km)	(0.28 km)	(0.57 km)	(0.39 km)	(0.21 km)	23.562 km
1	Dismantling and Demolishing Work: Dismantling of (W1.5 x D1.25) size Open Brick drain	Cum	7191	2056	634	8456.00	3241	638	8338	9518.8	2259	4053.8	565	126.52	1027.7	997.5	358	49460.32
2	Excavation: Earth work in excavation by mechanical means (Hydraulic excavator) / manual means for Storm Water Drain & Electrical Trench.	Cum	59995.9	17819.6	3622.6	57167.2	30603.8	3666	49836.62	51412.4	27557.7	23663.8	3702.1	2153.8	6450.9	5243.3	2937.8	345833.52
3	Wooden Shoring: Close timbering in trenches including strutting, shoring and packing cavities for Storm Water Drain & Electrical Trench	m ²	30946	6628.4	2166	29710	10761.3	1660.9	36918.8	30681.50	12442.40	12509.30	2051	1216.70	3658.60	3140.8	1786.10	186277.80
4	Laying Brick Bats soling layer: Braking of Dismantled Drain bricks in Brick Bats of required size for Storm Water Drain & Electrical Trench	m ²	18527.4	1189	95	10641	3420	1668	23585.6	9305.80	5630.80	137.80	1829.4	1070.80	3375.20	45	1559.80	82080.60
5	Backfilling: Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. for Storm Water Drain & Electrical Trench	Cum	13754.10	5942.9	944.2	16688.7	8965	835.4	11637.8	13032.7	5831.3	5370.10	950	613.1	1606.8	1359.1	728.40	88259.60
6	PCC Work: Providing and laying cement concrete, 100mm Thick PCC below Raft for Storm Water Drain & Electrical Trench	Cum	2894.20	615	202.9	2426.8	957.3	162.7	3602.0	2566.70	1020.60	1235.90	1778	104.10	328.50	273.8	151.90	18320.40
7	RCC Work: Providing and laying Reinforced cement concrete grade M-25 for Storm Water Drain & Electrical Trench	Cum	14349.32	2911.03	907.86	11574.02	5212.23	738.8	16492.77	12597.62	6351.70	5587.60	841.4	627.84	1560.26	1331.66	746.08	81830.19
8	Flooring with Paver Tiles on Footpath Area	m ²	13188	2718	929	12726	4176	600	14034.00	12482	3300	4641	750	504	1481	1470	756	73755.00
9	Electrical tray supporting arrangement: Providing structural steel work in single section fixed with or without connecting plate	kg	85975.9	17543.7	5995.0	65527.6	18705.5	4647.3	104007.6	88206.7	25560.4	35947.2	5809.2	3253.1	10259.0	9062.3	4879.71	485380.21
10	Providing Grating on storm water Drain at 15mc/c	No.	464.0	101	34	483	155	27	596	506	146	206	33	18	58	52	28	2907.00
11	Providing and laying non-pressure NP2 class (light duty) RCC pipesfor inlet to Storm Drains	m	870.875	189	65	905	290	50	1119	949.0	275.0	386.8	62.5	35.0	110.4	98	52.5	5458.08

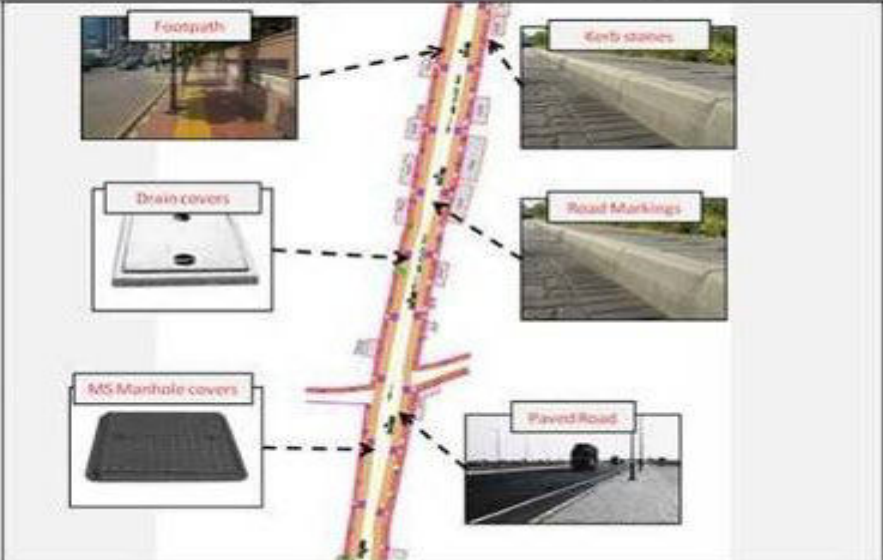
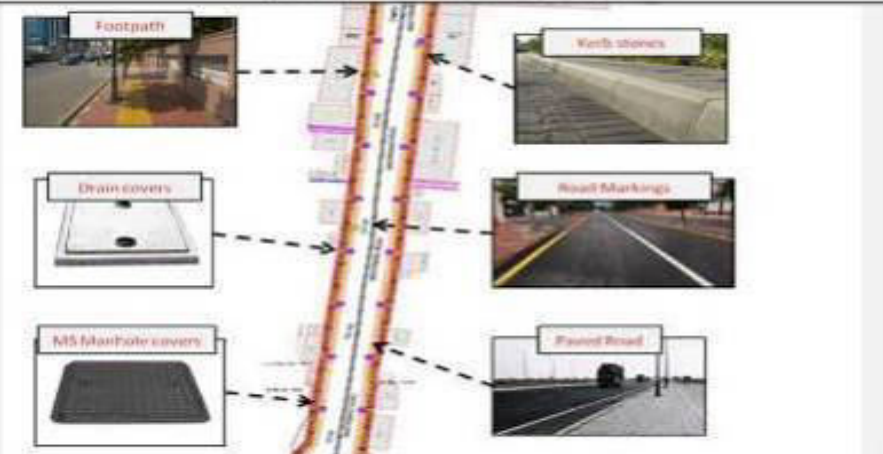
19. **Visual improvement proposals:** Roads considered under smart road category are proposed to have dedicated footpaths with street furniture, tree belt and landscaping, smart road elements such as smart light poles, WIFI and CCTV poles, smart traffic signals, and parking, etc. Services are designed underground to increase the visual aesthetic in coordination with ICT components being proposed. The images showing the visual improvement is given in Table 3.

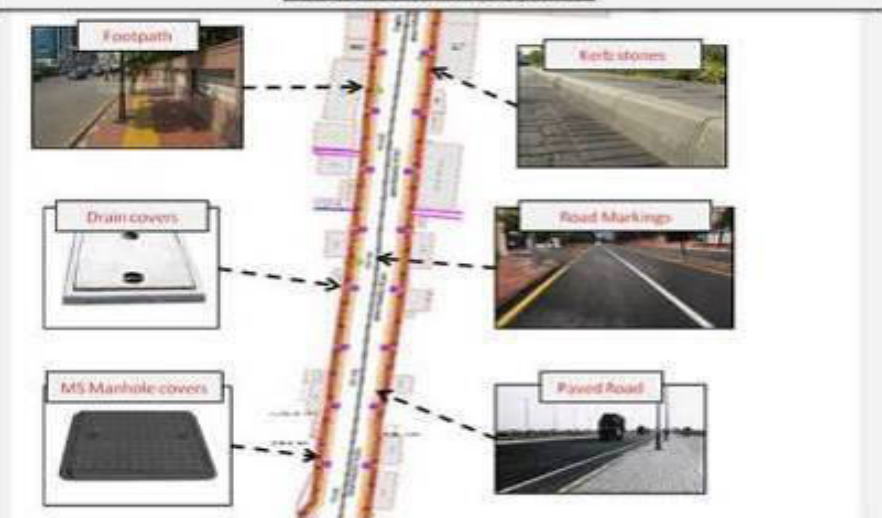
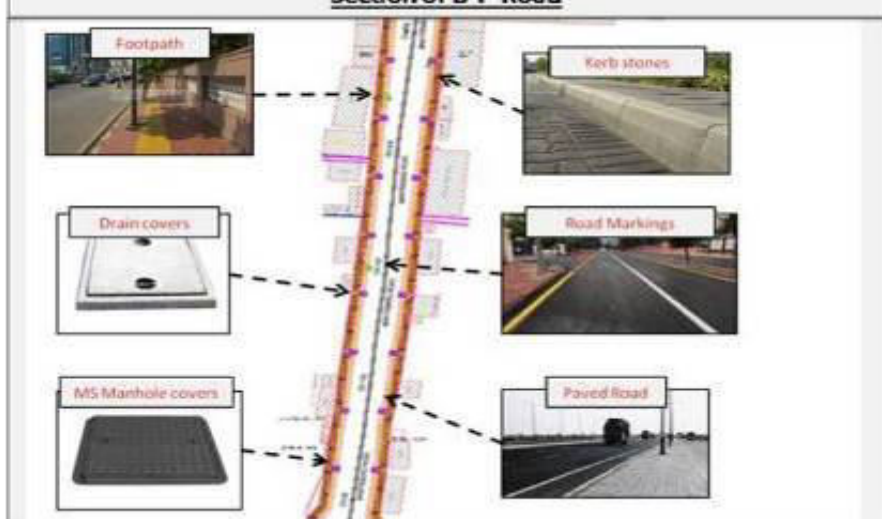
Table 3: Details of Proposed Visual Improvement on Subproject Roads


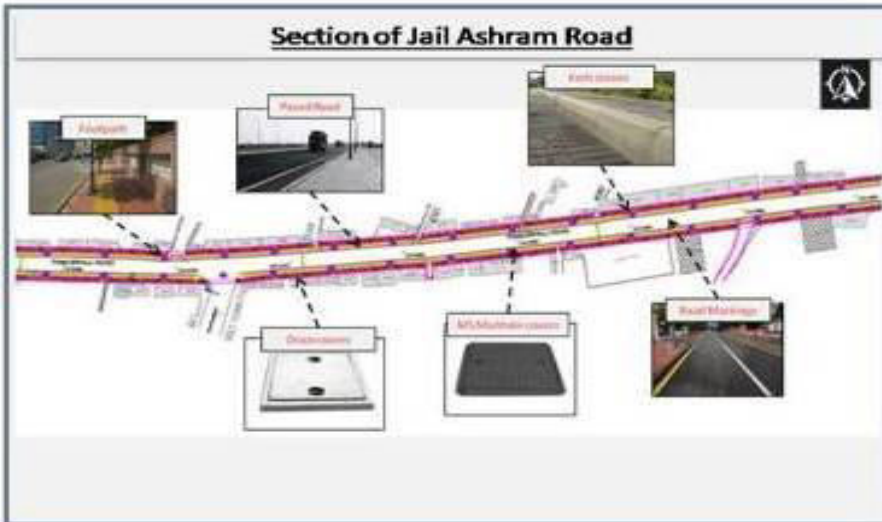
Sr. No	Name of Road	Proposed Visual Improvements
1	Hariganga Basak Road	 <p>The diagram illustrates the proposed visual improvements for Hariganga Basak Road. It shows a cross-section of the road with various components labeled: Drain covers, Footpath, Kerb stones, Road Markings, MS Manhole covers, and Paved Road. A north arrow is located in the top right corner of the diagram.</p>
2	VIP Road	 <p>The diagram illustrates the proposed visual improvements for Airport Road. It shows a cross-section of the road with various components labeled: Footpath, Drain covers, MS Manhole covers, Kerb stones, Road Markings, Paved Road, and Parking. A north arrow is located in the top right corner of the diagram.</p>

Sr. No	Name of Road	Proposed Visual Improvements
3	Akhaura Road	<p data-bbox="792 289 1015 317"><u>Section of Akhaura Road</u></p> 
4	Thakurpalli Road	<p data-bbox="792 837 1015 865"><u>Section of Thakurpalli Road</u></p> 

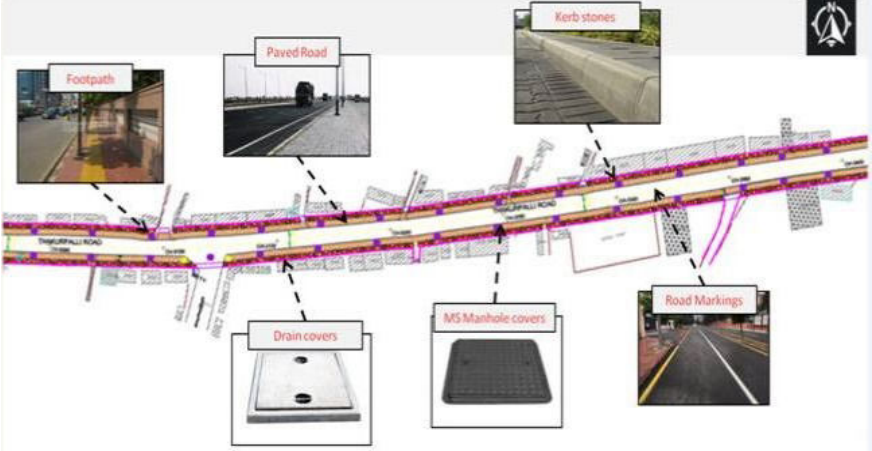
Sr. No	Name of Road	Proposed Visual Improvements
5	Mantribari Road	<p>Section of Mantribari Road</p>
6	Shakuntala Road	<p>Section of Sakuntala Road</p>

Sr. No	Name of Road	Proposed Visual Improvements
7	Barjala Road	<p style="text-align: center;"><u>Section of Barjala Road</u></p> 
8	Lankamura Road	<p style="text-align: center;"><u>Section of Lankamura Road</u></p> 

Sr. No	Name of Road	Proposed Visual Improvements
9	Ronaldsay Road	<p>Section of Ronaldsay Road</p> 
10	B T Road	<p>Section of B T Road</p> 

Sr. No	Name of Road	Proposed Visual Improvements
11	Jail Road	<p>Section of Jail Road</p>  <p>The diagram for Jail Road shows a cross-section of the road with the following improvements indicated:</p> <ul style="list-style-type: none"> Footpath: A paved area on the left side of the road. Drain covers: Rectangular covers for drainage along the road. MS Manhole covers: Circular covers for manholes, made of mild steel. Kerb stones: A raised edge along the side of the road. Road Markings: White lines on the road surface for lane demarcation. Paved Road: The main road surface, shown as a smooth, dark material.
12	Jail Ashram Road	<p>Section of Jail Ashram Road</p>  <p>The diagram for Jail Ashram Road shows a cross-section of the road with the following improvements indicated:</p> <ul style="list-style-type: none"> Footpath: A paved area on the left side of the road. Paved Road: The main road surface, shown as a smooth, dark material. Kerb stones: A raised edge along the side of the road. Drain covers: Rectangular covers for drainage along the road. MS Manhole covers: Circular covers for manholes, made of mild steel. Road Markings: White lines on the road surface for lane demarcation.

Sr. No	Name of Road	Proposed Visual Improvements
13	Roads surrounding IT Hub	<p>Section of Surrounding IT Hub Site (3 Side Roads)</p>
14	ITI Road	<p>Section of G B Chowmuhan to Proposed ICCCLocation</p>

Sr. No	Name of Road	Proposed Visual Improvements
15	GB Road	

20. **Proposals for Utility Corridor & Overhead to Underground Conversion of Transmission Lines:** As suggested under smart city features in the Smart City Guidelines, cities need to focus on energy efficiency and promote underground electric wiring to ensure continuous electricity supply. City of Agartala has a network of 11kv, 33 kv and LT lines located along the proposed selected roads for upgradation. Considering the human safety, aesthetic view of the city, traffic needs and uninterrupted supply requirements, ASCL intends to make an underground utility corridor for conversion of overhead line network to underground cable system. The proposal of underground utility corridor consists of providing of:

- (i) Utility Trench with Cable Tray system
- (ii) Utility Conduit (Ducting- Pipe and Manhole) system

21. The City has a mix of transmission network for its HT and LT systems. The HT networks in the city are mostly laid overhead through transmission lines. However, in some areas the HT networks are laid in pipes directly buried underground and are aerially visible only at the termination points at various Distribution Transformer Centers. Most of the 415V LT systems are laid overhead through transmission lines. These HT and LT lines are laid on the same or different cement (PSC) or metal (RSJ) poles. These transmission lines are laid along either side of the roads with the poles mounted at the edge of the road.

22. The street lights on these roads are also mounted on same electric poles which are carrying the transmission lines. Since these transmission lines would be converted to Underground cables, these poles would be removed. The upgradation work includes scope of provision of new Octagonal/ tubular GI Poles including the bracket, LED fixtures, feeder pillar and cables.

D. Other features:

23. **Bridges and culverts:** All the hydraulic data for bridges has been collected from the field and analyzed to determine the adequacy of waterways. Based on the assessment no bridges and culverts are considered for development.

24. **Railway Crossing:** There is no railway crossing across the proposed subproject. The proposed improvement will be limited along the existing ROW.

25. **Design standards, Cross Sections improvements:** The design standards adopted for the study have been evolved based on a study of the existing standards and practices in the country keeping in view the standards recommended by IRC and MoUD. The standards so evolved are presented below.

Table 4: Design Standards Adopted

Sr. No.	Details	Proposed Standards
1	Road Classification	Sub-Arterial Road
2	Design Speed	50 KMPH
3	ROW	Varies from 8.70m to 33.0m
4	Carriageway	Varies from 5.0 to 15.0m.
		FL of Utility corridor designed for use as Carriageway
5	Median	0.5m to 1.1m
6	Trees	No cutting > 300 cm girth
7	Footpaths	1.5m to 1.8 m on either side of carriageway
8	Camber	2.5%
9	Cross-fall for Footpath	2%
10	Super Elevation	Min – 2.5%; Max – 7.0%
11	Minimum radii of Horizontal curve ©	230 m (corresponding to 7 % Super Elevation)
12	Transition curve Required	$r > 200$
13	Vertical Gradient	Min – 0.5 %
14	Length of Vertical Curve	50 m

Figure 2: Google Earth Image of VIP Road

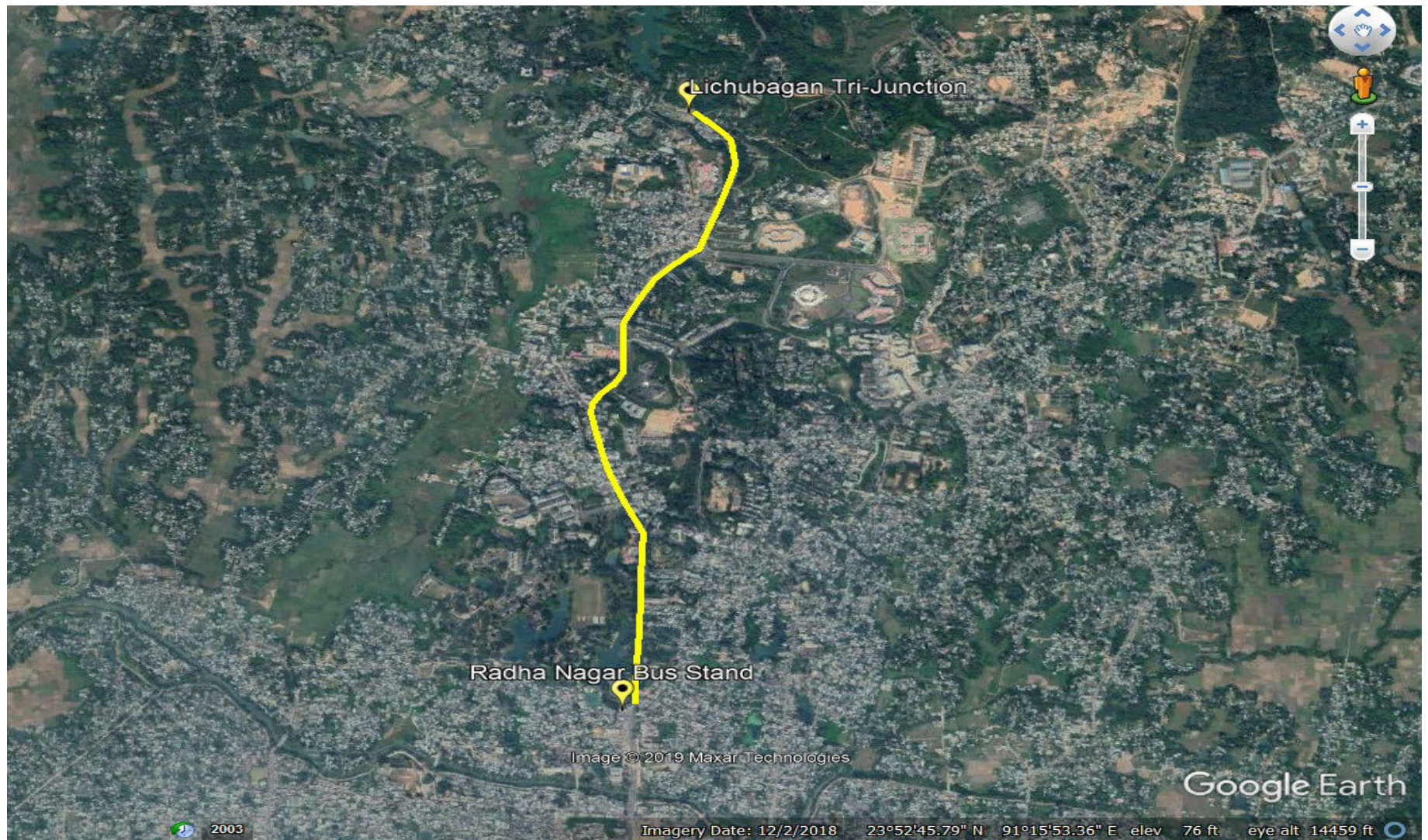


Figure 3: Google Earth Image of Hariganga Basak Road

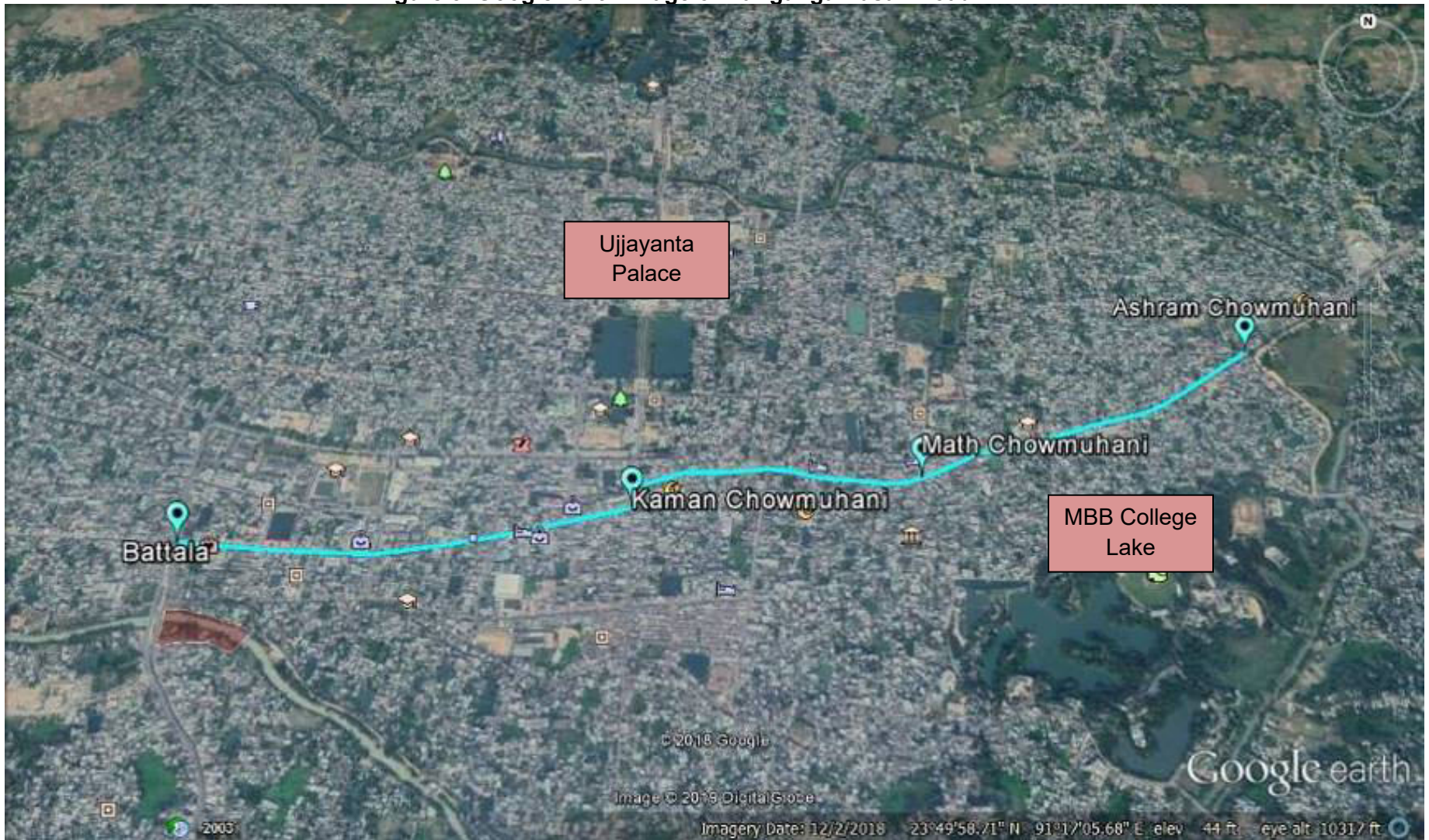


Figure 4: Google Earth Image of Akhaura Road

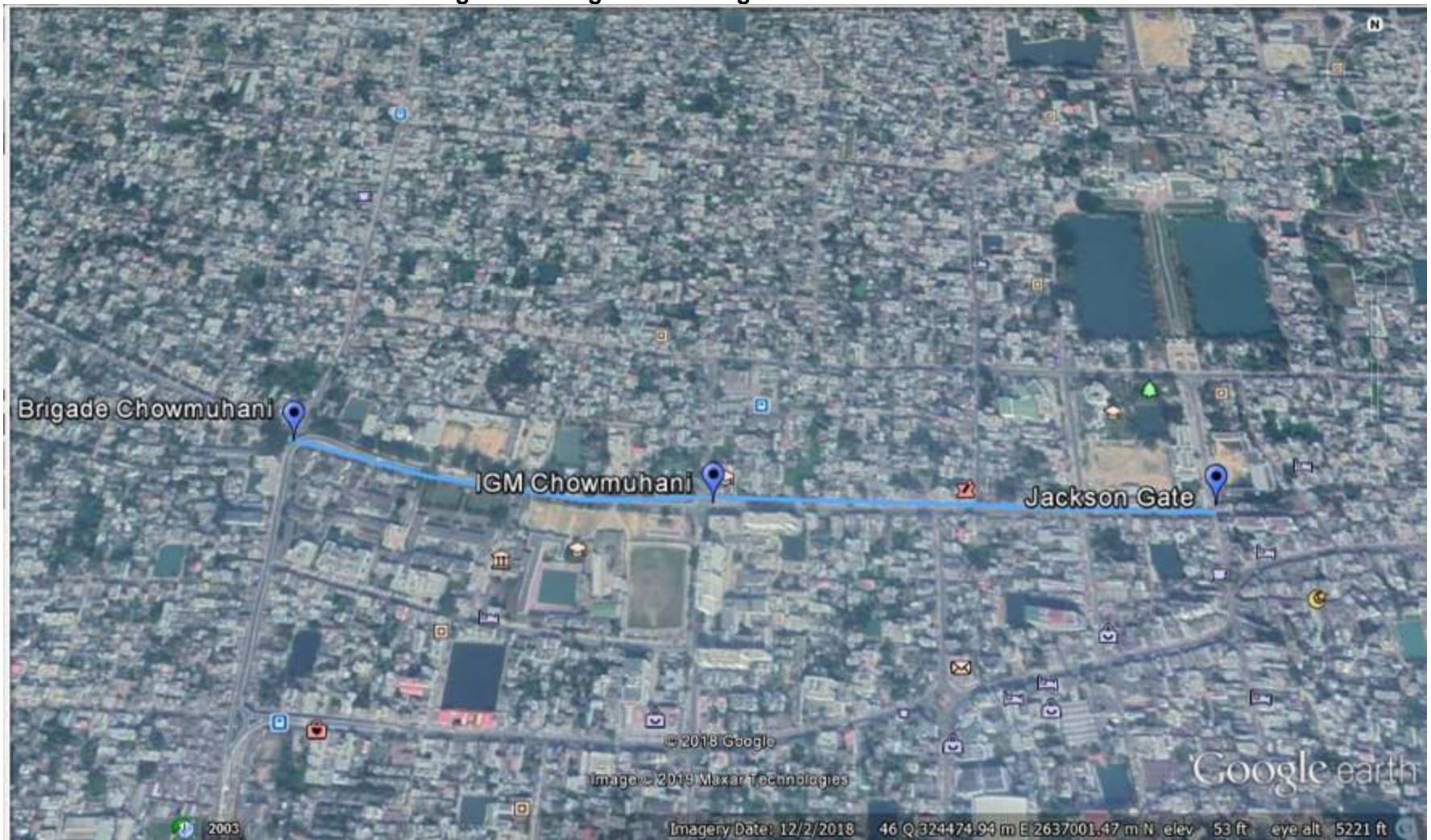


Figure 5: Google Earth Image of Thakurpalli Road



Figure 6: Google Earth Image of Mantribari Road

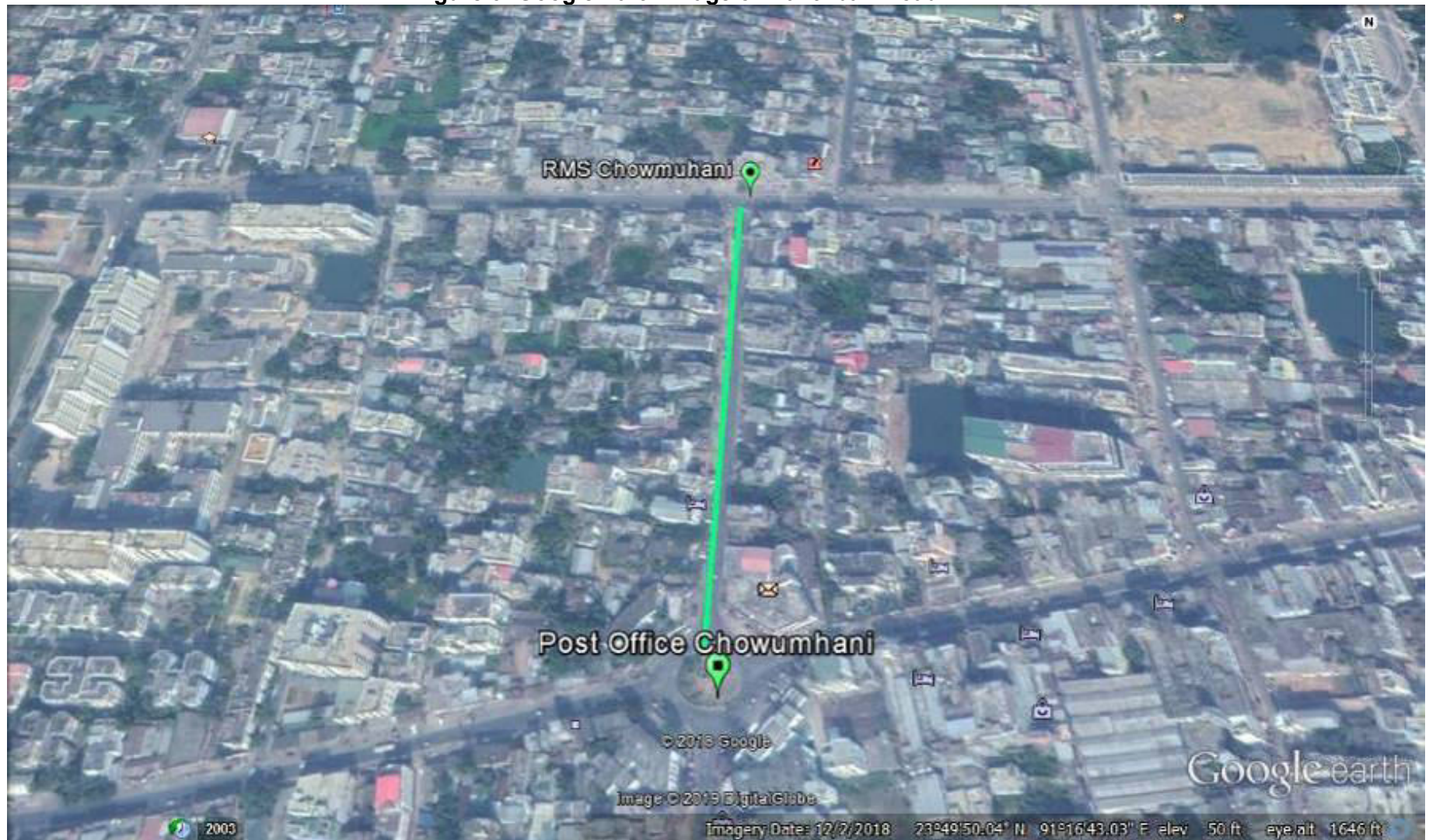


Figure 7: Google Earth Image of Sakuntala Road



Figure 8: Google Earth Image of G B Road

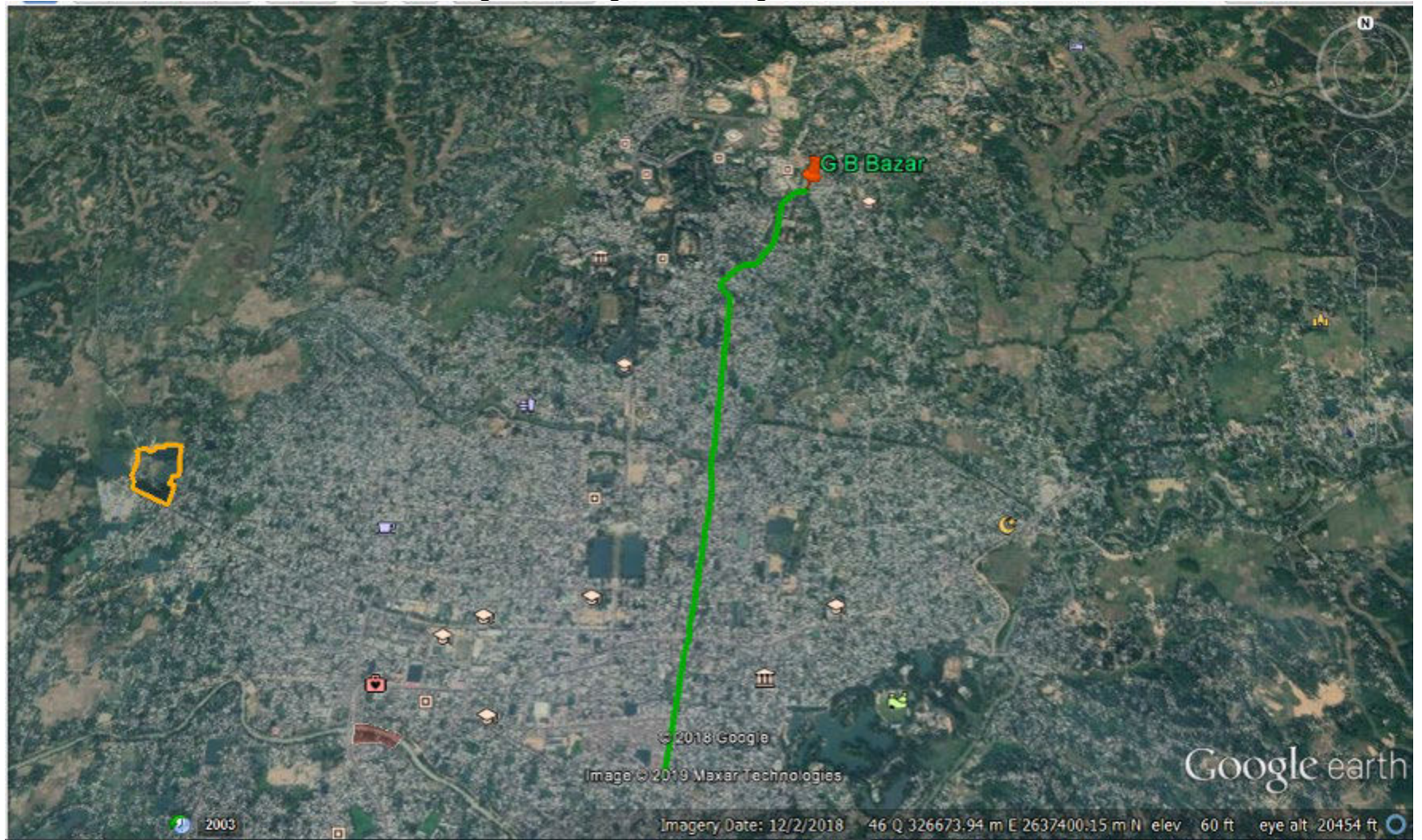


Figure 9: Google Earth Image of Barjala Road

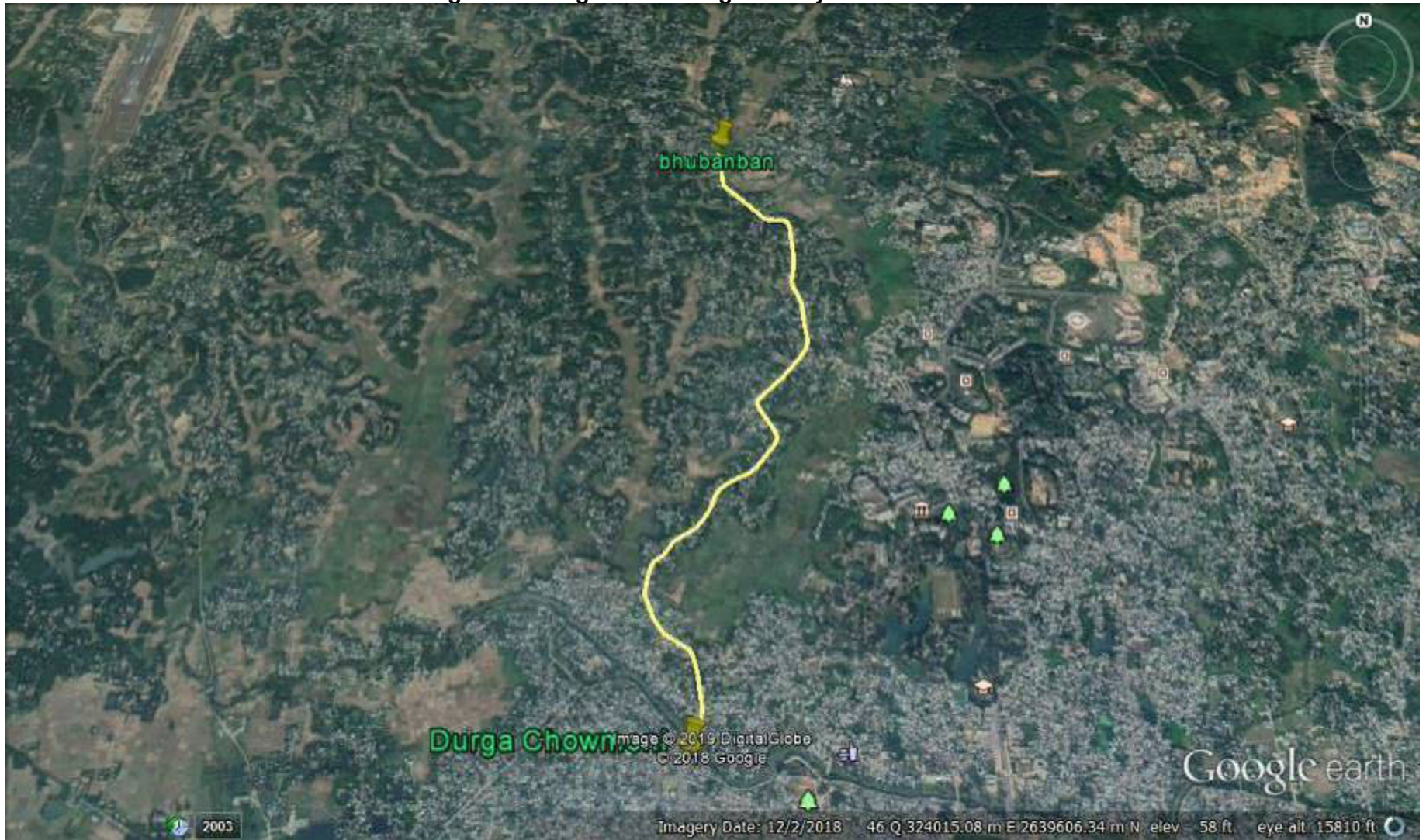


Figure 10: Google Earth Image of Lankamura Road

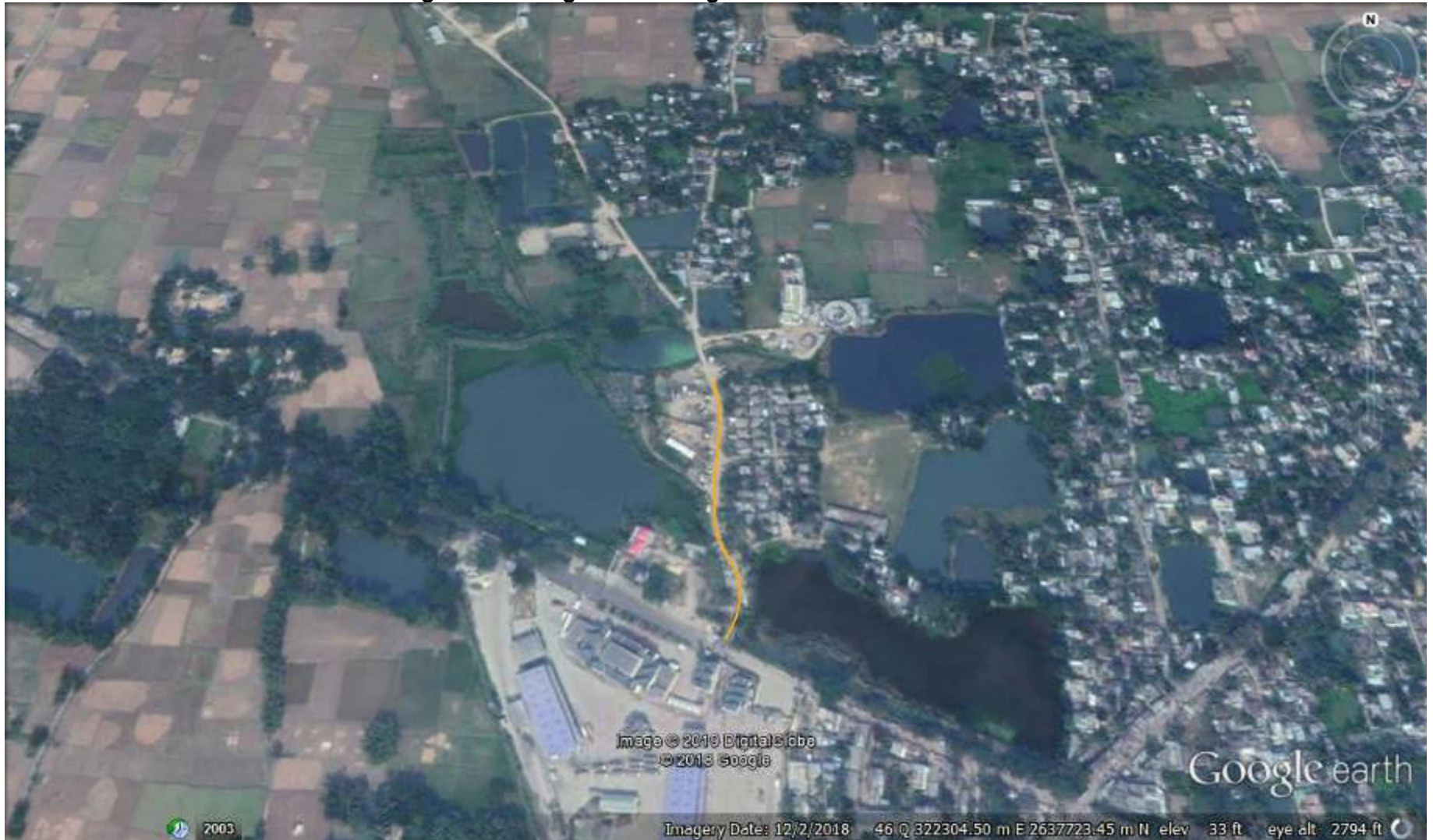


Figure 11: Google Earth Image of Ronaldsay Road

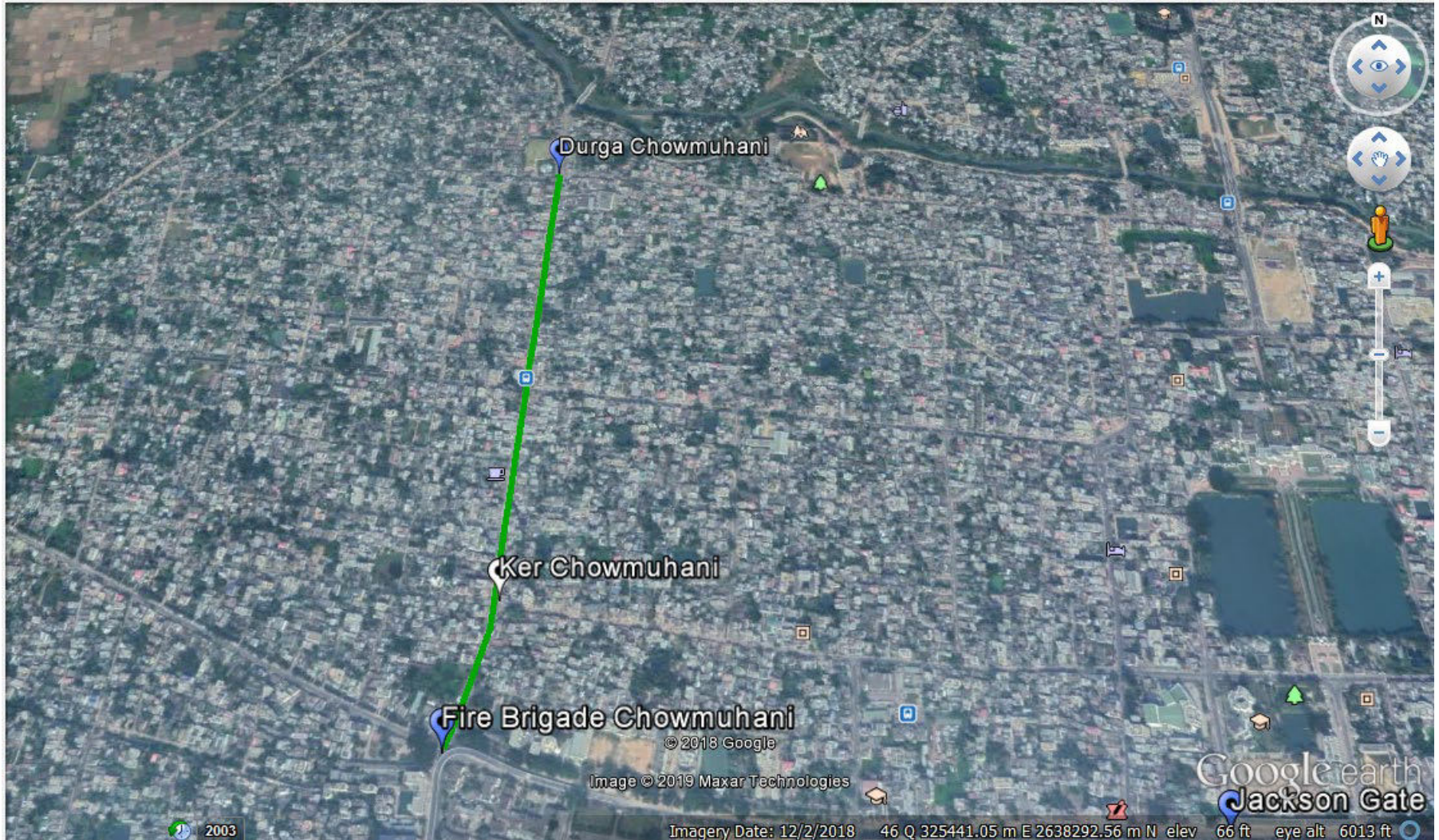


Figure 12: Google Earth Image of Jail Ashram Road

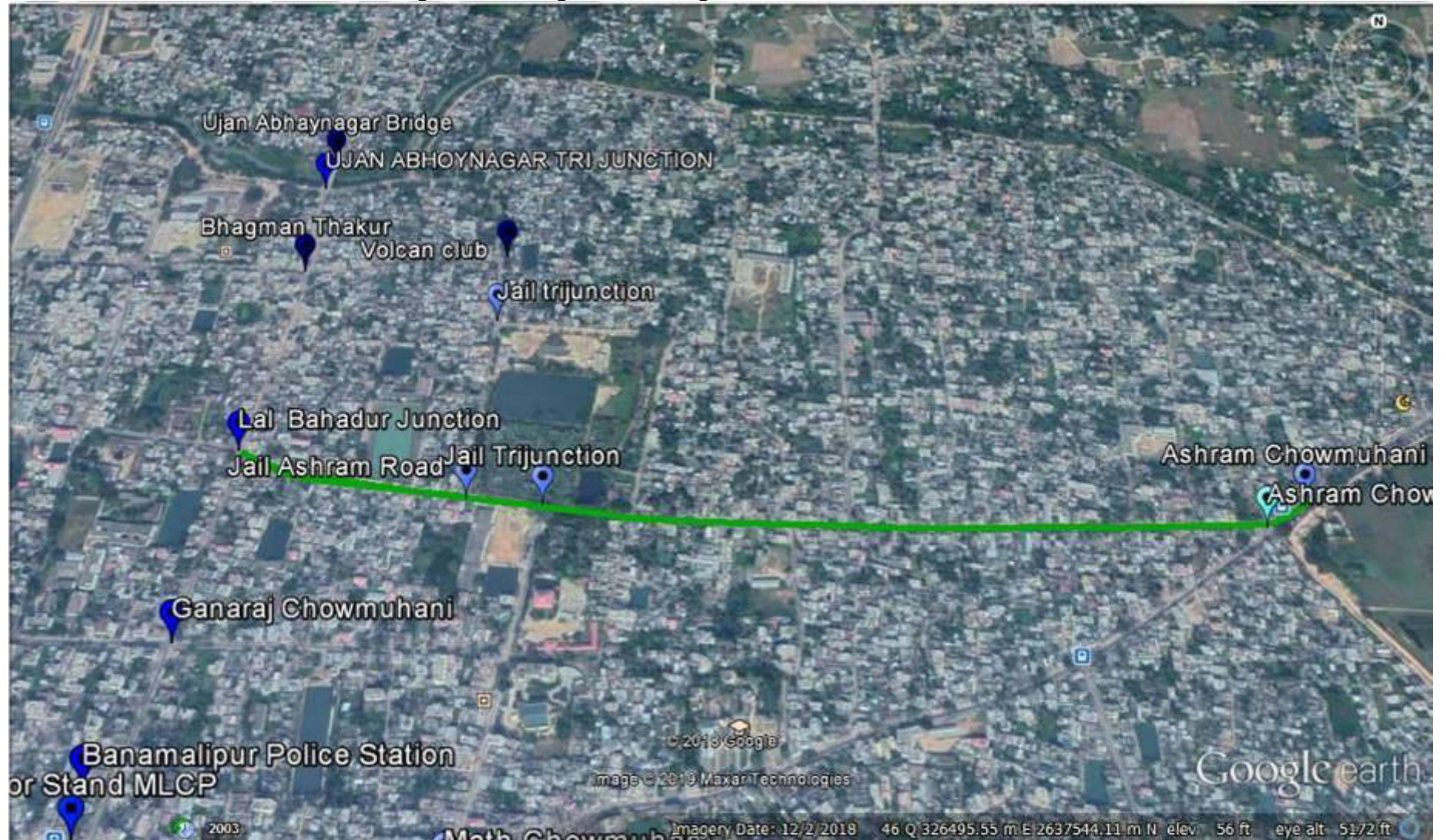


Figure 13: Google Earth Image of Jail Road

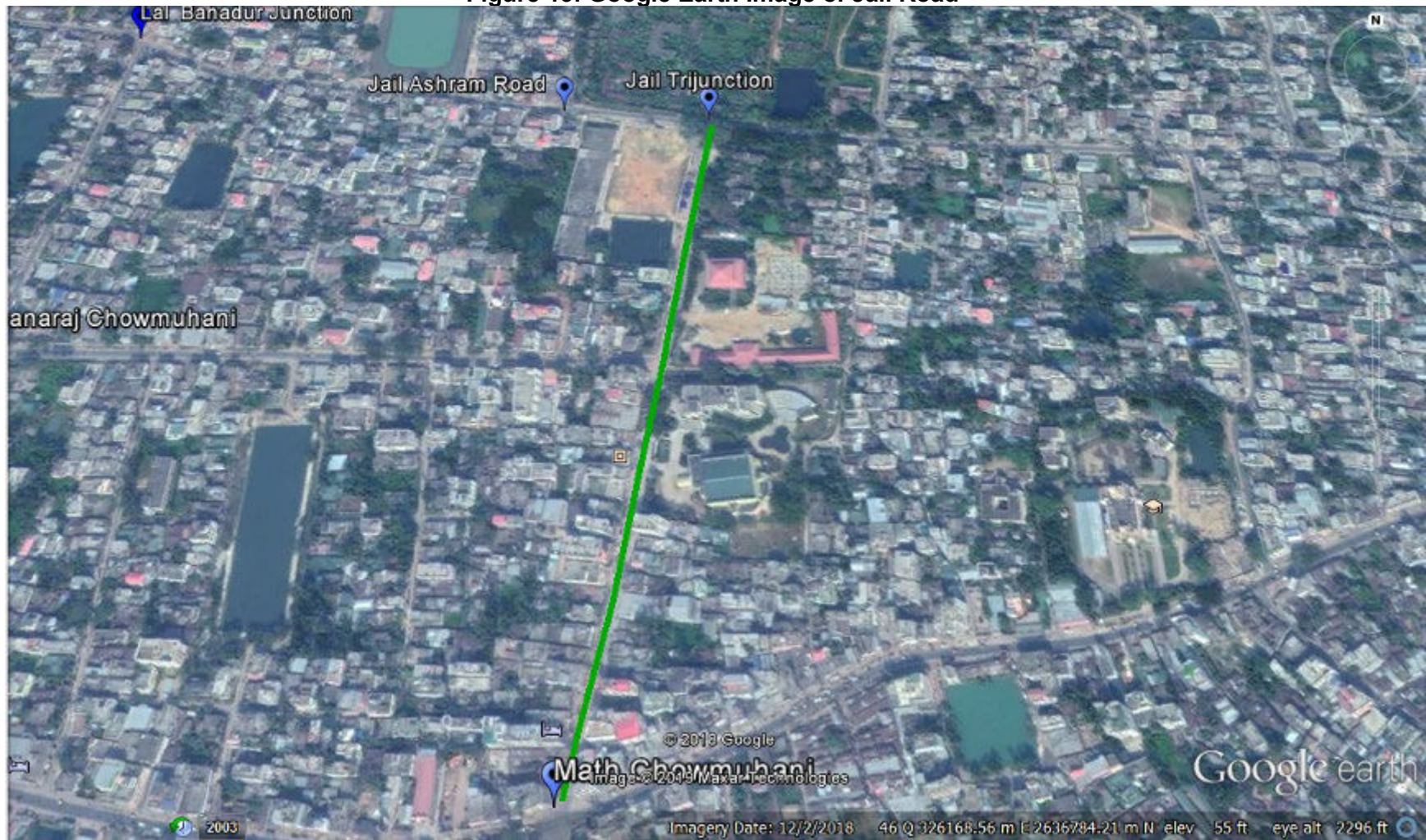


Figure 14: Google Earth Image of B T Road

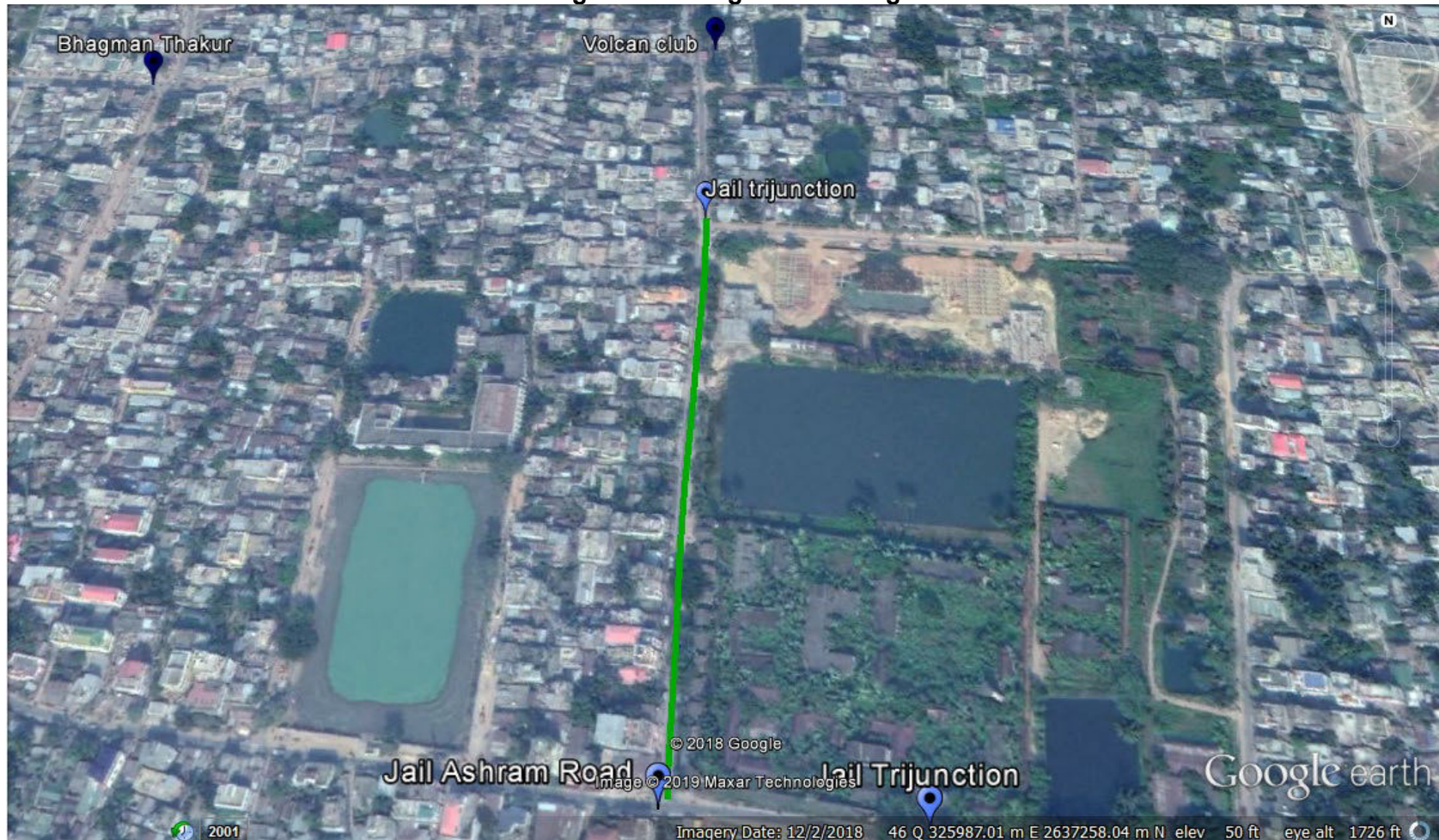


Figure 15: Google Earth Image of ITI Road

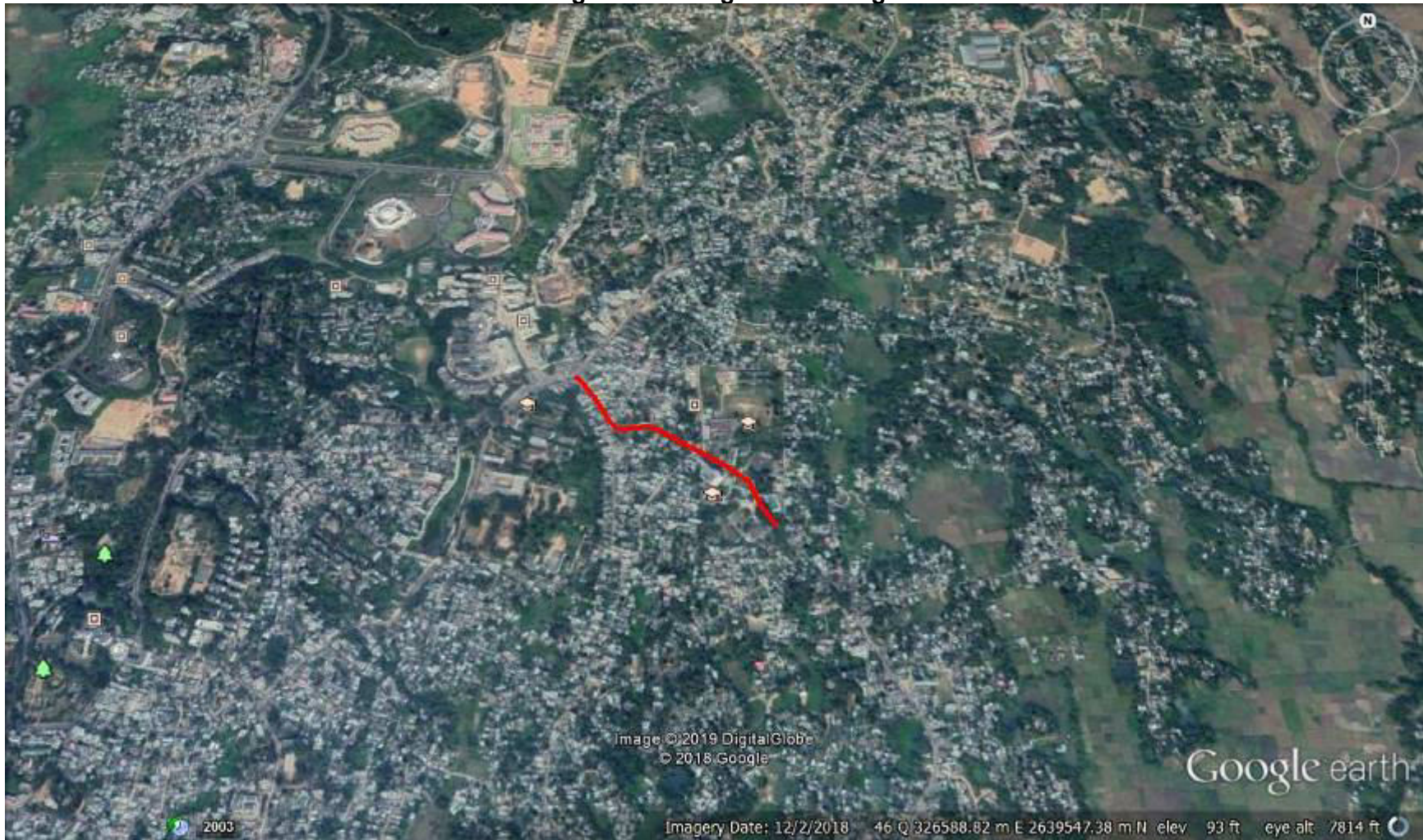


Figure 16: Google Earth Image of Road surrounding IT Hub



E. Design Concept

26. Analysis of Classified Traffic volume count surveys done during traffic assessment studies for Agartala City shows that the carriageway widths are enough on some road sections and require upgradation to additional lanes. As the required Right of Way cannot be made available in the core ABD area, it is decided to propose the Upgrade/improvement proposals within the available ROW and conversion of above ground utilities to underground. This process will avoid Land acquisition process and henceforth to design a retrofit model for implementation of smart road concept in Agartala City Urban Development Project. Various levels of discussions based on the available data and site conditions has led to development of four design concepts, these design concepts are applied to various sections of the road according to the existing site conditions and available utilities. Strip plan of individual roads are attached in Appendix 17.

27. **Design Concept-I:** This concept is applicable where there are brick storm drains at both sides of the roads and the same to be remodeled. Based on this, the concept two (2) vent RCC structure is proposed. Out of which one vent (Towards the carriageway) shall carry Storm Water and other one (Towards the property line) shall carry Electrical and OFC cables. The vent for ormElectrical & OFC system will be provided below the footpath wherein pedestrian loads has been considered and SWD vent shall be provided below the carriageway (At the edge) and the same will be designed for vehicular movement. This concept is proposed for road sections listed below:

- (i) Hariganga Basak Road: The entire road length has SWD of Brick material, thus Design Concept – I is applicable to entire road length. Seven typical sections are generated as per site requirements for the Road length of 3.48 Km.
- (ii) Mantribari Road: The entire road length is proposed to be developed as per this concept for the Road length of 0.258 Km.
- (iii) Thankurpalli Road: The Road section from Bidurkarta to Ganaraj Chowumhai is proposed to be upgraded with this concept. The section length is 0.74 Km.
- (iv) VIP Road: From Circuit House Chowmuhanani to St. Francis Church. The length of this section is 3.00 km.
- (v) Shankuntala Road: Section from Surya Chowmuhanani To Orient Chowmuhanani of length 0.2 Km.
- (vi) ITI Road: Section from GB Chkkar to ICCC location of length 0.39 Km.
- (vii) GB Road: Playground near GB hospital to Ganaraj Chowmuhanani of length 1.0 Km.
- (viii) Barjala Road: Barjala road Airport Trijunction to Durga Chowmuhanani Bridge of length 3.49 Km.
- (ix) Ronaldsay Road: Entire Ronaldsay road of length 1.1 Km.
- (x) Jail Ashram Road: Entire Jail Ashram road of length 1.547 Km.
- (xi) Lankamura Road: Entire road length of 0.21 Km.

28. **Design Concept-II:** This concept is proposed at the locations where existing RCC Storm Water Drain is on one side and Brick Storm Water Drain is on other side of the road section. Accordingly, the proposal Side-1 (RCC Storm Water Drain Side): Existing RCC Storm water drain is retained. However, OFC & Electrical Cables are proposed to be taken underground through utility conduit system below the carriageway by the side of the drains. This conduit system is will be covered with heavy duty Paver Blocks. Improvement of existing Storm Water Drain surface for pedestrian movement with aesthetic elements to be taken up. And Side-2 (Brick Storm Water Drain Side): Existing Brick Drain is remodeled and a two vent RCC structure is proposed. Out of which one vent shall carry Storm Water Drain and other one shall carry Electrical and OFC cables. The vent for Electrical & OFC system will be provided towards property line and designed for

pedestrian movement as well. SWD vent is designed for vehicular movement and will be below the carriageway. This concept is proposed for road sections listed below:

- (i) Akhaura Road: Road section from Orient chowmuhanani to Jackson Gate chowmuhanani is proposed to be upgraded with this concept for the Road length of 0.19 km.
- (ii) Thankurpalli Road: Road section from Ker Chowmuhanani to Bidurkarta Chowmuhanani is proposed to be upgraded with this concept. The section length is 0.98 km.
- (iii) GB Road: Abhoynagar trijunction to playground of length 0.648 km. and Abhoynagar bridge to Ramthakur Club Chowmuhanani of length 1.2 km.
- (iv) Jail Road: Entire jail road length of 0.5 km.

29. **Design Concept-III:** This concept is proposed where the existing RCC Storm Water Drains are present on both sides. In this concept, the existing SWD structure is retained and a Utility Conduit System below the carriageway with heavy duty Paver blocks at the top. The utility conduit alley shall be at the edge of the carriageway. However, in view of maintenance and overlay of road bituminous surface, the main carriageway (Portion without covered with paver blocks) with cement concrete pavement is proposed. This concept is proposed for road sections listed below:

- (i) VIP Road: Road section from Radhanagar Motorstand to Circuit House Chowmuhanani. This section has existing footpath and trees on RHS and trees with large girth on LHS. The footpath on RHS is retained. However, on LHS, the footpath is proposed between Road edge line and Compound wall of Assam rifles. The length of section is 0.62 Km.
- (ii) Thakurpalli Road: Road section from Ganaraj Chowmuhanani to Purbasha is to be upgraded with this concept for the section length of 0.38 Km.
- (iii) Shankuntala Road: Section from Orient Chowmuhanani To Rabindra Bhawan length of 0.3 km.

30. **Design Concept - IV:** This concept is proposed at the locations where existing RCC Storm Water Drain is on one side and Brick Storm Water Drain is on other side of the road section. Accordingly, the proposal is, Side-1 (RCC Storm Water Drain Side): Existing RCC Storm water drain is retained. However, OFC & Electrical Cables are proposed to be taken underground through utility conduit system below the carriageway by the side of the drains. This conduit system is will be covered with heavy duty Paver Blocks. Improvement of existing Storm Water Drain surface for pedestrian movement with aesthetic elements to be taken up Side-2 (Brick Storm Water Drain Side): Existing Brick Drain is remodeled and a two vent RCC structure is proposed. vent shall carry Storm Water Drain and other one shall carry Electrical and OFC cables. The vent for Electrical & OFC system will be provided towards property line and SWD towards carriageway. Combined width of this structure is proposed for pedestrian movement only. This two-vent structure will be above the finished road level as per IRC standards for pedestrian safety concern. This concept is applicable for Akhaura Road: Road section from IGM Chowmuhanani to Orient Chowmuhanani is proposed to be upgraded with this concept for the Road length of 0.54 km. The typical section drawing for each concept in shown in Figure 17-20 below and the details of design component like pathways, storm water drains and electrical trenches for each road is provided in Table 5.

Figure 17: Typical Section Concept I- Hariganga Basak Road

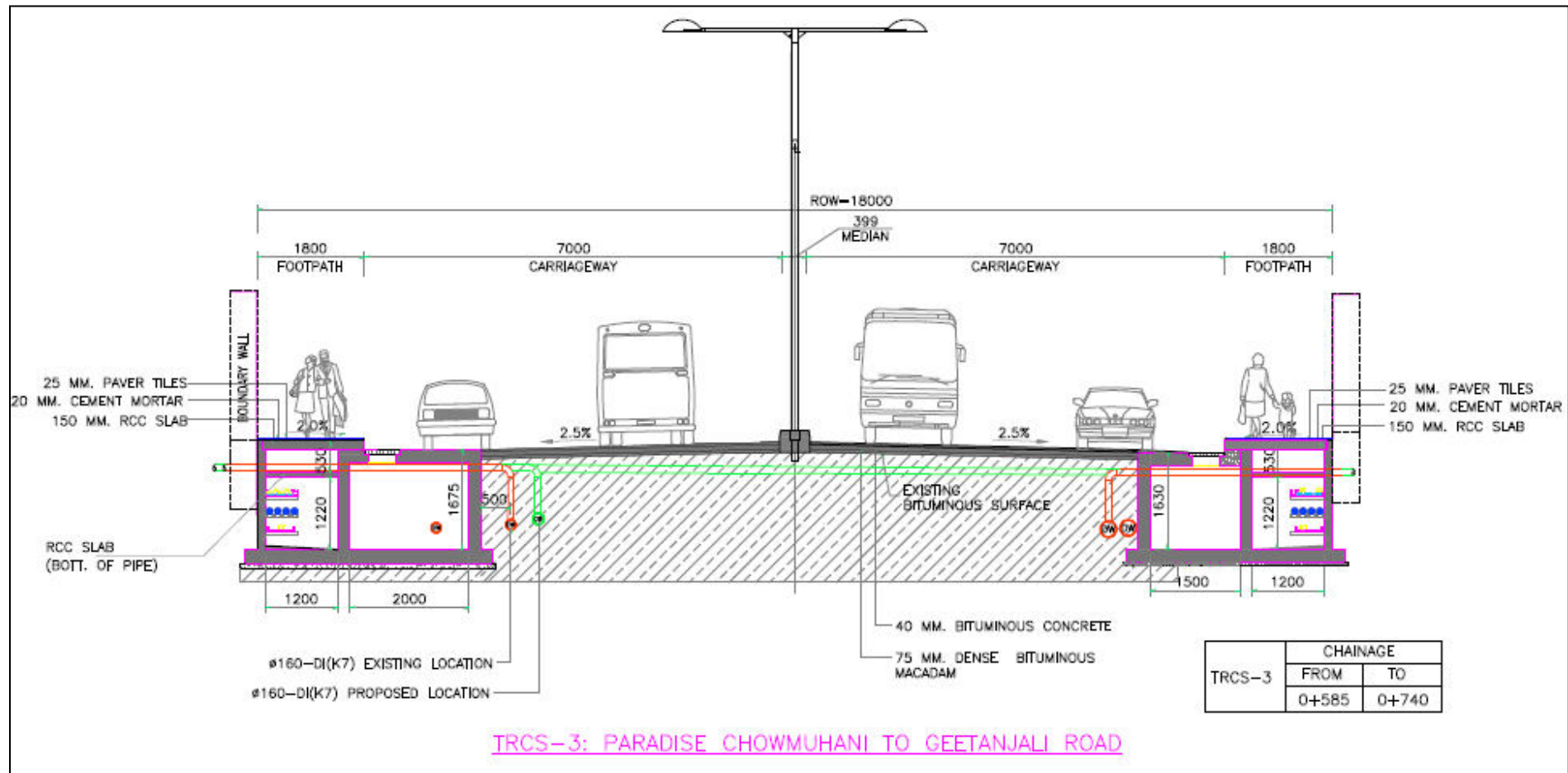


Figure 18: Typical Section Concept II- Akhaura Road

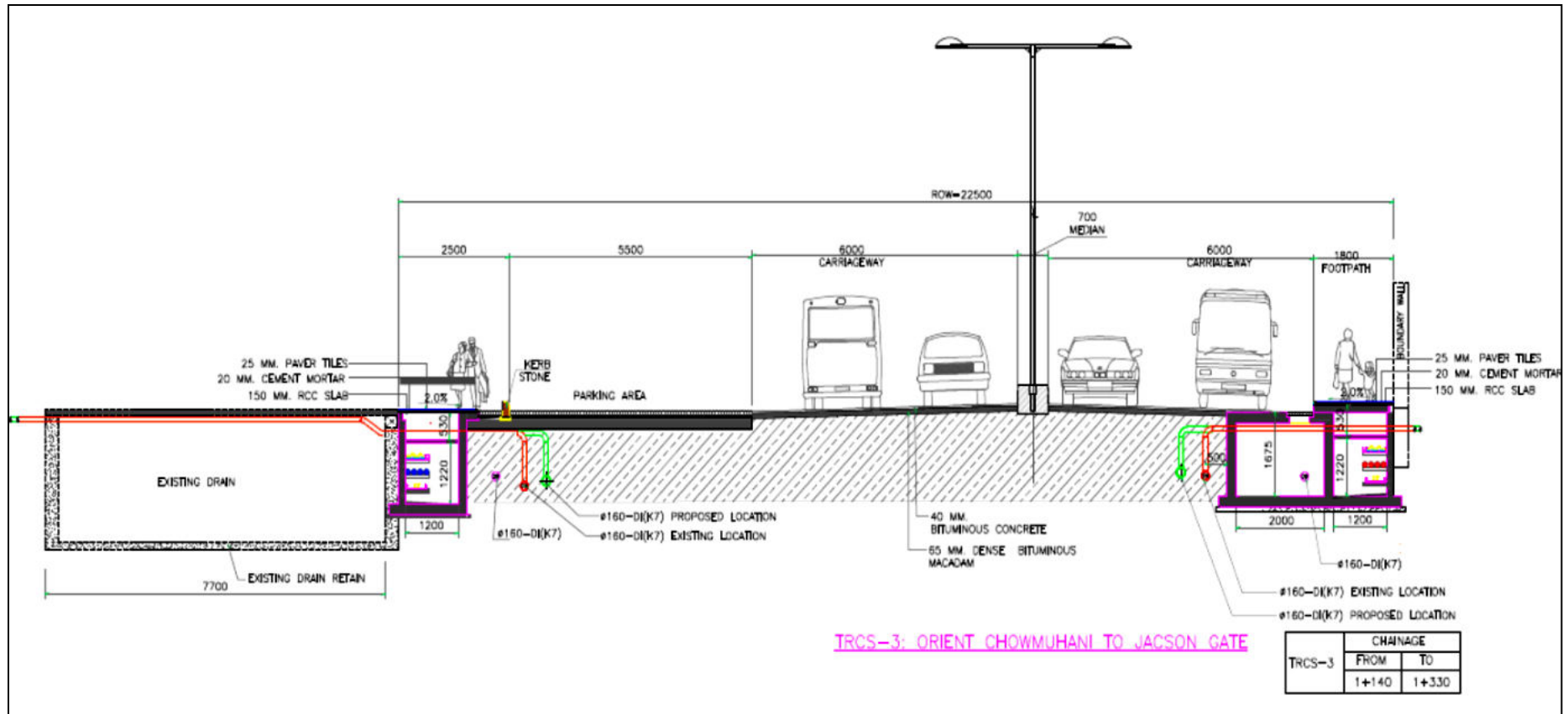


Figure 19: Typical Section- Concept III-VIP Road

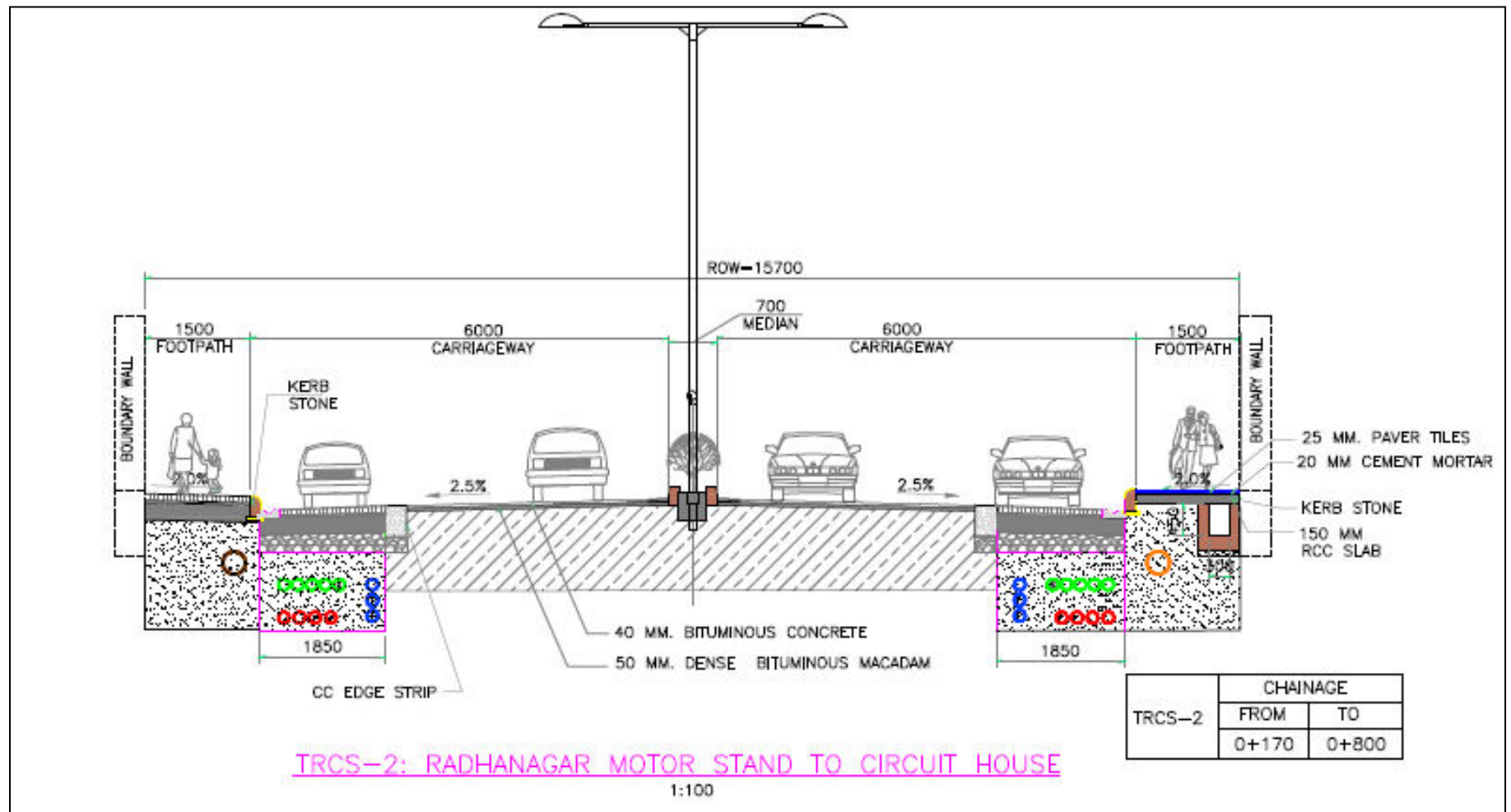


Figure 20: Typical Section- Concept IV- Akhaura Road

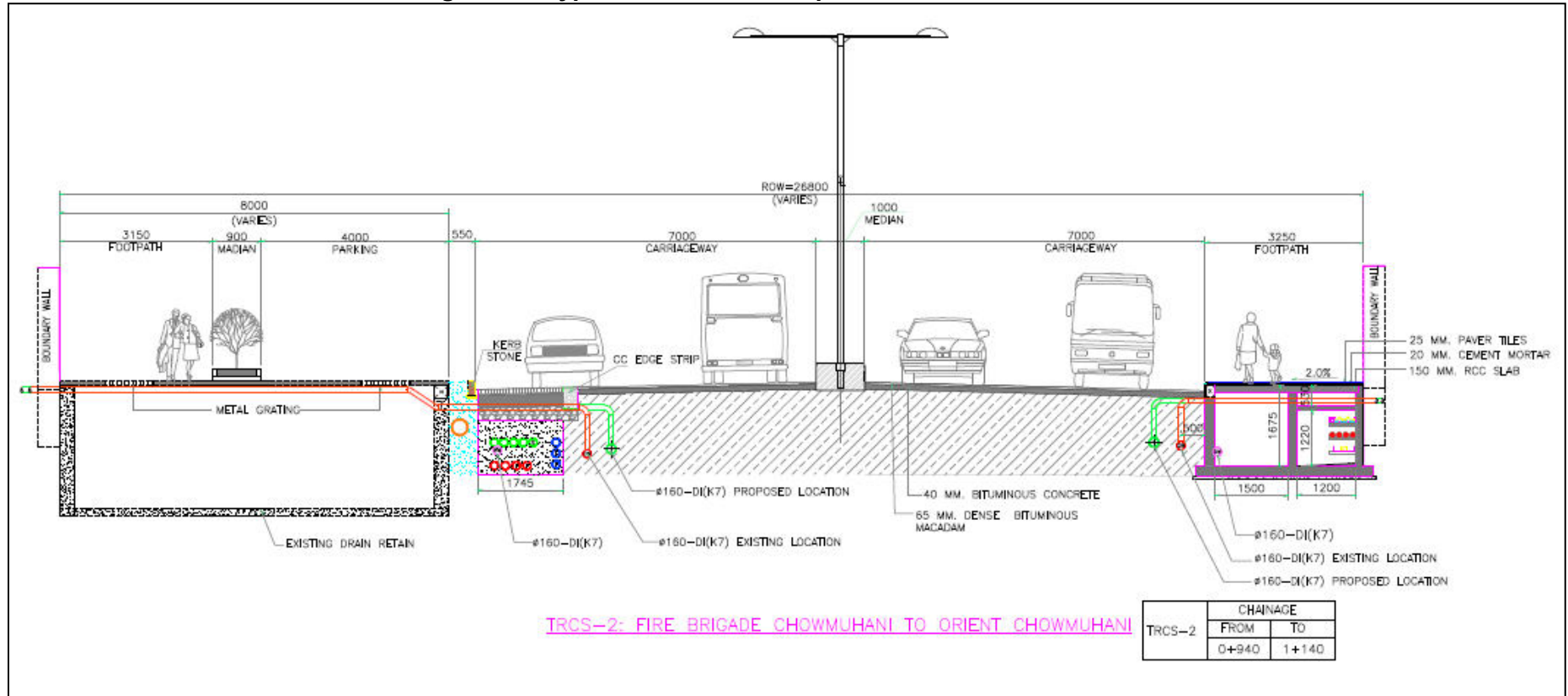


Table 5: Details of proposed design components of Upgradation of major roads

S r. n o.	Descrip tion	Road sections	Len gth (Km)	Pathways/ Pedestrian Facilities width (m)		Proposed SWD size below the road surface (m)						Size of Electrical Cable Trench (m)					
						LHS			RHS			LHS			RHS		
				LHS	RHS	L	W	D	L	W	D	L	W	D	L	W	D
1	Harigan ga Basak Road	Battala to End of Flyover Chowmuhani	0.18 5	1.8	1.8	185	1	1.53	185	2.00	2.00	185	1. 20	1. 68	185	1.2	2.2
		Battala to Paradise Chowmuhani	0.4	1.8	1.8	400	0.75	1.53	400	2.00	2.00	400	1. 20	1. 68	400	1.2	2.2
		Paradise Chowmuhani to Geetanjali Road	0.15 5	1.8	1.8	155	2	2.50	155	1.50	1.52	155	1. 20	2. 70	155	1.2	1.6 7
		Geetanjali road to Post office Chowmuhani	0.18	1.8	1.8	180	1.5	2.50	180	1.50	1.52	180	1. 20	2. 70	180	1.2	1.6 7
		Post office Chowmuhani to Kaman Chowmuhani	0.4	1.4	1.4	400	0.75	1.53	400	1.00	1.52	400	1. 20	1. 68	400	1.2	1.6 7
		Kaman Chowmuhani to old Motorstand	0.34	1.4	1.4	340	1.5	1.53	340	1.50	1.52	340	1. 20	1. 68	340	1.2	1.6 7
		Old Motorstand to Petrol Pump	0.22	1.5	1.5	220	1.5	1.53	220	1.50	1.52	220	1. 20	1. 68	220	1.2	1.6 7
		Petrol Pump junction to Joy guru Chowmuhani	0.82	1.5	1.5	820	1.5	1.53	820	1.50	1.52	820	1. 20	1. 68	820	1.2	1.6 7
		Joy guru Chowmuhani to KK Singha School	0.1	1.5	1.5	100	1.5	1.53	100	1.50	1.52	100	1. 20	1. 68	100	1.2	1.6 7
		KK Singha School to Ashram Chowmuhani	0.68	1.5	1.5	680	1.5	1.53	680	1.50	1.52	680	1. 20	1. 68	680	1.2	1.6 7
4	VIP Road	Radhanagar Motorstand Stand Area	0.17	1.8	Varie s	170	0.75	1.50	170	3.50	2.50	0	0. 00	0. 00	0	0	0
		Radhanagar Motor Stand to Circuit House	0.63	1.5	1.5	630	1	1.50	630	1.00	1.50	0	0. 00	0. 00	0	0	0

S r. n o.	Descrip tion	Road sections	Len gth (Km)	Pathways/ Pedestrian Facilities width (m)		Proposed SWD size below the road surface (m)						Size of Electrical Cable Trench (m)					
						LHS			RHS			LHS			RHS		
				LHS	RHS	L	W	D	L	W	D	L	W	D	L	W	D
		Circuit House Chowmuhani To Ginger Hotel	1.2	1.8	1.8	1200	1	1.53	1200	1.00	1.52	1200	1.20	1.68	1200	1.2	1.67
		Ginger Hotel To Secretariat Chowmuhani	0.45	1.8	1.8	450	1	1.53	450	1.00	1.52	450	1.20	1.68	450	1.2	1.67
		Secretariat Chowmuhani To Lichubagan Chowmuhani	0.73	1.8	1.8	730	1	1.53	730	1.50	1.52	730	1.20	1.68	730	1.2	1.67
2	Akha ur Road	Fire Brigade Chowmuhani to RMS Chowmuhani	0.94	8.55	2.75	-	-	-	940	1.00	1.52	0	0.00	0.00	940	1.2	1.67
		RMS Chowmuhani to Orient Chowmuhani	0.2	8.55	2.75	-	-	-	200	1.00	1.52	0	0.00	0.00	200	1.2	1.67
		Orient Chowmuhani To Jackson Gate	0.19	8.55	1.8	-	-	-	190	2.00	2.00	0	0.00	0.00	190	1.2	2.2
5	Thakurp alli Road	Thakurpalli Road Ker Chowmuhani To Bidurkarta Chowmuhani	0.97	2.5	1.8	-	-	-	970	2.00	2.00	0	0.00	0.00	970	1.2	2.2
		Thakurpalli Road Bidurkarta Chowmuhani To Ganaraj Chowmuhani	0.32	1.8	1.8	320	1.4	1.53	320	1.80	1.80	320	1.20	1.68	320	1.2	2
		Ganaraj Chowmuhani to Purbasa	0.827	2	2.5	-	-	-	-	-	-	0	0.00	0.00	0	0	0
3	Mantrib ari Road	Post office Chowmuhani to RMS Chowmuhani	0.258	1.8	1.8	258	1	1.53	258	1.00	1.52	258	1.20	1.68	258	1.2	1.67
6	Sakunta la Road	Surya Chowmuhani To Orient Chowmuhani	0.2	1.4	1.4	200	1.5	1.53	200	1.50	1.52	200	1.20	1.68	200	1.2	1.67

S r. n o.	Descrip tion	Road sections	Len gth (Km)	Pathways/ Pedestrian Facilities width (m)		Proposed SWD size below the road surface (m)						Size of Electrical Cable Trench (m)					
						LHS			RHS			LHS			RHS		
				LHS	RHS	L	W	D	L	W	D	L	W	D	L	W	D
		Orient Chowmuhan To Rabindra Bhawan	0.3	2.3	2.3	0	0	0.00	0	0.00	0.00	0	0.00	0.00	0	0	0
1 4	ITI ROAD	G.B. Bazar to Turning Bazar Area	0.16 5	2	2	165	1	1.53	165	1.00	1.52	165	1.20	1.68	165	1.2	1.6 7
		Bazar area of I.T.I Road	0.22 5	1.8	1.8	225	1	1.53	225	1.00	1.52	225	1.20	1.68	225	1.2	1.6 7
7	GB Road	S.D. Barman bridge to Ujan Abhaynagar Tri Junction	0.64 8	1.5	1.5	648	1.4	1.53	648	1.50	1.52	648	1.20	1.68	648	1.2	1.6 7
		Ujan Abhaynagar Tri Junction to Play ground	0.25	3.35	1.5	-	-	-	250	1.50	1.52	0	0.00	0.00	250	1.2	1.6 7
		Play Ground to Abhoy Nagar Bridge	1.20 2	3.35	1.5	1202	1.5	1.53	1202	1.50	1.52	1202	1.20	1.68	1202	1.2	1.6 7
		Abhoy Nagar Bridge to Ganaraj Chowmuhan Via Lal Bahadur Junction	0.91	1.5	1.8	910	1.8	1.80	910	1.00	1.52	910	1.20	1.68	910	1.2	1.6 7
		Ganaraj Chowmuhan to Banamalipur Police Station	0.09	3.2	1.5	-	-	-	90	1.50	1.52	0	0.00	0.00	90	1.2	1.6 7
		Banamalipur Police Station to Old Motorstand	0.1	3	1.8	-	-	-	100	1.50	1.52	0	0.00	0.00	100	1.2	1.6 7
		Old Motor Stand to M.B.B. Club	0.4	3.2	1.5	-	-	-	400	1.50	1.52	0	0.00	0.00	400	1.2	1.6 7
		M.B.B. Club Chowmani To Ram Thakur Club Chowmani	0.45	3.2	1.5	-	-	-	450	1.50	1.52	0	0.00	0.00	450	1.2	1.6 7
8	Barjala Road	Barjala Junction (Airport Road Tri	0.82	1.5	1.5	820	1	1.53	820	0.80	1.52	820	1.20	1.68	820	1.2	1.6 7

S r. n o. .	Descrip tion	Road sections	Len gth (Km)	Pathways/ Pedestrian Facilities width (m)		Proposed SWD size below the road surface (m)						Size of Electrical Cable Trench (m)					
						LHS			RHS			LHS			RHS		
				LHS	RHS	L	W	D	L	W	D	L	W	D	L	W	D
		Junction) To Start of Barjala Town															
		Sart Of Barjala Junction to End of Barjala Junction	1.09 4	2	2	1094	1	1.53	1094	1.00	1.52	109 4	1. 20	1. 68	109 4	1.2	1.6 7
		End of Barjala Junction to Bhati Abhoynagar Tri Junction	1.58 4	1.5	1.5	1584	0.75	1.53	1584	1.20	1.52	158 4	1. 20	1. 68	158 4	1.2	1.6 7
		Bhati Abhoynagar To Ramnagar Outpost	0.25 4	2.5	1.8	-	-	-	-	-	-	254	-	-	254	-	-
		Ramnagar Town Outpost to Durga Chowmuhani	0.29 8	1.5	1.5	298	0.75	1.53	298	1.20	1.52	298	1. 20	1. 68	298	1.2	1.6 7
9	Ronalds ay Road	Durga Chowmuhani To Fire Brigade Station Chowmuhani	1.1	1.5	1.5	1100	2	2.50	1100	2.00	2.50	110 0	1. 20	2. 70	110 0	1.2	2.7
10	Jail Ashram Road	Lal Bahadur junction to Jail Ashram Road	1.54 7	1.5	1.5	1547	1.5	1.53	1547	1.50	1.53	154 7	1. 20	1. 68	154 7	1.2	1.6 7
11	Jail Roa d	Old Central Jail Tri-Junction to Modern Club Tri-Junction (Purbasa)	0.5	2.5	1.5	-	-	-	500	1.00	1.52	0	0. 00	0. 00	500	1.2	1.6 7
12	BT Road	IT-Hub Tri-Junction to Jail Ashram Road	0.28	1.8	3	280	1	1.53	-	-	-	280	1. 20	1. 68	0	0	0
13	Road Surroun ding the propose d IT Hub Site	BT Road to Shiv Temple	0.25 7	2	1.5	-	-	-	257	1.00	1.52	257	0. 00	0. 00	257	1.2	1.6 7
		Shiv Temple to Jail Ashram Road	0.31 3	2	1.5	313	1.2	1.53	313	1.20	1.52	313	1. 20	1. 68	313	1.2	1.6 7

S r. n o .	Descrip tion	Road sections	Len gth (Km)	Pathways/ Pedestrian Facilities width (m)		Proposed SWD size below the road surface (m)						Size of Electrical Cable Trench (m)					
						LHS			RHS			LHS			RHS		
				LHS	RHS	L	W	D	L	W	D	L	W	D	L	W	D
1 5	Lankam ura Road	Check post to Compound Wall	0.15 5	1.8	1.8	155	0.5	1.53	155	1.50	1.52	155	1. 20	1. 68	155	1.2	1.6 7
		Compound wall to Water treatment plant	0.05 5	1.8	1.8	55	0.5	1.53	55	1.50	1.52	55	1. 20	1. 68	55	1.2	1.6 7
Total Road Length (km)			23.5 62			17.8 34 (in Km)			21.9 01 (In Km)			17. 034 (In Km)			21. 101 (In Km)		

Note: LHS: Left Hand Side, RHS: Right Hand Side, SWD: Storm Water Drain, L: Length, W: Width, D: Depth

F. Construction Methodology

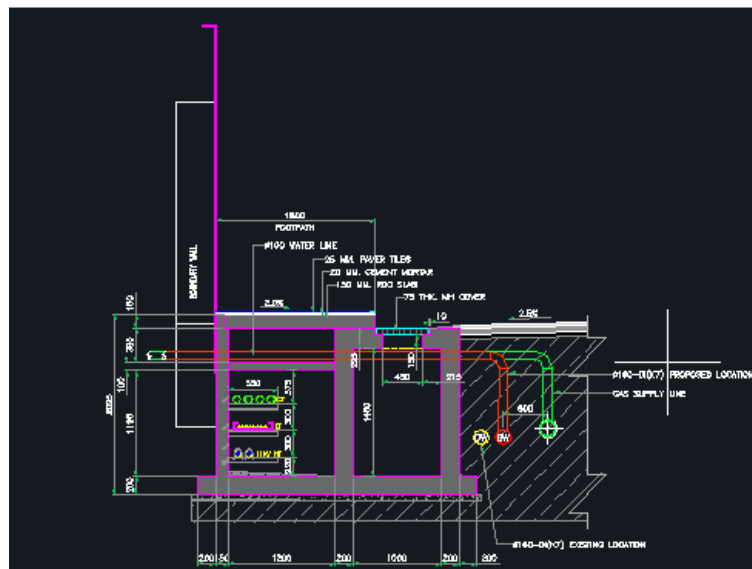
31. The upgradation / Improvements proposals of the Major roads of 23.562 km (15 nos) are based on the Design Concepts and their applicability on the road sections is already given in Section C of this chapter. Construction methodology of each concept is described below:

32. **Site clearance and Earthwork:** Site clearance of the existing road sections include:

- (i) Removal of rubbish, ground clearance
- (ii) Cutting of trees, including cutting of trunks, branches and removal of stumps & roots, refilling the disturbed area.
- (iii) Dismantling of Chambers, Kerb stones, Removal of RCC slab covers and dismantling of existing brick work drains.
- (iv) Dismantling of existing Flexible pavement, existing manholes of various services / underground utilities along the proposed road sections (Water pipeline, OFC and Gas Pipelines).
- (v) Carriageway of materials and haulage.

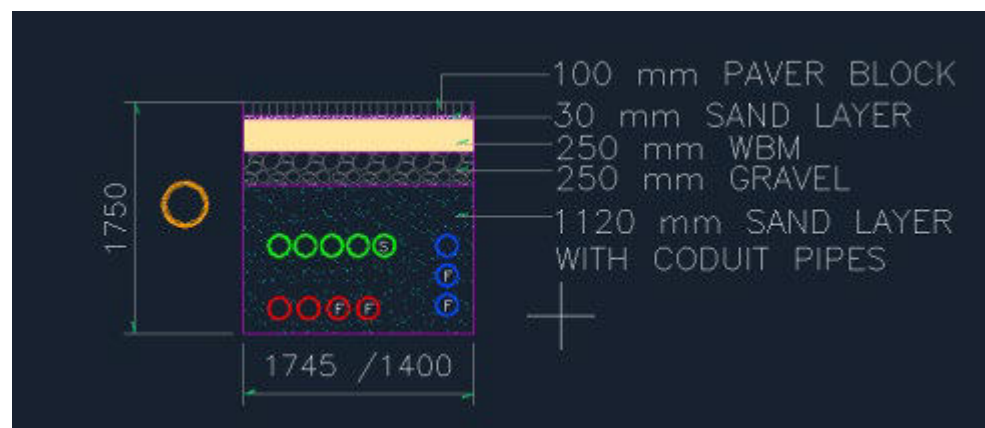
33. **Utility Conduit / Utility Cable Tray System:** Design concepts developed based on the proposed utility system and existing Storm water drain structures shall be implemented broadly by three types of construction methodologies/strategies. They are:

- (i) Construction methodology for implementation of new Two vent RCC structure on both sides of the road section is:
 - (a) This concept has new RCC structure with SWD + Utility cable tray combination with an average width of 2.5m and depth of 2.0m. For this existing brick water drains and existing Pavement surface adjacent to SWD to be dismantled to make clear working area for the RCC structure.
 - (b) Stretches between crossroads can be taken up for new construction at an alternate interval of next crossroad connectivity.



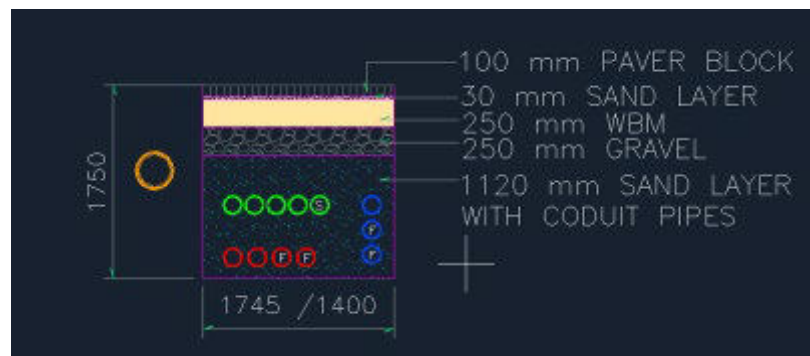
- (c) This methodology to be adopted at staggered manner along the road section.

- (d) Existing connections of underground utilities with the adjacent household connections need to be re-connected or re-laid before the fabrication of the top slabs on RCC structure are laid.
 - (e) With the top slabs ready for vehicular movement over SWD structure and pedestrian movement over Cable tray structure, completion of cross drain structure works and across the cable tray connections (electrical / OFC lines); the subgrade levels of the disturbed road section to be re-constructed.
 - (f) Paver tiles + cement mortar over RCC slab of utility cable tray system with tactile paving to be done.
 - (g) Scarification of existing road surface to attain the finished road levels w.r. to the overlay thickness proposed.
 - (h) Laying the overlay pavement compositions as per provisions. Bituminous concrete, Dense Bituminous concrete, Bituminous Macadam and Profile correction also with Bituminous Macadam layer.
 - (i) Road furniture such as Traffic signages, road marking and furniture related to traffic safety and traffic calming measures.
 - (j) Implementation of landscape related works.
- (ii) Construction methodology for implementation of new Two vent RCC structure on one side and utility conduit system with paver block pavement as finished surface on other side is:
- (a) For the side with existing brick drain and its reconstruction into Two vent RCC structure construction methodology given in strategy-A to be followed excluding point - III.
 - (b) For the side with existing RCC structure and the proposed utility conduit system to accommodate the Electrical lines, OFC lines and Gas pipelines shall be rest on suitable sand and fine aggregates (10mm to 20mm) layer as per technical specifications and standards.



- (c) Initially the manual excavation along existing road portion of width 2.0m from the face of drain and up to a depth of 2.0 m is considered. The bed shall be leveled after complete excavation.
- (d) The excavated area shall be kept dry during the backfilling with suitable dewatering method, if required.
- (e) Backfilling of good earth layers upto 600mm as per standard compaction methodology and MoRTH Specifications.

- (f) Pipe conduits of 11kv lines, LT lines and OFC cable lines are laid in a sand layer embedded with safe offset distance above and below the Gravel layer respectively. The overall depth of this layer including cushion and Pipe laying combination is 1220mm.
- (g) Preparation of Base layers for M50 Grade 100mm CC Blocks: As per the recommendations of base layers given in IRC: SP: 63-2004, layer systems are proposed and they are:
- Gravel layer of 250mm over back filled earth layer
 - Water bound macadam layer of 250mm
 - Sand layer of 30mm as bed layer for paver blocks
 - 100mm paver blocks.
- (h) Edge restraint blocks or edge strip is proposed: as per Clause 4.6 of IRC:SP:63 -2004, to avoid the displacement of concrete blocks due to braking and maneuvering of vehicular movement on the edges. In-situ edge block of M-30 grade concrete section is proposed between paver blocks and existing road base layers of 300 x 450 mm.
- (iii) Construction methodology for implementation of Utility conduit system with paver block pavement as finished surface on both sides:
- (a) To retain the existing RCC structure and the proposed utility conduit system to accommodate the Electrical lines, OFC lines and Gas pipelines shall be rest on suitable sand and fine aggregates (10mm to 20mm) layer as per technical specifications and standards.



- (b) Initially the manual excavation along existing road portion of width 2.0m from the face of drain and up to a depth of 2.0 m is considered. The bed shall be leveled after complete excavation.
- (c) The excavated area shall be kept dry during the backfilling with suitable dewatering method, if required.
- (d) Backfilling of good earth layers upto 600mm as per standard compaction methodology and MoRTH Specifications.
- (e) Pipe conduits of 11kv lines, LT lines and OFC cable lines are laid in a sand layer embedded with safe offset distance above and below the Gravel layer respectively. The overall depth of this layer including cushion and Pipe laying combination is 1220mm.
- (f) Preparation of Base layers for M50 Grade 100mm CC Blocks: As per the recommendations of base layers given in IRC: SP: 63-2004, layer systems are proposed and they are:
- Gravel layer of 250mm over back filled earth layer

- Water bound macadam layer of 250mm
- Sand layer of 30mm as bed layer for paver blocks
- 100mm paver blocks.

- (g) Edge restraint blocks or edge strip is proposed: as per Clause 4.6 of IRC:SP:63 -2004, to avoid the displacement of concrete blocks due to braking and maneuvering of vehicular movement on the edges. In-situ edge block of M-30 grade concrete section is proposed between paver blocks and existing road base layers of 300 x 450 mm.

34. **Construction Material:** Material required for construction will be explored from the project area. Existing sites which are operated with relevant licenses and approvals will be used especially for extraction of metal and sand. Offshore sand could also be used for construction subjected to confirmation of quality. If new material extraction sites will be opened for this project, necessary licenses and approvals will be obtained from relevant agencies. Based on the engineering estimates prepared for each road, approximate quantities of material required for the district is given in table below; The natural raw materials like sand, gravel and soil shall be procured/ sourced from the authorized mines listed by Tripura Government as specified in the website http://trpensis.nic.in/test/natural_resources.html. Of these raw materials, gravel is brought/ imported from mines in Assam state mainly from Harangajao mines which is at a distance of around 334 Km from Agartala, Bituminous macadam is brought is from Haldia in West Bengal state and partially from Assam state.

Table 6: Material Quantities

Sr. No.	Item	Quantity	Unit
1.	Steel	11122	tonnes
2.	Gravel in sub base	52109	cu.m
3.	Sand	31308	cu.m
4.	Bituminous Macadam	10,899	cu.m
5.	Cement	25836	cum
6.	Colored Concrete	78862	Sq.m

35. **Construction Waste Quantity:** The waste generated due to the construction and demolition activities for the subproject roads and estimated quantities of silt from the drains of subproject roads are provided in Table 7.

Table 7: Estimated Waste Quantities

Sr. No.	Description of Road Stretch	Length (km)	Total Excavation (cum)	Total Demolition (cum)	Silt (cum)	Total Back Filling/ reuse
1	Hariganga Basak Road	3.48	59995.90	7191.00	1670.40	13754.10
2	Akhaura Road	1.33	17819.60	2056.00	638.40	5942.90
3	Mantribari Road	0.258	3622.60	634.00	123.84	944.20
4	VIP Road	3.18	57167.20	8456.00	1737.60	16688.70
5	Thakurpalli Road	2.117	30603.80	3241.00	1016.16	8965.00

	Year-1				Year-2				Year-3				Year-4-7			
Activity	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Civil Works	Pre - construction Phase				Construction Phase								Defects Notification Period / Maintenance Period			
Works Execution																
Contractor Demobilization and Maintenance																

Note: Q- Quarter

III. ANALYSIS OF ALTERNATIVES

38. **No Project Alternative:** The 'No project scenario' is analyzed with respect to the development of Agartala City as a requirement of reliable quality infrastructure for sustained growth of economy and consequent well-being of its citizens. Providing better connectivity within the city will ensure that, goods and people from areas accessed by the road can commute quicker and save time. Increase in trade and commerce activity is expected. The savings in the vehicle operating costs makes the subproject viable.

39. In terms of environmental quality, not improving the roads will contribute to the further deterioration of the road surface, and traffic congestion on the roads. Poor road surface will result to increase in fuel consumption and combustion gas emissions and increase in noise and dust levels which will result to poorer air quality particularly immediately along the project road. Limiting the road improving to the available ROW also minimized the need for vegetation clearing and tree cutting.

40. If the subproject is not implemented, there is every likelihood that the existing bad pavement of the corridor deteriorates further. In the absence of the proposed subproject, the districts will also find it extremely difficult to generate revenue. Increased air pollution, due to bad road condition, slow moving traffic and congestion, will increase as the time goes by. Noise levels will rise due to deterioration of the pavement as well as increased honking. Without the improvement of subproject, the traffic would continue to pose a safety risk for the road users.

41. Therefore, 'project with alternatives' scenario, with its minor adverse impacts are more acceptable than 'No project scenario' which would mean an aggravation of the existing problems. Potential benefits of the proposed road improvements are substantial and far reaching both in terms of the geographical spread and time. Hence the implementation of the subproject will be a definite advantage to Agartala to achieve all-round development of its economy and progress for its people.

42. **With Project Alternative:** The subproject alternatives in terms of location (alignment) option are very limited as the project objective is to improve the existing roads. With the project, 23.562 km of urban road will be upgraded and maintained to all weather standards. On the other

hand, once the accessibility is increased, the travel time to centers such as hospitals, schools, markets and other infrastructure facilities available in town centers will be reduced. Therefore, this is a timely required project to facilitate the socioeconomic development of the densely populated city of Agartala and ultimately for the development of the country.

43. **Identification of subproject roads for development:** The road selection under Agartala Smart City ADB project is done keeping in view the Strategic importance, Connectivity to the adjoining important locations such as Major areas including important National Highways and State Highways, Market Places, Important Structures and Locations.

44. The selection of roads which are done on the basis of connection to major trade centers, markets and commercial areas are:

- (i) Hari Ganga Basak (HGB) Road
- (ii) Mantribari Road
- (iii) Thakurpalli Road
- (iv) Akhura road
- (v) ITI Road
- (vi) Road Surrounding IT hub
- (vii) GB Road
- (viii) Shakuntala Road
- (ix) BT Road
- (x) Jail Road

45. The selection of roads which are done on the basis of connection to major National and State Highways and Important places are:

- (i) VIP Road
- (ii) Barjala Road
- (iii) Jail Ashram Road
- (iv) Ronaldsay Road

46. The selection of roads which are done on the basis of connection to Important Structures, places and locations with strategic importance are:

- (i) Lankamura Road

47. Few sections of the road like, VIP road stretch from Lichubagan to Agartala Airport has been dropped, as the road construction and widening required felling of trees and land acquisition.

IV. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

A. ADB Policy

48. ADB SPS requires that during the design, construction and operation of the project necessary compliance to all applicable laws and international conventions / treaties along with pollution prevention and control technologies and practices consistent with international good practice, are ensured.

49. **Screening and Categorization with that of ADB SPS 2009:** ADB uses a classification system to reflect the significance of a project's potential environmental impacts. A project's category is determined by the category of its most environmentally sensitive component, including direct, indirect, cumulative, and induced impacts in the project's area of influence. Each proposed project is scrutinized as to its type, location, scale, and sensitivity and the magnitude of its potential environmental impacts. Projects are assigned to one of the following four categories:

- (i) **Category A.** A proposed project is classified as category A if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment is required.
- (ii) **Category B.** A proposed project is classified as category B if its potential adverse environmental impacts are less adverse than those of category A projects. These impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for Category A projects. An initial environmental examination is required.
- (iii) **Category C.** A proposed project is classified as category C if it is likely to have minimal or no adverse environmental impacts. No environmental assessment is required although environmental implications need to be reviewed.
- (iv) **Category FI.** A proposed project is classified as category FI if it involves investment of ADB funds to or through a FI.

50. The environmental impacts of upgradation of major roads in Agartala City have been identified and assessed as part of the planning and design process. An environmental assessment using ADB's Rapid Environmental Assessment Checklist for Urban development (Appendix 1) was conducted, and results of the assessment show that the subproject is unlikely to cause significant adverse impacts. Thus, this IEE has been prepared in accordance with ADB SPS's requirements for environment category B projects.

51. **Environment Management Plan:** An EMP which addresses the potential impacts and risks identified by the environmental assessment shall be prepared. The level of detail and complexity of the EMP and the priority of the identified measures and actions will be commensurate with the Project's impact and risks.

52. **Environmental Audit of Existing Facilities.** ADB SPS requires an environmental audit, if a subproject involves facilities and/or business activities that already exist or are under construction, including an on-site assessment to identify past or present concerns related to impacts on the environment. The objective of this compliance audit is to determine whether actions were in accordance with ADB's safeguard principles and requirements for borrowers/clients, and to identify and plan appropriate measures to address outstanding compliance issues.

53. The excess C&D waste for construction will be processed at C&D waste management site at DC Nagar Lunga, Therefore the existing C&D processing site is an associated facility as per the ADB Safeguard Policy Statement 2009. Compliance with the environmental safeguards will ensure the subproject sustainability. The Environmental Audit Report of Existing C&D waste Management site in Agartala is attached as Appendix 6.

54. **Public Disclosure:** The IEE will be put in an accessible place (e.g., local government offices, libraries, community centers, etc.), and a summary translated into local language for the project affected people and other stakeholders. The following safeguard documents will be put up

in ADB's website so that the affected people, other stakeholders, and the public can provide meaningful inputs into the project design and implementation:

- (i) For environmental category A projects, a draft EIA report at least 120 days before Board consideration;
- (ii) Final or updated IEE upon receipt; and
- (iii) Environmental monitoring reports submitted by the Project Implementation Unit (PIU) during project implementation upon receipt.

55. **Consultation and Participation.** ADB SPS require borrower to conduct meaningful consultation⁷ with affected people and other concerned stakeholders, including civil society, and facilitate their informed participation. The consultation process and its results are to be documented and reflected in the environmental assessment report.

56. **Grievance Redress Mechanism.** ADB SPS require borrowers to establish a mechanism to receive and facilitate resolution of affected people's concerns, complaints, and grievances about the subproject's performance. The grievance mechanism shall be scaled to the risks and adverse impacts of the subproject.

57. **Monitoring and Reporting.** Borrower shall monitor, measure and document the implementation progress of the EMP. If necessary, the borrower shall identify the necessary corrective actions, and reflect them in a corrective action plan. Borrower shall prepare and submit to ADB semi-annual environmental monitoring reports that describe progress with implementation of the EMP and compliance issues and corrective actions, if any. For subprojects likely to have significant adverse environmental impacts during operation, reporting will continue at the minimum on an annual basis until ADB issues a project completion report.

58. **Unanticipated Environmental Impacts.** Where unanticipated environmental impacts become apparent during subproject implementation, ADB SPS requires the borrower to update the environmental assessment and EMP or prepare a new environmental assessment and EMP to assess the potential impacts, evaluate the alternatives, and outline mitigation measures and resources to address those impacts.

59. **Occupational Health and Safety.** ADB SPS requires the borrower⁸ to ensure that workers⁹ are provided with a safe and healthy working environment, considering risks inherent to the sector and specific classes of hazards in the subproject work areas, including physical, chemical, biological, and radiological hazards. Borrower shall take steps to prevent accidents, injury, and disease arising from, associated with, or occurring during the course of work, including:

⁷ Per ADB SPS, 2009, meaningful consultation means a process that (i) begins early in the project preparation stage and is carried out on an ongoing basis throughout the project cycle; (ii) provides timely disclosure of relevant and adequate information that is understandable and readily accessible to affected people; (iii) is undertaken in an atmosphere free of intimidation or coercion; (iv) is gender inclusive and responsive, and tailored to the needs of disadvantaged and vulnerable groups; and (v) enables the incorporation of all relevant views of affected people and other stakeholders into decision making, such as project design, mitigation measures, the sharing of development benefits and opportunities, and implementation issues

⁸ In case where responsibility is delegated to subproject contractors during construction phase, borrower shall ensure that the responsibilities on occupational health and safety are included in the contract documents

⁹ Including nonemployee workers engaged by the borrower/client through contractors or other intermediaries to work on project sites or perform work directly related to the project's core functions.

(i) identifying and minimizing, so far as reasonably practicable, the causes of potential hazards to workers; (ii) providing preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances; (iii) providing appropriate equipment to minimize risks and requiring and enforcing its use; (iv) training workers and providing them with appropriate incentives to use and comply with health and safety procedures and protective equipment; (v) documenting and reporting occupational accidents, diseases, and incidents; and (vi) having emergency prevention, preparedness, and response arrangements in place.

60. **Community Health and Safety.** ADB SPS requires the borrower to identify and assess risks to, and potential impacts on, the safety of affected communities during the design, construction, operation, and decommissioning of the subproject, and shall establish preventive measures and plans to address them in a manner commensurate with the identified risks and impacts.

61. **Physical Cultural Resources.** Borrower is responsible for siting and designing the subproject to avoid significant damage to physical cultural resources. ADB SPS requires that such resources likely to be affected by the subproject are identified, and qualified and experienced experts assess the subproject's potential impacts on these resources using field-based surveys as an integral part of the environmental assessment process. When the designed location of a subproject component is in areas where physical cultural resources are expected to be found as determined during the environmental assessment process, chance finds procedures shall be included in the EMP (Appendix 11).

62. **ADB SPS International Best Practice Requirements.** ADB SPS requires that, during the design, construction, and operation of the project, the executing agency shall apply pollution prevention and control technologies and practices that are consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group's Environment, Health and Safety Guidelines. (IFC's General EHS Guidelines¹⁰ and Sector Specific [Water and Sanitation] Guidelines).¹¹ These standards contain performance levels and measures that are normally acceptable and applicable to projects. These standards contain performance levels and measures that are normally acceptable and applicable to projects. When Government of India regulations differ from these levels and measures, the PMU and PIUs will achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the PMU and PIUs will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS. The IEEs shall also reflect meaningful consultation and disclosure process with a provision for grievance redress mechanism.

B. National and State Laws

63. The implementation of the subprojects will be governed by Government of India and State of Tripura and other applicable environmental acts, rules, regulations, and standards. These regulations impose restrictions on the activities to minimize or mitigate likely impacts on the environment. It is the responsibility of the project executing and implementing agencies to ensure

¹⁰<https://www.ifc.org/wps/wcm/connect/554e8d80488658e4b76af76a6515bb18/Final%2B-%2BGeneral%2BEHS%2BGuidelines.pdf?MOD=AJPERES>

¹¹<https://www.ifc.org/wps/wcm/connect/e22c050048855ae0875cd76a6515bb18/Final%2B-%2BWater%2Band%2BSanitation.pdf?MOD=AJPERES>

subprojects are consistent with the legal framework, whether applicable international, national, state or municipal or local. Key standards include those related to drinking water quality, air quality, and protected areas. Compliance is required in all stages of the subprojects including design, construction, and operation and maintenance.

64. **Environmental Assessment.** The GoI EIA Notification of 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.

65. **Category A** projects requires EC from the central Ministry of Environment, Forests and Climate Change (MoEFCC). The proponent is required to provide preliminary details of the project in the prescribed manner with all requisite details, after which an Expert Appraisal Committee (EAC) of the MoEFCC prepares comprehensive Terms of Reference (ToR) for the EIA study. On completion of the study and review of the report by the EAC, MoEFCC considers the recommendation of the EAC and provides the EC if appropriate.

66. **Category B** projects require environmental clearance from the State Environment Impact Assessment Authority (SEIAA). The State level EAC categorizes the project as either B1 (requiring EIA study) or B2 (no EIA study) and prepares ToR for B1 projects within 60 days. On completion of the study and review of the report by the EAC, the SEIAA issues the EC based on the EAC recommendation. The Notification also provides that any project or activity classified as category B will be treated as category A if it is in whole or in part within 10 km from the boundary of protected areas, notified areas or inter-state or international boundaries.

67. None of the components of up gradation of major roads subproject in Agartala falls under the ambit of the EIA Notification 2006, and, therefore EIA Study or EC is not required for the subproject.

68. **Applicable environmental regulations.** Besides EIA Notification 2006, there are various other acts, rules, policies and regulations currently in force in India that deal with environmental issues that could apply to infrastructure development. The specific regulatory compliance requirements of the subproject are shown in the below Table 9.

Table 9: Applicable Environmental Regulations

Law	Description	Requirement	Project Phase
National Environment Policy, 2006.	NEP is a comprehensive guiding document in India for all environmental conservation programs and legislations by central, state and local government. The dominant theme of this policy is to promote betterment of livelihoods without compromising or degrading the environmental resources. The policy also advocates	All subprojects under ASCL should adhere to NEP principle of “enhancing and conservation of environmental resources and abatement of pollution”.	All phases of the project

Law	Description	Requirement	Project Phase
	collaboration method of different stakeholders to harness potential resources and strengthen environmental management.		
EIA Notification	The EIA Notification of 2006 and 2009 (replacing the EIA Notification of 1994), set out the requirement for environmental assessment in India. This states that Environmental Clearance is required for certain defined 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. Category A projects requires Environmental Clearance from the National Ministry of Environment, Forest and Climate Change (MoEFCC). Category B projects require Environmental Clearance from the State Environmental Impact Assessment Authority (SEIAA).	None of the components of this subproject falls under the ambit of the notification	Not Applicable
Water (Prevention and Control of Pollution) Act of 1974, Rules of 1975, and amendments	Control of water pollution is achieved through administering conditions imposed in consent issued under provision of the Water (Prevention and Control of Pollution) Act of 1974. These conditions regulate the quality and quantity of effluent, the location of discharge and the frequency of monitoring of effluents. Any component of the Project having the potential to generate sewage or trade effluent will come under the purview of	<p>None of the components in this subproject requires CFE or CFO under this act.</p> <p>Consent to Establish & Operate Certificate has been obtained for the Solid waste management Facility at DC Nagar Lunga Site where the solid waste dumping of waste generated from this subproject is proposed from the TSPCB by AMC. Copy of certificate attached as Appendix 6</p>	Construction phase

Law	Description	Requirement	Project Phase
	<p>this Act, its rules and amendments. Such projects must obtain Consent to Establish (CTE) under Section 25 of the Act from Tripura state Pollution Control Board (TSPCB) before starting implementation and Consent to Operate (CTO) before commissioning. The Water Act also requires the occupier of such subprojects to take measures for abating the possible pollution of receiving water bodies.</p>		
<p>Air (Prevention and Control of Pollution) Act of 1981, Rules of 1982 and amendments.</p>	<p>The subprojects having potential to emit air pollutants into the atmosphere must obtain CTE under Section 21 of the Air (Prevention and Control of Pollution) Act of 1981 from TSPCB before starting implementation and CTO before commissioning the project. The occupier of the project/facility has the responsibility to adopt necessary air pollution control measures for abating air pollution.</p>	<p>For the project, the following will require CTE and CTO from TSPCB: if, (i) diesel generators; (ii) hot mix plants; and (iii) stone crushers, installed for construction. All relevant forms, prescribed fees and procedures to obtain the CFE and CFO can be found in the TSPCB website (www.tspcb.gov.in).</p> <p>If procuring using third party, contractor to ensure that the plants, from where material is being purchased is having CTE/CTO and copy should be collected from third party and submitted in PIU.</p> <p>Consent to Establish & Operate Certificate has been obtained for the Solid waste management Facility at DC Nagar Lunga Site where the solid waste dumping of waste generated from this subproject is proposed from the TSPCB by AMC.</p>	<p>Construction and Operation phase</p>

Law	Description	Requirement	Project Phase
		Copy of certificate attached as Appendix 6.	
The Motor Vehicles Act, 1988 (59 Of 1988) (14 Oct. 1988)	<p>The subprojects having potential to emit smoke and vapor carrying air pollutants, and enforcement of other applicable rules as per the motor vehicle act As per Rule no 115. Emission of smoke, vapor, etc. from motor vehicles and</p> <p>Rule no 116. Test for smoke emission level and carbon monoxide level for motor vehicles of THE CENTRAL MOTOR VEHICLES RULES, 1989</p>	Pollution under control (PUC) certificate is required for all construction and vehicle used for the subproject.	Construction and maintenance
Environment (Protection) Act, 1986 and CPCB Environmental Standards.	Emissions and discharges from the facilities to be created or refurbished or augmented shall comply with the notified standards notified.	<p>Appendix 3 provides applicable standards for ambient air quality which should be followed during construction phase.</p> <p>Appendix 3 also provides a comparison of national standards and internationally recognized guidelines with respect to ambient air and noise, ADB SPS requires adoption of stringent values for project implementation.</p>	Construction and maintenance
Noise Pollution (Regulation and Control) Rules, 2002 amended up to 2010.	Rule 3 of the Act specifies ambient air quality standards in respect of noise for different areas/zones.	<p>Appendix 3 provides applicable noise standards.</p> <p>Contractors are required to ensure all noise-producing activities during civil works conform to applicable standards</p>	Construction and maintenance
National Institute of Occupational Safety and Health (NIOSH) Publication No. 98-126	NIOSH has laid down criteria for a recommended standard: occupational noise exposure. The standard is a combination of noise exposure levels and duration that no worker exposure shall equal or exceed.	Internationally recognized environmental standards. Contractors are required to provide hearing-protection equipment and ensure exposures of workers to noise-generating activities are within allowed NIOSH standards.	Construction and maintenance

Law	Description	Requirement	Project Phase
Municipal Solid Wastes Management Rules, 2016	Rules to manage municipal solid waste generated; provides rules for segregation, storage, collection, processing and disposal.	Solid waste generated at proposed facilities shall be managed and disposed in accordance with the Rules.	Construction and maintenance
Construction and Demolition Waste Management Rules, 2016	Rules to manage construction and to waste resulting from construction, remodeling, repair and demolition of any civil structure. Rules define C and D waste as waste comprising of building materials, debris resulting from construction, remodeling, repair and demolition of any civil structure.	Construction and demolition waste generated from the project construction shall be managed and disposed as per the rules Request for permission of dumping of the Construction and demolition waste At the DC Nagar Lunga Site and allowing to use the plant for recycling of construction and demolition waste located at DC Nagar Lunga site for further reuse is made by ASCL to AMC.	Construction phase
Hazardous and Other Wastes (Management and Trans boundary Movement) Rules, 2016	According to the Rules, hazardous wastes are wastes having constituents specified in Schedule II of the Rules if their concentration is equal to or more than the limit indicated in the said schedule.	If during excavation works, the excavated material is analyzed to be hazardous, they are to be stored and disposed of only in such facilities as may be authorized by the TSPCB for the purpose.	Construction phase
Forest (Conservation) Act, 1980 and Forest Conservation Rules, 2003 as amended	As per Rule 6, every user agency, who wants to use any forest land for non-forest purposes, shall seek approval of the Central Government.	Not applicable as subprojects components are not located in designated forest area	Not Applicable
Wetlands (Conservation and Management) Rules, 2017	The Rules specify activities which are harmful and prohibited in the wetlands such as industrialization, construction, dumping of untreated waste and effluents, and reclamation. The Central Government may permit any of the prohibited activities on the recommendation of Central Wetlands Regulatory Authority.	Not applicable to the Subproject.	Not Applicable

Law	Description	Requirement	Project Phase
Indian Wildlife (Protection) Act, 1972 amended 1993 and Rules 1995; Wildlife (Protection) Amendment Act, 2002	<p>An Act to provide for the comprehensive protection of wild animals, birds and plants. This would cover matters concerning Appointment of forest authorities, hunting of wild animals, protection of specified plants, conservation of national parks and sanctuaries, trade commerce in relation to plants and animals and prevention of any offences. Wildlife protected areas are notified under this act.</p> <ul style="list-style-type: none"> - In Tripura State, there are 2 National Parks and 4 Wildlife Sanctuaries 	Not applicable as subprojects components are not located in designated protected area.	Not Applicable
Manufacture, Storage, and Import of Hazardous Chemical Rules, 1989	<p>Defines hazardous chemicals</p> <ul style="list-style-type: none"> • Stipulates rules, procedures to manufacture, storage and import of hazardous chemicals • Requires permission, authorization from various agencies if the total storage exceeds specified quantity; requires emergency management plan 	Requires permission, authorization from various agencies if the total storage exceeds specified quantity; for the hazardous material used for the project like fuel oil for DG sets, Waste fuel oil, grease residues, scarified bitumen, thinners, paints etc.	Construction phase
<p>Mines and Minerals (Regulation and Development) Act, 1957 as amended in 1972</p> <p>Mining of Minerals as per EIA notification 2006 and MoEF circular as per the Supreme Court Order 27.02.2012</p>	<ul style="list-style-type: none"> • Permission of Mining of aggregates and sand <p>As per the circular all mining project (including minor minerals) irrespective of their lease areas of operation would now require environmental clearance.</p>	<p>Only licensed quarry will be used and no new quarries will be developed for minor minerals like stone, soil, river sand etc.</p> <p>However, if new mining of more than 5ha is being explored the contractor may need to take environmental clearance</p>	Construction phase

Law	Description	Requirement	Project Phase
The Ancient Monument and Archaeological Sites and Remains (Amendment and Validation) Act 2010	<p>The Rules designate areas within a radius of 100 m and 200 m from the “protected property/ monument/ area” as “prohibited area” and “regulated area” respectively.</p> <p>Henceforth, no permission for construction of any public projects or any other nature shall be granted in the prohibited areas of the protected monument and protected area</p> <p>In respect of regulated area, the Competent Authority may grant permission for construction, reconstruction, repair and renovation based on recommendation of the National Monument Authority duly taking note of heritage bye-laws, which shall be prepared in respect of each protected monument and protected area</p>	<p>There is no protected property/ monument/ area” as “prohibited area” and “regulated area” on the project corridor. The Ujjayanta Palace a tourist site, which is 58 m from the proposed Thakurpalli Road.</p> <p>In case of chance finds, measures are suggested in Environmental Management Plan (EMP) to take prompt action to ensure its removal or protection in situ.</p>	Construction phase
The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 (LARR)	<p>Private land acquisition is guided by the provisions and procedures under this Act. Before the acquisition of any land, the Government is required to consult the concerned Panchayat or Municipal Corporation and carry out a Social Impact Assessment in consultation with them. The Act provides a transparent process for land acquisition for industrialization, development of essential infrastructural facilities and urbanization by giving adequate financial compensation to the affected people.</p>	<p>The entire road upgradation project is within the existing ROW. Land acquisition is not applicable to this project.</p>	Construction phase
The Scheduled Tribes and other Traditional	It grants legal recognition to the rights of traditional forest dwelling communities.	This rule is applicable if land acquisition of forest dwelling ST and other traditional forest dwelling	Not Applicable

Law	Description	Requirement	Project Phase
Forest Dwellers (Recognition of Forest Rights) Act, 2006		communities may be required. This is not applicable for the project.	
The Child Labour (Prohibition and Regulation) Amendment Act, 2016 The Child Labour (Prohibition and Regulation) Act, 1986	No child below 14 years of age will be employed or permitted to work in any of the occupations set forth in the Act's Part A of the Schedule or in any workshop wherein any of the processes set forth in Part B of the Schedule. Child can help his family or family enterprise, which is other than any hazardous occupations or processes set forth in the Schedule, after his school hours or during vacations	No children between the age of 14 to 18 years will be engaged in hazardous working conditions.	Construction and Maintenance phase
The National Green Tribunal (NGT) Act, 2010	NGT provides an effective and expeditious disposal of cases relating to environmental protection and conservation of forests and other natural resources including enforcement of any legal right relating to environment and giving relief and compensation for damages to persons and property and for matters connected therewith. NGT has jurisdiction over matters related to Water Act, 1974; Water Cess Act, 1977; Forest (Conservation) Act, 1980; Air Act, 1981; Environment (Protection) Act, 1986; Public Liability Insurance Act, 1991; and Biodiversity Act, 2002. Consequently, no other court will have jurisdiction over the matters related to environment falling under the above referred Acts. Being a dedicated tribunal for environmental matters with the necessary expertise to handle environmental disputes.	Stakeholders / affected persons may approach NGT to resolve project induced environmental issues	Construction and Maintenance phase

Law	Description	Requirement	Project Phase
Contract Labour (Regulation and Abolition) Act, 1970	The Act provides for certain welfare measures to be provided by the Contractor to contract labor and in case the Contractor fails to provide, the same are required to be provided by the Principal Employer by Law. The principal employer is required to take Certificate of Registration and the Contractor is required to take a License from the designated Officer. The Act is applicable to the establishments or Contractor of principal employer if they employ 20 or more contract labor.	<ul style="list-style-type: none"> • Applicable to all construction works under ASCL • IA to obtain a Certificate of Registration as the principle employer; 	Construction and Maintenance phase
Notification by Forest Department, Government of Tripura,	Guidelines for extraction of trees from non-forest area stipulates that permission for tree cutting shall be taken from State Forest department	Necessary permission for non-forest tree cutting shall be taken from the Forest Department. Compensatory plantation arrangements will be done in Forest Department in its Letter no. F.11-13/WFD/Deppt.0prnt/2018-19/11595-597 dated 27-02-2020.	Construction phase
The Inter-State Migrant Workmen (Regulation of Employment and Conditions of Service) Act, 1979	The Act is applicable to an establishment which employs 5 or more inter-state migrant workmen through an intermediary (who has recruited workmen in one state for employment in the establishment situated in another state). The inter-state migrant workmen, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, traveling expenses from home up to the establishment and back, etc.,	<ul style="list-style-type: none"> • Contractor shall register with Labour Department, if Inter-state migrant workmen are engaged • Adequate and appropriate amenities and facilities to be provided to workers - housing, medical aid, traveling expenses 	Construction and Operation phase
Minimum Wages Act, 1948.	The employer is supposed to pay not less than the Minimum Wages fixed by	<ul style="list-style-type: none"> • All construction workers should be paid not less than the 	Construction and Maintenance phase

Law	Description	Requirement	Project Phase
	appropriate Government as per provisions of the Act if the employment is a scheduled employment. Construction of Buildings, Roads, Runways are scheduled employment.	prescribed minimum wage.	
Workmen Compensation Act, 1923.	The Act provides for compensation in case of injury by accident arising out of and during employment.	<ul style="list-style-type: none"> • Compensation for workers in case of injury by accident. 	Construction and Maintenance phase
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 in the matters of transfers, training and promotions etc.	<ul style="list-style-type: none"> • Equal wages for work of equal nature to male and female workers. 	Construction and Maintenance phase
Regulation of Polychlorinated Biphenyls (PCB) Order, 2016.	The order bans the import of Polychlorinated Biphenyls containing equipment.	<ul style="list-style-type: none"> • No equipment containing PCB shall be used in the project. • TSECL official has confirmed that all Transformers in Tripura state are PCB free. 	Construction phase

C. International Conventions and Treaties

69. In addition to national and state rules and regulations, international conventions such as the International Union for Conservation of Nature and Natural Resources, Convention on Migratory Species of Wild Animals, Convention on International Trade in Endangered Species of Wild Fauna and Flora, and Ramsar Convention on Wetlands of International Importance are applicable in the selection and screening of subprojects under restricted/sensitive areas. India is a party to these conventions. The international conventions and their requirement to the subproject are given in Table 10 below.

Table 10: International Conventions and Their Requirement to the Subproject

International Convention	Description	Requirements
International Union for Conservation of Nature and Natural Resources - 1 st July 1975	The International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species (also known as the IUCN Red List or Red Data List), founded in 1963, is a comprehensive inventory of the global conservation status of plant and animal species. The IUCN is an authority on the conservation status of species. A series of Regional Red Lists are produced by countries or organizations, which assess the risk of extinction to species within a political management unit. The IUCN Red List is set upon precise criteria to evaluate the extinction risk of thousands of species and subspecies.	These criteria are relevant to all species and all regions of the world. The aim is to convey the urgency of conservation issues to the public and policy makers, as well as help the international community to try to reduce species extinction. Not relevant to the target area of subproject.
Convention on Migratory Species of Wild Animals – 1 st November 1983	The Convention on Migratory Species of Wild Animals (CMS) was adopted in 1979 and entered into force on 1 November 1983. CMS, also known as the Bonn Convention, recognizes that states must be the protectors of migratory species that live within or pass through their national jurisdictions, and aims to conserve terrestrial, marine and avian migratory species throughout their ranges.	CMS Parties strive towards strictly protecting these species, conserving or restoring the places where they live, mitigating obstacles to migration and controlling other factors that might endanger them. Not relevant to the target area of subproject.
Convention on International Trade in Endangered Species of Wild Fauna and Flora – March 1973	The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival. CITES were first formed, in the 1960s. Annually, international wildlife trade is estimated to be worth billions of dollars and to include hundreds of millions of plant and animal specimens. The trade is diverse, ranging from live animals and plants to a vast array of wildlife products derived from them, including food products, exotic leather goods, wooden musical instruments, timber, tourist curios and medicines. Levels of exploitation of some animal and plant species are high and the trade in them, together with other factors, such as habitat loss, is capable of heavily depleting their populations and even bringing some species close to extinction.	Many wildlife species in trade are not endangered, but the existence of an agreement to ensure the sustainability of the trade is important to safeguard these resources for the future. Because the trade in wild animals and plants crosses borders between countries, the effort to regulate it requires international cooperation to safeguard certain species from over-exploitation. Not relevant to the subproject area.
Ramsar Convention, 3 rd February 1971.	The Ramsar Convention is an intergovernmental treaty that provides the framework for national action and international co-operation for the conservation and wise use of wetlands and their resources. India is one of	ASCL will help the Government of India comply with this agreement. ASCL will not support subprojects that will locate in wetlands

International Convention	Description	Requirements
	the signatories to the treaty. The Ramsar convention made it mandatory for the signatory countries to include wetland conservation in their national land use plans.	and other protected areas of the country
Montreal Protocol, 6 th September 1987	India is a signatory of this convention which aims to reduction in the consumption and production of ozone-depleting substances (ODS), while recognizing differences in a nation's responsibilities. Ozone depleting substances are divided in two groups Chlorofluorocarbons (CFCs) and Hydro Chlorofluorocarbons (HCFCs)	Not applicable in this project as no ODS are involved in construction works.
Basel Convention on Trans-boundary Movement of Hazardous Wastes, 22 nd March 1989	India is a signatory of this convention which aims to reduce trans-boundary movement and creation of hazardous wastes.	Contractor shall abide by Basel Convention as well as Hazardous Waste Rules, 2016 for storage, handling, transport and disposal of hazardous waste emerged during construction works.

D. Clearances / Permissions to be Obtained

70. Clearances / permissions to be obtained prior to start of construction. Below Table 11 shows the list of clearances/permissions required for project construction. This list indicative and the contractor should ascertain the requirements prior to start of the construction and obtain all necessary clearances/permission prior to start of construction.

Table 11: Clearances and Permissions Required for Construction Activities

Sr. No.	Construction Activity	Statute under which Clearance is Required	Implementation	Supervision
1	Tree Cutting/pruning – 520 Nos. of Trees	State forest department (NOC required from Forest Department as per the notification No. F1.7(44)/FPR/FP/2001/Part-II/19.630-720 dated 20/10/2010.)	PIU	PIU and PMU
2	Consent to Operate Hot mix plants, Crushers and Batching plants	TSPCB	Contractor	PIU
3	Land for project activity	Allotment and approval for specific land use	AMC	PMU
4	Permission for Storage, handling and transport of	Hazardous Wastes (Management and Handling) Rules. 2016 Manufacturing, Storage and Import of	Contractor	PIU

Sr. No.	Construction Activity	Statute under which Clearance is Required	Implementation	Supervision
	hazardous materials	Hazardous Chemicals Rules, 1989 from TSPCB		
5	Permission for Sand mining, quarries and borrow areas	Department of Mines and Geology Government of Tripura	Contractor	PIU
6	Permission for New quarries and borrow areas	Environmental clearance under EIA Notification 2006	Contractor	PIU
7	Permission for Temporary traffic diversion	District traffic police	Contractor	PIU
8	Permission for Disposal of bituminous and other wastes	Hazardous and Other Wastes (Management and Trans boundary Movement) Rules, 2016. Permission from AMC	Contractor	PIU
9	Installation of Diesel Generators	CTE and CTO from TSPCB	Contractor	PIU
10	Clearance for excavation and transporting soil	Department of Mines and Geology/ Local Bodies	Contractor	PIU
11	License for storing Diesel	Commissioner of Explosives and TSPCB	Contractor	PIU
12	Labour Camps	District health Officer	Contractor	PIU
13	Clearance for crossing any waterway	Irrigation Department, Government of Tripura	Contractor	PIU
14	If water must be taken from river	Concerned Water Authority	Contractor	PIU
15	Pollution Under Control Certificate	Central Motor and Vehicle Act 1988	Contractor	PIU

71. PMU will ensure all necessary regulatory clearances and approvals are obtained prior to commencement of works. Respective PIUs, with support of project consultants and DBO contractors, are responsible for obtaining the clearances/permits and ensuring conditions/specifications/provisions are incorporated in the subproject design, costs, and implementation. The PIUs shall report to PMU the status of compliance to clearances/permits as part of the regular progress reporting.

V. DESCRIPTION OF ENVIRONMENT

A. Physical Resources

1. Location, Area and Connectivity

72. Agartala, the capital of Tripura, is situated along 23° 45' 23° 55' N latitude and 91°15' 91°20' E longitude, in the flood plains of the Haora River. Historically, the city has been an

important border-trading town with trading linkages with Bangladesh. Agartala is the second-largest city in northeast India after Guwahati. The city is governed by the Agartala Municipal Corporation. It is located on the banks of the Haora River, near the Bangladesh border, about 90 km (55 mi) east of Bangladesh's capital Dhaka.

73. **Administrative Boundaries:** Agartala is the capital of Tripura, the third smallest Indian state considered as the gateway to the North-Eastern India. The Agartala Municipal Corporation (AMC) was established in 1871 with an area of only 3 km². Presently the extended limit of AMC covers an area of 62 km² comprising of 35 wards. The Greater Agartala Planning Area (GAPA) is spread over an area of 92.0 km². It comprises of AMC and eight other villages with population of more than 4 lakhs. Considering the natural geographical division created by the Haora River and Katakhal channel, the GAPA has been demarcated to distinguish the three (3) zones: the north zone, central zone and south zone.

74. **Road, Rail and Air Connectivity:** The National Highway (NH)-44 connects Agartala with Silchar, Guwahati and other towns of Assam. The city has its own airport and direct flights from many other cities of India for the Agartala Airport. The city also has a very prominent and busy railway station, which connects it with all the major cities of the country. The intercity transportation of Agartala is very well organized too. All the places in the city are easily connected by a well laid network of roads such as VIP road, Pragati Road, Akhaura Road and others. There are buses and other transportations that run in the city all day long. Some important localities in the city include Hrishikesh Colony, Abhoy Nagar, Ram Nagar, Manipuri Basti, Banamalipur and Shib Nagar.

2. Topography, Soils and Geology

75. **Topography:** -The major part of the City (Central Agartala) has a flat terrain. However, the North and South Zones have a rolling terrain with average altitude varying from a high of 25 to 30 m to a low of 8 m. Greater Agartala is a combination of plain and undulated areas. The central zone is a flat land bounded by the rivers Haora in the south and Katakhal in the north. An important characteristic of the central part of the city is that it is located at a lower level than other areas giving it the appearance of a saucer. Due to its saucer shape, the low-lying areas are vulnerable to inundation during monsoons.

76. **Soils:** - The plains of Haora River are alluvial in nature consisting of sand, silt and clay. The soil in Agartala is in general of poor to medium quality. It is characterized by a top soil underlain by a soft to medium/stiff, silty clay/clayey silt layer, which follows a moderately dense to very dense silty sand layer. Bearing capacity of soil is poor and usually is of the range of 4 – 6 tons per m Central Agartala and most parts of south Agartala.

77. **Geology:** -The geology of Agartala is represented by the repetitive succession of sedimentary rock like sandstone, shale and clay from bottom to top, belonging to Surma group, Tipam group and Dupitila group. The valley is dominated by thick sandstones horizons with thin intervening shale/clay horizons. The sedimentary rocks are deformed and folded. The sandstones are highly porous underlain by impermeable shales or clay and are favorable for ground water retention.

3. Natural Disasters

78. **Cyclone.**¹² The District is completely prone to cyclonic hazard zone and the probability of damage is very high. The seasonality of occurrence of cyclone are during the month of October & November. Sometimes the cyclonic wind flows in the state after passing Bangladesh. In such events weakly built houses suffer the damage. Cyclones also disrupt power supply, telecommunication, surface communication and it damages agricultural crops and greenery in the District

79. **Seismicity.**¹³ The District is a part of the most severe seismic zone in the country namely Zone-V of seismic zoning map of India. Several number of moderate to large magnitude earthquake occurred within the District. In 1897 and earthquake took place in the state where the State's only one building that is the king palace which was damaged completely. Several landslide and liquefaction took place in the district.

80. **Floods.** The District faces flash flood annually during the monsoon season i.e. June to September. Howrah and Kathakhal rivers are two major drainage channels draining flood water to Bangladesh. Now a days due to climate change effect there are irregular raining resulting temporary flooding occur in the low-lying area in District. The city is facing frequent floods also due to blockage of drainage system.

4. Climatic Conditions

81. The climate of Tripura exhibits a strong seasonal rhythm. The state is characterized by a warm and humid tropical climate with five distinct seasons, namely, spring, summer, monsoon, autumn and winter. Spring starts from late mid-February & continues till mid-March. Winter returns if there is rain a fresh in mid-February. Summer season starts from middle of March and reaches its peak in April - May. The monsoon generally breaks in the later part of May or first week of June and lasts till September.

82. Winter sets in from November and is severe in the month of January minimum temperature recorded is 4°C in January 1995. Humidity is generally high throughout the year. In the summer season the relative humidity is varied from 50 percent to 74 percent whereas in the rainy season it is over 85 percent.

83. Relatively high temperature, occasional thunderstorms and wind velocities characterize the summer season, which extends from March end to mid-May. The average maximum temperature is 34°C and average minimum temperature is 15°C. Annual rainfall ranges from 1922 mm to 2855 mm.

84. On-site monitoring was undertaken for various meteorological variables to generate the site-specific data. Data was collected at site every hour continuously from 20th December 2018 to 7th January 2019.

85. **Methodology.** Site specific data covering micro-meteorological parameters were recorded on hourly basis during the study period and comprises of parameters like wind speed, wind direction (from 0 to 360 degrees), temperature, relative humidity, atmospheric pressure,

¹² District Disaster Management Plan 2016-2017

¹³ District Disaster Management Plan 2016-2017

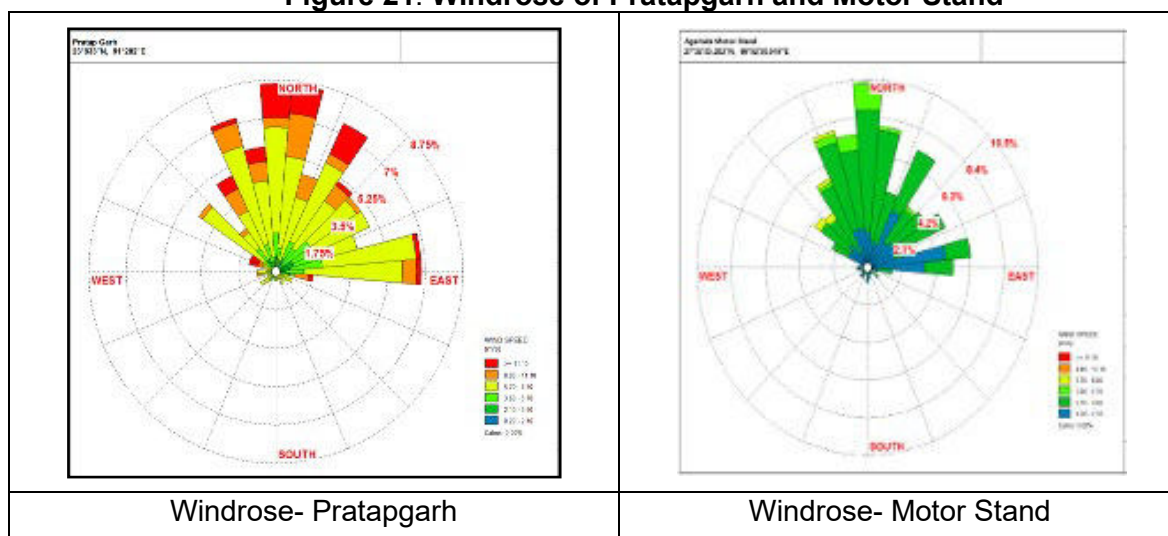
rainfall and cloud cover. The monitoring was carried out at two locations; Pratapgarh (21st-28th December 2018) and Agartala Motor Stand (29th December 2018 -5th January 2019).

86. **Observations:** The minimum, maximum and average values for all the parameters except wind direction are presented in Table 12.

Table 12: Summarized Meteorological Data

Sr. No.	Parameters	Min. Value	Max. Value	Avg. Value
Pratapgarh				
1	Wind speed, (kmph)	0.72	18.04	7.18
2	Temperature, °C	11.98	30.89	21.44
3	Humidity (%)	23	79	46.43
Agartala Motor Stand				
1	Wind speed, (kmph)	1.14	28.01	7.74
2	Temperature, °C	11.01	31.5	22.21
3	Humidity (%)	21	78	45.45

Figure 21: Windrose of Pratapgarh and Motor Stand



surface water for Greater Agartala. In addition to these two rivers, there are other rivers like Bangeshwar Gang, Debta Gang, Nagichara, Kalapani Charra and its tributaries within Greater Agartala. The Akhaura canal system running along the Akhaura road serves mainly the central area. All rivers are rain-fed and ephemeral in nature and their flow is directly related to rainfall.

89. **Surface Water:** 7 surface water sources within 10-km radial distance were examined for physico-chemical, heavy metals and bacteriological parameters to assess the effect of industrial and other activities on surface and ground water. The samples were analyzed as per the procedures specified in 'Standard Methods for the Examination of Water and Wastewater published by American Public Health Association (APHA). These samples were taken as grab samples and were analyzed for various parameters to compare with the standards for drinking water as per IS: 10500. The water sampling locations are listed below in Table 13 below and are shown in Figure 22. The results of the surface water sampling are shown in Table 14.

Table 13: Surface Water Monitoring Locations

Sr. No.	Monitoring Location	Date of Sampling	Location Code
1	Near BMS college	27 th December 2018	SW1
2	Near Bir Bikram University		SW2
3	Durgabari		SW3
4	Dim Sagar		SW4
5	Kathakal		SW5
6	Howrah River near Pratapgarh		SW6
7	Near Krishnanagar		SW7

Figure 22: Surface Water Monitoring Locations



Table 14: Surface Water Monitoring Results

[illegible]

Sr. No.	Parameters	Unit	Standards	SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	SW-7
	Dates			27-12-2018						
25	Total Chromium (as Cr)	mg/l	0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
26	Sodium (as Na) **	mg/l	60	10	11.3	7.2	6.4	28	12	11
27	Potassium (as K)	mg/l	-	2.7	4.0	4.7	1.8	6.2	2.7	2.6
28	Zinc (as Zn)	mg/l	5	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01
29	Hexavalent Chromium (as Cr+6)	mg/l	0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
30	Total Suspended Solid (as TSS)	mg/l	-	15	21	20	14	38	53	26
31	Temperature	Deg C	-	26	26	26	26	26	26	26
32	Conductivity	us/cm	-	105	149	203	187	316	159	110
33	Biochemical Oxygen Demand (BOD)	mg/l	-	8	6.2	5.4	2.2	3.8	<2	5.6
34	Chemical Oxygen Demand (COD)	mg/l	-	53	39	35	14	28	<4	46
35	Oil and Grease	mg/l	-	<1.4	<1.4	<1.4	<1.4	<1.4	<1.4	<1.4
36	Silica (as SiO ₂)	mg/l	-	6.2	9.9	16.2	9.3	50	36	6.6
37	Salinity*	mg/l	-	0.06	0.09	0.12	0.10	0.18	0.09	0.07
38	Phosphate (as PO ₄)	mg/l	-	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
39	Phosphorus	mg/l	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
40	DO	mg/l	-	5.6	5.8	5.6	5.8	6.0	6.4	6.0
41	Total Nitrogen	mg/l	-	4.3	2.8	3.4	0.7	7.3	1.4	1.9
42	Petroleum Hydrocarbon	mg/l	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
(II)	Microbiological Parameters									
1	Fecal coliform	/100 ml	zero	Detected	Detected	Detected	Not Detected	Detected	Detected	Detected
2	Total coliform	MPN/100m	zero	110	280	170	17	220	110	140
3	Zooplankton	/1lit	-	Absent	Absent	Absent	Absent	Absent	Absent	Absent
4	Phytoplankton	/1lit	-	Absent	Absent	Absent	Absent	Absent	Absent	Absent

*In respect to KCl equivalent salinity 35

** as per EPA standards, 2018

90. **Observations:** The result of water quality monitoring shows that most of the parameters are within the limit as prescribed by IS: 10500. At few locations, iron and manganese was found to be in excess. Fecal coliform were also observed in the water which indicated the contamination due to sewage. The iron and manganese in water is due to the geological reasons.

6. Ground Water

91. **Ground water Quality:** 8 ground water sources within 10-km radial distance were examined for physico-chemical, heavy metals and bacteriological parameters to assess the effect of industrial and other activities on surface and ground water. The samples were analyzed as per the procedures specified in 'Standard Methods for the Examination of Water and Wastewater' published by American Public Health Association (APHA). These samples were taken as grab samples and were analyzed for various parameters to compare with the standards for drinking water as per IS: 10500. The water sampling locations are listed below in Table 15 and the results of the analysis are given in Table 16.

Table 15: Ground Water Monitoring Locations

Sr. No.	Monitoring Location	Date of Sampling	Location Code
1	Near Bir Bikram University	27 th December 2018	GW1
2	Near Dhalwal Water Supply road		GW2
3	Dhaleshwar		GW3
4	Near Krishnanagar, Thakurpally road		GW4
5	Near Kanjuben Colony		GW5
6	Near Bankumare		GW6
7	Near Barodwali		GW7
8	Near Usha Bazaar		GW8

Table 16: Ground Water Monitoring Analysis

[illegible]

Sr. No.	Parameters	Unit	Standard	GW-1	GW-2	GW-3	GW-4	GW-5	GW-6	GW-7	GW-8
	Dates of Sampling			27-12-2018							
18	Polychlorinated biphenyls (as PCB)	mg/l	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
19	Arsenic (as As)	mg/l	0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
20	Total Chromium (as Cr)	mg/l	0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
21	Sodium (as Na)**	mg/l	60	10	16	20	46	56	18	10	9.1
22	Potassium (as K)	mg/l	-	2.8	2.9	2	3.1	3.9	4.3	2.9	2.4
23	Zinc (as Zn)	mg/l	5	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
24	Hexavalent Chromium (as Cr+6)	mg/l		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
25	Total Petroleum Hydrocarbon (as TPH)	mg/l		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
26	Total Suspended Solid (as TSS)	mg/l		<2.5	22	3.9	33	<2.5	<2.5	<2.5	8.2
27	Temperature	Deg C	-	26	26	26	26	26	26	26	26
28	Conductivity	us/cm	-	103	140	162	439	346	135	123	137
29	Dissolved Oxygen	mg/l	-	4.8	3.4	3.6	3.6	4.2	4.0	3.8	4.2
30	Biochemical Oxygen Demand (as BOD)	mg/l	-	<2	2.1	<2	<2	<2	6.2	<2.0	<2.0
31	Chemical Oxygen Demand (COD)	mg/l	-	<4	11	<4	<4	<4	39	8	<4.0
32	Oil and Grease	mg/l	-	<1.4	<1.4	<1.4	<1.4	<1.4	<1.4	<1.4	<1.4
33	Silica (as SiO ₂)	mg/l	-	20	23	24	22	16	12	16	13
34	Salinity*	mg/l	-	0.06	0.08	0.09	0.25	0.20	0.08	0.07	0.08
35	Total Alkalinity (as CaCO ₃)	mg/l	200	54	60	76	130	103	22	27	32
36	Phosphate	mg/l	-	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
37	Total Nitrogen	mg/l	-	<0.3	<0.3	0.4	0.7	3.4	3.6	2.3	2.0
38	Total Phosphorous	mg/l	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
(III)	Microbiological Parameters										
1	Faecal coliform	/100ml	Zero	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Det	Not Det	Not Detected

Sr. No.	Parameters	Unit	Standard	GW-1	GW-2	GW-3	GW-4	GW-5	GW-6	GW-7	GW-8
	Dates of Sampling			27-12-2018							
									ected	ected	
2	Total coliform	MPN/100ml	zero	2	<2	4	7	4	4	4	2

*In respect to KCl equivalent salinity 35

** as per EPA standards, 2018

92. **Observations:** The result of water quality monitoring shows that most of the parameters are within the limit as prescribed by IS: 10500. At few locations, iron and manganese was found to be in excess.

7. Air Quality

93. The baseline ambient air quality was monitored near all the proposed roads to assess the existing air quality of the area, the air quality monitoring was taken place at 25 locations around the Agartala city during December 2018 to February 2019 representing winter season. The details of monitoring locations are given in Table 17. The ambient air quality was monitored during the winter season at all AAQMS.

Table 17: Details of AAQMS

Sr. No.	Monitoring Location	Location Code	Date of Sampling	Latitude	Longitude
1	Rabindra Bhavan	AQ1	24 and 27 Dec 2018	23.834°N	91.2808°E
2	Math Chowmuhani	AQ2	20 and 26 Dec 2018	23.9312°N	91.291°E
3	Purbasa	AQ3	21 and 26 Dec 2018	23.8354°N	91.2916°E
4	RMS Chowmuhani	AQ4	24 and 27 Dec 2018	23.8319°N	91.2788°E
5	Surya Chowmuhani	AQ5	24 and 27 Dec 2018	23.8299°N	91.2808°E
6	IGM Chowmuhani	AQ6	25 and 28 Dec 2018	23.8326°N	91.2756°E
7	Battala	AQ7	25 and 28 Dec 2018	23.8292°N	91.2704°E
8	Kaman Chowmuhani	AQ8	20 and 26 Dec 2018	23.8303°N	91.2825°E
9	Circuit House	AQ9	25 and 28 Dec 2018	23.851°N	91.2834°E
10	Jackson Gate	AQ10	21 and 27 Dec 2018	23.832°N	91.2824°E
11	Bidurkata	AQ11	24 and 27 Dec 2018	23.834°N	91.2801°E
12	Kargil Chowmuhani	AQ12	25 and 28 Dec 2018	23.835°N	91.2706°E
13	Ashram Chowmuhani	AQ13	30 Dec 2018 and 01 Jan 2019	23.835°N	91.3016°E
14	North Gate Tri-Junction	AQ14	30 Dec 2018 and 03 Jan 2019	23.8399°N	91.2831°E
15	Post Office Chowmuhani	AQ15	30 Dec 2018 and 03 Jan 2019	23.8293°N	91.2787°E
16	Barjala Tri-Junction	AQ16	30 Dec 2018 and 03 Jan 2019	23.8738°N	91.2709°E

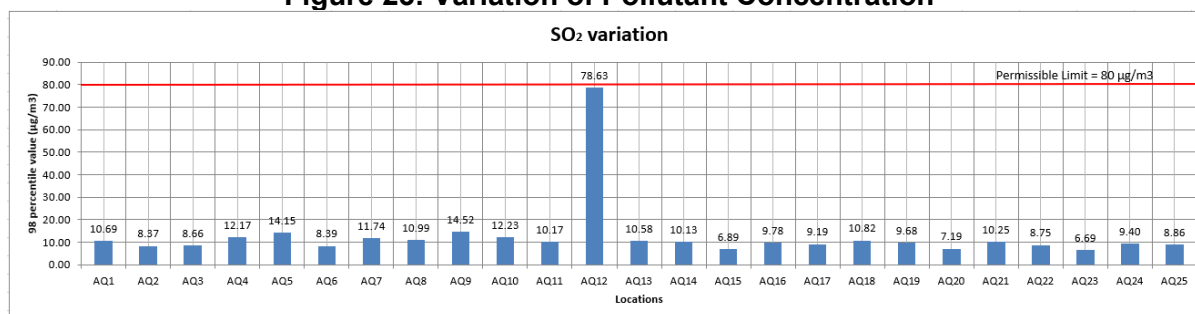
Sr. No.	Monitoring Location	Location Code	Date of Sampling	Latitude	Longitude
17	Lichubagan Tri-Junction	AQ17	31 Dec 2018 and 04 Jan 2019	23.8711°N	91.2852°E
18	Airport Entrance	AQ18	31 Dec 2018 and 04 Jan 2019	23.8906°N	91.2446°E
19	Ujjayanta Palace	AQ19	31 Dec 2018 and 04 Jan 2019	23.837°N	91.2828°E
20	Thakurpalli Road	AQ20	31 Dec 2018 and 05 Jan 2019	23.834°N	91.2827°E
21	Mantribai Road	AQ21	01 and 05 Jan 2019	23.8318°N	91.2801°E
22	Akhaura Road	AQ22	01 and 05 Jan 2019	23.8347°N	91.2591°E
23	Sakuntala Road	AQ23	01 and 06 Jan 2019	23.8671°N	91.2689°E
24	Banamalipur	AQ24	02 and 06 Jan 2019	23.8398°N	91.2915°E
25	Pratapgarh	AQ25	02 and 06 Jan 2019	23.811°N	91.2888°E

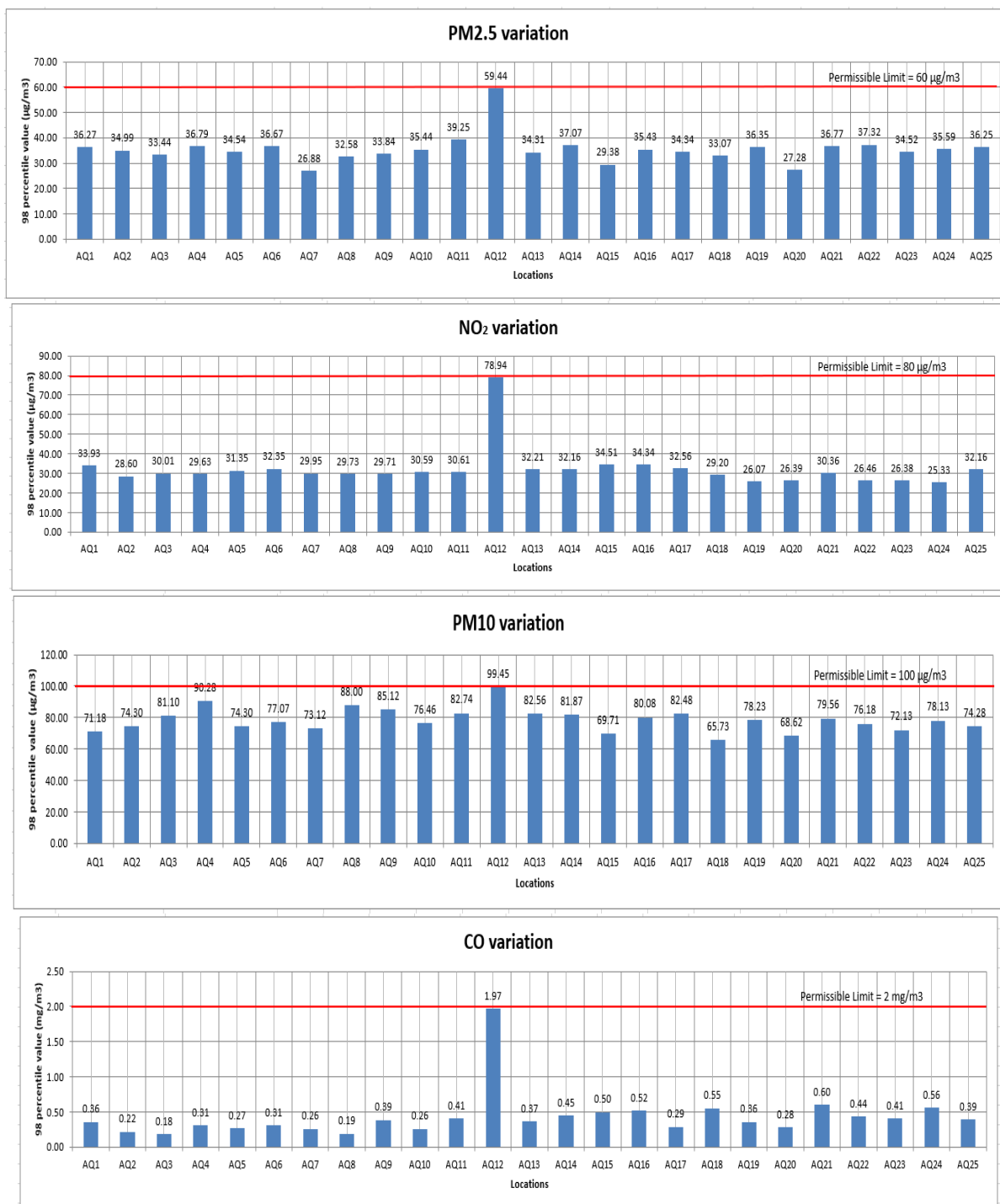
94. **Parameters of Sampling:** - As per Central Pollution Control Board (CPCB) monitoring guidelines Monitoring of Particulate Matter size less than 10 microns (PM₁₀) and Particulate Matter size less than 2.5 microns (PM_{2.5}), Sulphur Dioxide (SO₂), Nitrogen Dioxide (NO₂) were monitored on 24 hourly basis and for CO were monitored on eight hourly basis.

95. **Presentation of Primary Data:** - The graphs in Figure 23 give the variation of various parameters across all the 25 locations. The 98 percentile values are denoted in the graphs. Appendix 3 compares the WHO guidelines and GOI standards, in most of the parameters, Government of India's Standards are more stringent than WHO AAQS (except PM₁₀ and PM_{2.5}). For SO₂, the results are within WHO standards, For NO₂, the results are within NAAQS (absence of WHO standards for 24 hrs.), For PM_{2.5}, the results are more than WHO standards, For PM₁₀, the results are more than WHO standards, For CO, the results are within NAAQS (absence of WHO standards).

96. **Observation:** All the parameters at all the locations are within the permissible limit (SO₂- 80 µg/m³, NO₂-80 µg/m³ PM₁₀- 100 µg/m³, PM_{2.5}- 60 µg/m³ and CO-2000 mg/m³) of the National Ambient Air Quality Standards (NAAQS). The highest concentration was found at station 12 near Kargil Chowmuhani, which is also in permissible limits. Kargil Chowmuhani is very congested place and received loads of pollutants from slow moving traffic, this situation will be improved after execution of project.

Figure 23: Variation of Pollutant Concentration





8. Noise Quality

97. To understand the noise levels in vicinity of proposed subproject roads, 24 hrs continuous noise monitoring was done at 15 locations in the city. The sites are selected considering proximity

to sensitive receptor and traffic congestion areas¹⁴. Data was recorded using a Lutron sound level meter. The sound level meter was used to record the SPL reading placed in flat terrain at 1.2 to 1.5m above ground level in an open area with minimum obstruction, at least 3m away from sound reflecting sources like walls, matted or tall grasses, shrubs, or wooded areas. The details of the locations are given in Table 18.

Table 18: Noise Quality Monitoring Locations

Sr. No.	Monitoring Location	Date of Monitoring	Location Code
1	NQ1 (NEAR JAMPUJILA-2)	20-12-18	NQ1
2	NQ2 (NEAR DHALESWAR-2)	20-12-18	NQ2
3	NQ3 (NEAR DHALESWAR GAON)	21-12-18	NQ3
4	NQ4 (NEAR COLLEGE AREA-2)	21-12-18	NQ4
5	NQ5 (NEAR JAMPUJILA)	23-12-18	NQ5
6	NQ6 (NEAR COLLEGE AREA-1)	23-12-18	NQ6
7	NQ7 (NEAR DURGABARI)	25-12-18	NQ7
8	NQ8 (NEAR MUSEUM AREA)	25-12-18	NQ8
9	NQ9 (NEAR USHA BAZAR)	27-12-18	NQ9
10	NQ10 (NEAR NUTAN NAGAR)	27-12-18	NQ10
11	NQ11 (RADHA NAGAR NEAR AKHAURA ROAD)	26-12-18	NQ11
12	NQ12 (NEAR RADHA NAGAR)	26-12-18	NQ12
13	NQ13 (NEAR KRISHNA NAGAR)	28-12-18	NQ13
14	NQ14 (NEAR INDRANAGAR)	28-12-18	NQ14
15	NQ15 (NEAR HARI GANGA BASAK ROAD)	28-12-18	NQ15

¹⁴ N15 AMC office – 5m; N11 Akhaura Road IGM hospital – 2m; N14 Khsudiram Basu English medium school – 2m; N7 Thakurpally road – 5m; N12 motor stand – 6m; N13 near Nehru park – 5m; N 10 Nutan Nagar School – 5m; N9 Usha Bazar – 5m.

98. **Observations:** 24-hour monitoring was done at each station. Data was recorded using a Lutron sound level meter. The sound level meter was used to record the SPL reading placed in flat terrain at 1.2 to 1.5m above ground level in an open area with minimum obstruction, at least 3m away from sound reflecting sources like walls, matted or tall grasses, shrubs, or wooded areas. The statistical analysis is done for measured noise levels at fifteen (15) locations during summer season. The results show that the noise levels are high during both day and night time for the Commercial, Residential areas. The parameters are analyzed for Lday and Lnight. These results are shown in Figures 24 and 25.

Figure 24: Noise Variation (day)

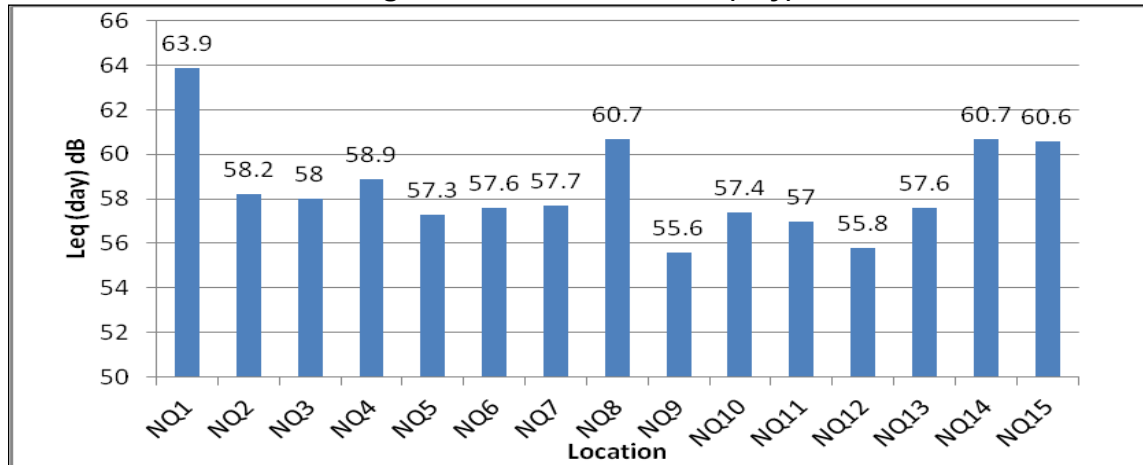
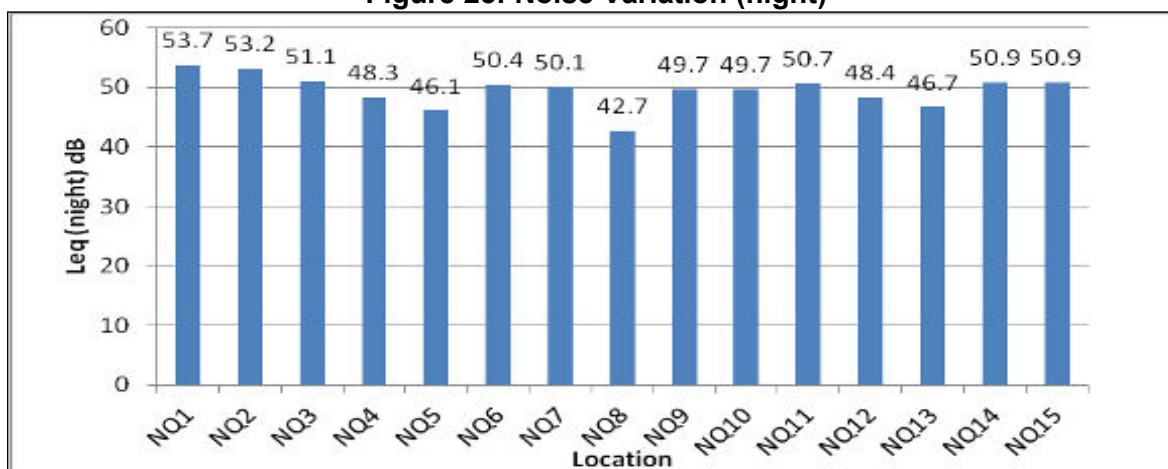


Figure 25: Noise Variation (night)

99. **Results:** The results show that the noise levels are higher than the standard limits during both day and night time for the Commercial, Residential and Silent Zone Areas, this could be attributed to the high traffic density and mixed type of land use across the city at most of the locations within the Agartala City.

100. Following requirements of ADB SPS, 2009, PMU and PIUs shall apply pollution prevention and control technologies for all the applicable environmental parameters and practices consistent with international good practice. When the Government of India regulations differ from these levels and measures, PMU shall achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific subproject circumstances, PMU will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS, 2009.

B. Ecological Resources

101. **Biodiversity Assessment:** A rapid biodiversity assessment of the proposed Upgradation of major roads was done in December 2018 to understand the various facets of biodiversity of the roads and the adjoining area by field survey. Diversity indices provide important information about rarity and commonness of species in a community. It is important to ascertain these indices as they give a quantitative estimate of how good or bad the baseline biodiversity is. For this subproject a 500m buffer area on either side of each road was demarcated. 7 quadrats were laid in various areas according to various type of ecosystem. The floral species were recorded on basis of visual observation. In the study area quadrats of size 10 x 10 m for trees and 5 x 5 m for shrubs/ herbs were laid and the floral species within the quadrat were noted. Data on number of individuals per species was noted. The faunal survey was done based on direct observation/ visual encounter and searching of signs. The study shows that there were 11 species of trees, 29 herbs, 8 shrubs, 4 climbers, 29 Avifauna, 1 reptile and 17 insects were found during the study period. The details of the species are given in Table 19 and 20.

Table 19: List of Flora observed along the project roads

Sr no.	Name	Family / IUCN Status
Trees		
1	<i>Artocarpus heterophyllus</i>	Moraceae / NA

Sr no.	Name	Family / IUCN Status
2	<i>Carica papaya</i>	Caricaceae / DD
3	<i>Trema orientalis</i>	Cannabaceae / LC
4	<i>Bambusa sp</i>	Poaceae -
5	<i>Terminalia arjuna</i>	Combretaceae / NA
6	<i>Ficus religiosa</i>	Moraceae / NA
7	<i>Washingtonia sp</i>	Arecaceae -
8	<i>Dillenia indica</i>	Dilleniaceae / LC
9	<i>Delonix regia</i>	Caesalpinaceae / LC
10	<i>Albizia saman</i>	Mimosaceae / NA
11	<i>Tectona grandis</i>	Lamiaceae / NA
Herbs		
1	<i>Chromolaena odorata</i>	Asteraceae / NA
2	<i>Acmella radicans</i>	Asteraceae / NA
3	<i>Mimosa pudica</i>	Mimosaceae / LC
4	<i>Alternanthera ficoidea</i>	Amaranthaceae / NA
5	<i>Cassia tora</i>	Caesalpinaceae / NA
6	<i>Synedrella nodiflora</i>	Asteraceae / NA
7	<i>Amaranthus spinosus</i>	Amaranthaceae / NA
8	<i>Rungia pectinata</i>	Acanthaceae / NA
9	<i>Leucas stelligera</i>	Lamiaceae / NA
10	<i>Cassia tora</i>	Caesalpinaceae / NA
11	<i>Solanum virginianum</i>	Solanaceae / NA
12	<i>Curcuma Sp</i>	Zingiberaceae / NA
13	<i>Cyathula prostrata</i>	Amaranthaceae / NA
14	<i>Chromolaena odorata</i>	Asteraceae / NA
15	<i>Sida acuta</i>	Malvaceae / NA
16	<i>Cassia occidentalis</i>	Caesalpinaceae / NA
17	<i>Ageratum conyzoides</i>	Asteraceae / NA
18	<i>Ammania baccifera</i>	Lythraceae / NA
19	<i>Hydrolea zeylanica</i>	Hydroleaceae / LC
20	<i>Physalis minima</i>	Solanaceae / NA
21	<i>Ludwigia perennis</i>	Onagraceae / LC
22	<i>Eclipta alba</i>	Asteraceae / LC
23	<i>Acmella paniculata</i>	Asteraceae / LC
24	<i>Alternanthera sessilis</i>	Amaranthaceae / LC
25	<i>Calocasia esculenta</i>	Araceae / NA
26	<i>Triumfetta rhomboidea</i>	Tiliaceae / NA
27	<i>Spermacoce hispida</i>	Rubiaceae / NA
28	<i>Mimosa pudica</i>	Mimosaceae / NA
29	<i>Chromolaena odorata</i>	Asteraceae / NA

Sr no.	Name	Family / IUCN Status
Shrubs		
1	<i>Lantana camara</i>	Verbenaceae / NA
2	<i>Ludwogia sp</i>	Onagraceae / NA
3	<i>Microcos paniculata</i>	Tiliaceae / LC
4	<i>Macaranga peltata</i>	Euphorbiaceae / NA
5	<i>Ipomoea carnea</i>	Convolvulaceae / NA
6	<i>Ficus hispida</i>	Moraceae / LC
7	<i>Melastoma malabathricum</i>	Melastomataceae NA
8	<i>Clerodendrum infortunatum</i>	Verbenaceae / NA
Climbers		
1	<i>Mikania micrantha</i>	Asteraceae / NA
2	<i>Cissampelos pareira</i>	Menispermaceae / NA
3	<i>Ipomoea sp</i>	Convolvulaceae -
4	<i>Ipomoea aquatica</i>	Convolvceae / NA

DD - Data deficient; NA – Not Assessed; LC – Least Concerned

Source : <https://www.iucnredlist.org>

Table 20: List of Faunal Species observed along the project roads

Sr. No.	Common Name	Scientific Name	Family	Status(IUCN)	WPA,1972 (Schedule)
1	Rose Ringed parakeet	<i>Pittacula krameri</i>	Psittacidae	LC	Schedule IV
2	Red wattled lapwing	<i>Vanellus indicus</i>	Charadriidae	LC	Schedule IV
3	Oriental honey Buzzard	<i>Pernis ptilorhynchus</i>	Accipitridae	LC	-
4	Rufous Treepie	<i>Dendrocitta vagabunda</i>	Corvidae	LC	Schedule IV
5	Red-breasted parakeet	<i>Psittacula alexandri</i>	Psittaculidae	NT	Schedule IV
6	Spangled Drongo	<i>Dicrurus bracteatus</i>	Dicruridae	LC	Schedule IV
7	Yellow-footed green pigeon	<i>Treron phoenicoptera</i>	Columbidae	LC	Schedule IV
8	Asian openbilled Stork	<i>Psittacula alexandri</i>	Psittaculidae	NT	Schedule IV
9	lineated Barbet	<i>Psilopogon lineatus</i>	Megalaimidae	LC	Schedule IV
10	Black Drongo	<i>Dicrurus macrocercus</i>	Dicruridae	LC	Schedule V
11	Shikra	<i>Accipiter badius</i>	Accipitridae	LC	-
12	Oriental Magpie- Robin	<i>Copsychus saularis</i>	Muscicapidae	LC	Schedule IV
13	Black-rumped flameback	<i>Dinopium benghalense</i>	Picidae	LC	Schedule IV

Sr. No.	Common Name	Scientific Name	Family	Status(IUCN)	WPA,1972 (Schedule)
14	Common Myna	<i>Acridotheres tristis</i>	Sturnidae	LC	-
15	Asian Koel	<i>Eudynamys scolopaceus</i>	Cuculidae	LC	-
16	Greater Coucal	<i>Centropus sinensis</i>	Cuculidae	LC	Schedule IV
17	Black hooded oriole	<i>Oriolus xanthornus</i>	Oriolidae	LC	Schedule IV
18	Chestnut-tailed Starling	<i>Sturnia malabarica</i>	Sturnidae	LC	Schedule IV
19	Pond Heron	<i>Ardeola grayii</i>	Ardeidae	LC	-
20	Cattle Egret	<i>Bubulcus ibis</i>	Ardeidae	LC	Schedule IV
21	Laughing Dove				
22	Jungle Myna	<i>Acridotheres fuscus</i>	Sturnidae	LC	-
23	Red Vented Bulbul	<i>Pycnonotus cafer</i>	Pycnonotidae	LC	Schedule IV
24	large billed Crow	<i>Corvus macrorhyncho</i>	Corvidae	LC	Schedule V
25	Spotted Dove	<i>Spilopelia chinensis</i>	Columbidae	LC	Schedule V
26	House Sparrow	<i>Passer domesticus</i>	Passeridae	LC	-
27	Black Kite	<i>Milvus migrans</i>	Accipitridae	LC	-
28	Pied Starling	<i>Gracupica contra</i>	Sturnidae	LC	Schedule IV
29	Blue Rock pigeon	<i>Columba livia</i>	Columbidae	LC	
Insects					
1	Common emigrant	<i>Catopsilia pomona</i>	Pieridae	-	
2	Common sailor	<i>Neptis hylas</i>	Nymphalidae		
3	Grey pansy	<i>Junonia atlites</i>	Nymphalidae		
4	lemon pansy	<i>Junonia lemonias</i>	Nymphalidae		
5	Thai knight	<i>Lebadea martha martha</i>	Nymphalidae		
6	striped tiger	<i>Danaus genutia</i>	Nymphalidae		
7	Funnel Lizard				
Reptile					
1	Oriental Garden Lizard	<i>Calotes versicolor</i>	Agamidae		

DD - Data deficient; NA – Not Assessed; LC – Least Concerned

Source : <https://www.iucnredlist.org>

102. **Critically Endangered/ Endangered Species:** The species designated by the IUCN as Critically Endangered or endangered are potentially found within 50km of the subproject area. The subproject area is an urban area with complete modified habitats with no pristine natural habitat or flora and fauna, but the 50 km surrounding area of the subproject includes many pockets of pristine natural habitats and have ranges of many IUCN designated fauna and flora. The 50 km area includes Natural Habitat like moderate to dense forest, rivers with influence of tidal water

from Bay of Bengal. The IBAT results shows following IUCN designated species have their range in 50 km surroundings of project area.

103. **Critical Habitats:** As per Proximity report generated by the Integrated Biodiversity Assessment Tool (IBAT), there are no Protected Areas and Key Biodiversity Areas within 10 km of the subproject area. Ujjayanta Palace, which is the center of the proposed Upgradation of Major Roads project is taken as reference point for IBAT proximity analysis report generation. The list of protected area and key biodiversity areas as reported by IBAT proximity checklist are given below in Table 21 and 22. The summary of proximity report generated IBAT for 10 Km and 50 Km from the project area are given in Appendix 14. Some species of IUCN Category falling under critical, endangered and vulnerable are observed in the list, within 50 km from the Ujjayanta Palace. The list of species includes species which are in the hilly regions of Baramura hills (25-30km from project site) in the eastern side and the aquatic species of river basins Meghna and Titais (> 10 kms from project site) flowing in the western side. Since the project area is spread only in the exiting urban areas of Agartala city and the activities are limited to only the construction site and allied activities (Batching plant, labour camp etc.) the impact of the project on ecological components will be local in nature and will be limited.

Table 21: Protected Areas

Sr. No	Area name	Distance
1	Gumti	50 km
2	Rema Kalenga	50 km
3	Rudrasagar Lake	50 km
4	Satchari	50 km
5	Sepahijala	50 km
6	Trishna	50 km

Table 22: Key Biodiversity Areas

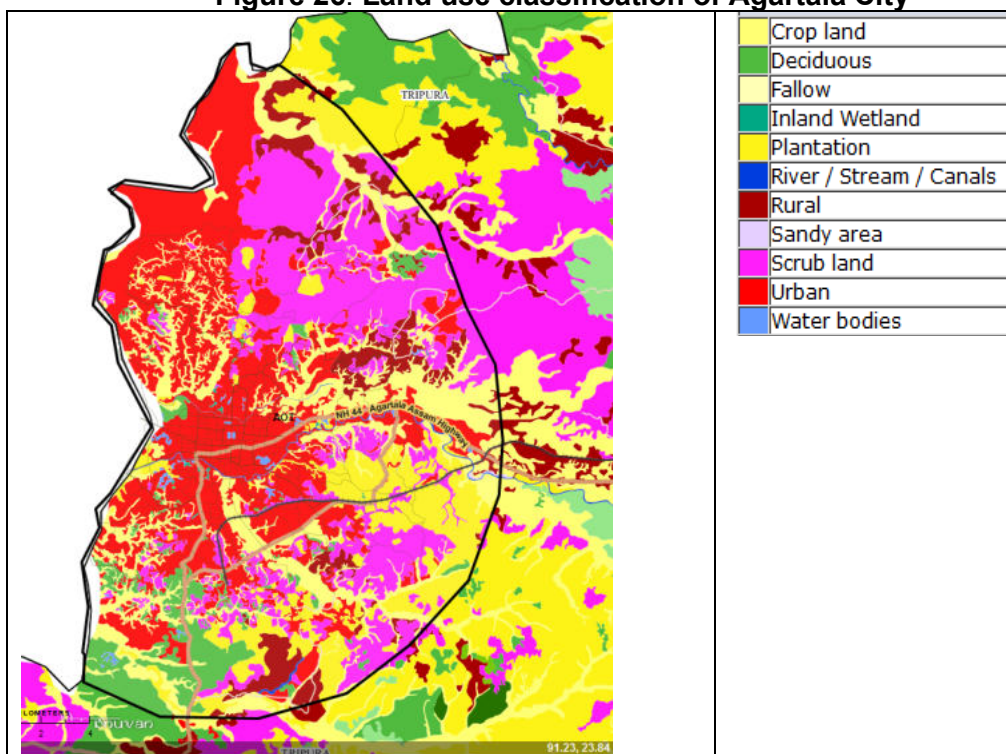
Sr. No	Area name	Distance
1	Gumti Wildlife Sanctuary	50 km
2	Rema-Kalenga Wildlife Sanctuary	50 km
3	Rudrasagar Lake	50 km
4	Sepahijala	50 km
5	Trishna Wildlife Sanctuary	50 km

104. Total number of trees to be cut, which are in RoW of the proposed project is 520. Total numbers of species of trees found in the RoW is 38 (list given in Table 27) with maximum trees of the category of avenue plantation. About 50% of the trees are either raintree or Radha-chura species of trees which are common avenue plantation species. No rare or endangered species of plants are found in the list of trees falling within the ROW.

C. Economic Development

105. **Land Use:** - The Landuse and land classification of Agartala City as performed using Bhuvan-India Geo-platform of ISRO shows that the entire Agartala City Falls under the urban land use with some water bodies spread across the city. Figure 26 shows the land use classification of Agartala City.

Figure 26: Land use classification of Agartala City



1. Commerce, Industry and Agriculture

106. Tripura's gross state domestic product for 2004 is estimated at \$2.1 billion in current prices. The economy of Tripura is agrarian. More than 50 per cent of its population depends on agriculture for livelihood and contribution of agriculture and allied activities. Tripura is characterized by low income, overwhelming percentage of population below the poverty line, income leakage, and unemployment. The state is predominantly rural in character (85.29%). Average land holding size is 0.97 hectare. 90% of the cultivators are either small or marginal.

107. **Trade and Commerce.** There are two small industrial estates, with a total number of 36 industrial units and with a total capital investment of INR 56.575 million. Other than the 2 industrial estates, there are 17 other significant industries in Agartala. These industries, as per records, are not in the category of large and medium industries. Wholesale trade in the city is functioning mostly in the Gole Market area and spreads haphazardly mixing with the retail trade. There are 9 markets maintained by AMC within Municipal limits, of which, Battala and Maharaj Ganja Bazaar are the main service and distribution centres of Greater Agartala.

108. **Agriculture.** Agriculture and allied activities is the mainstay of the people of Tripura and provides employment to about 64% of the population. There is a preponderance of food crop cultivation over cash crop cultivation in Tripura. At present about 62% of the net sown area is under food crop cultivation. Paddy is the principal crop, followed by oilseed, pulses, potato and sugarcane. Tea and rubber are the important cash crops of the State. Handicraft, particularly hand-woven cotton fabric, wood carvings and bamboo products, are also important. The subproject areas are not located in agricultural lands.

109. **Housing and Amenities:** 98% used houses primarily as residences while less than 2% had residence cum other use. 65.5% of the households lived in good condition houses, 29.4% in livable houses and about 3% in dilapidated houses. 1.9% used residence cum other use. Census households by type of structure for 56.3% of households were permanent and for 42.3% were semi-permanent and temporary were less than 1%. In terms of availability of Latrines, 98% of the households reported having latrines within the premises. 47.7T households Flush/pour flush latrine connected to septic tank. Only 9.4% of the households had piped sewer system. 28.2% had pit latrine with slab ventilated improved pit and 7 % had pit latrine without slab in open pit. For assets available at household level, 82.9 % had televisions and 67.9% had mobile phones, 42.6% owned bicycles, 23.6% reported owning motorcycles and 5.9% had car/jeep or van. 7.5% households owned TV, Computer/ Laptop, Telephone/mobile phone and Scooter/ Car.

110. **Health and Educational Facilities** There are good educational facilities in Tripura state, which serve both Agartala urban people and inhabitants of surrounding villages and towns in the hinterland. There are about 21 colleges in Agartala comprising Medical college, Degree college, Nursing college, Polytechnic college and Open university. Percentage of literacy according to 2011 census is 93.88, higher than the national literacy rate. There are also 9 nos. nursing home and hospital at Agartala. One Government Medical College is also located at Agartala

111. **Educational Institutions:** Agartala being a well-developed city and capital of the state, it is home to several educational institutions and this can be easily seen in the map given here. Some of the educational institutions in the city include B.Ed. College, Hindi H.Sec School, Ram Nagar School, Bijoy Kumar School, MTB Girls School, Vani Vidyapeeth, Government Women's College, Govt. Law College among others.

D. Social and Cultural Resources

112. **Demography:** - The total estimated population of AMC limits as per 2011 census is 3,99,668. Population density of GAPA increased to 41% person per hectare in the year 2001 in compared to 38% in 1991. There are two major racial groups, namely the Indo-Aryans represented by the Bengalis and the Indo-mongoloid represented by communities like the Tripuris, the Reangs, the Noatis, the Kukis, the Halams, the Chakma, the Mogh and the Lushai. The percentage of Scheduled Tribe population to the total city population is estimated to be around 4%. The scheduled tribe populations living in the city is well integrated with the mainstream and is gainfully employed. The literacy rate in Agartala is the highest among the localities of Tripura.

113. **History, Culture and Tourism:** One of the earliest kings of Tripura was Patardan B.C. 1900, long before the Manikya Dynasty. According to folklore, Chitrarath, Drikpati, Dharmapha, Loknath Jivandharan were important kings during the time of B.C. in Agartala.

114. In the past, Tripura served as the capital to several Hindu kingdoms. Although a timeline of the rulers has not been found, records reveal that the area has been ruled by as many as 179 Hindu rulers, starting from the mythological King Druhya to the last King of Tripura, Kirit Bikram Kishore Manikya. Tripura also came under Mughal rule. The state came under the governance of the British in 1808. Much later the ancient capital of the then Princely State 'Swadhin Tripura' was at Rangamati (Udaipur, South Tripura) by the bank of the river Gomati. In 1760 it was shifted by the Maharaja Krishna Chandra Manikya Bahadur (r.1829–1849) of Manikya Dynasty to present old Agartala by the bank of the river Haora/Saidra and was named 'Haveli'. Due to frequent invasion of the Kukis and also to keep easy communication with the British Bengali, the Maharaja Krishna Chandra Manikya started the process of shifting the capital from Old Haveli to New Haveli (present Agartala) in 1849.

115. During the British Raj, Agartala was the capital of the 'Hill Tippera' state, it became a municipality in 1874–75, and in 1901 had a population of 9,513. The princely state always remained as cake piece to the British and many other invaders. For example, when Arakhan soldiers attacked the old capital of the state the king of Tripura responded by defeating the entire troop. The Agartala Municipality was established during the reign of Maharaja Bir Chandra Manikya (1862–1896) within an area of 3 square miles (8 km²) having a population of only 875 by a royal proclamation in the last part of 1871. A.W.S. Power, the first British political agent for Tipperah was also appointed as the Chairman of the Agartala Municipality in 1872 who held office from 1872–73. The municipality located at the crossing of latitude N 23° 50' and longitude E 91° 17' covering 3 km². Area during that period.

E. Physical Cultural Resources

116. **Ujjayanta Palace** is a representative example of neoclassical style of early 20th century designed by Sir Alexander Martin for Maharaja Radha Kishore Manikya. The complex of site area 800 acres comprises of the two storied Palace building with central dome, symmetrically landscaped grand entrance promenade in between two ponds, Chhatris, Rear garden, North gate and Astabal.

117. The palace has historical association to the Manikya dynasty, the rulers of Tripura before merger into India. Ujjayanta palace presently accommodates the State Museum of Tripura from 2011, formerly being used as State Legislative Assembly. The site has provided opportunities for tourist attraction, knowledge source and social cohesion, as it also accommodates the Tourism Department office and a restaurant.

118. It is a Landmark structure in the city of Agartala with significant architectural, aesthetic, cultural value and huge associational value with the inhabitants of the state. It provides contextual value as it is historically and visually linked to its surroundings.




PCRs along the project roads




119. Agartala has plenty of religious and cultural places. Though Hinduism is the main religion of the place, other religions like Islam, Buddhism and Christianity are also having their place. The city has a lot of temples, churches, mosques and monastery, some of which are over 150 to 200 years old. Some of the famous religious institutions include Buddha Mandir, Mother Theresa Ashram and Ramakrishna Ashram Vidyamandir among many others. The city has a Universal Prayer Hall, where people can come and pray.




120. The significant PCR's identified along the proposed roads for up-gradation with distance from the ROW is given in Table 23. The impact of the project and the necessary mitigation measures are provided in the EMP Section.




Table 23: PCRs along the proposed subproject roads




Sr. No.	Road Name	Sensitive Receptor	Approx. Distance from Centerline of Road (m)
1.	Hari Ganga Basak Road	Kali Mandir- Hindu Temple	12




Sr. No.	Road Name	Sensitive Receptor	Approx. Distance from Centerline of Road (m)
			
2.	Hari Ganga Basak Road	Iskon Temple- Hindu Temple 	15
3.	Hari Ganga Basak Road	Shanitala- Hindu Temple 	12
4.	VIP Road	Lake Choumunahi Kali Mandir- Hindu Temple	32




Sr. No.	Road Name	Sensitive Receptor	Approx. Distance from Centerline of Road (m)
			
5.	VIP Road	Venuwan Vihar- Buddhist Temple 	40
6.	VIP Road	Nirmala Shishu Bhawan- Missionaire of Charity 	38
7.	Thakurpalli Road	Ujjayanta Palace- Historic Site	54




Sr. No.	Road Name	Sensitive Receptor	Approx. Distance from Centerline of Road (m)
			
8.	Thakurpalli Road	Laxmi Narayan Temple- Hindu Temple 	30
9.	Thakurpalli Road	Durga Bari temple- Hindu Temple 	35
10.	Thakurpalli Road	Rabindra Bhavan	15

Sr. No.	Road Name	Sensitive Receptor	Approx. Distance from Centerline of Road (m)
			
11.	Thakurpalli Road	Loknath Ashram- Hindu religious place 	20
12.	Thakurpalli Road	Satsang Vihar- Hindu Temple and Ashram 	15
13.	Thakurpalli Road	Shiv Kali Temple- Hindu temple	12

Sr. No.	Road Name	Sensitive Receptor	Approx. Distance from Centerline of Road (m)
			
14.	Sakuntala Road	Rabindra Satbarshiki Bhavan 	12
15.	GB Road	Medicinal Plants Garden 	15
16.	GB Road	Adoption Center	12

Sr. No.	Road Name	Sensitive Receptor	Approx. Distance from Centerline of Road (m)
			
17.	GB Road	Temple 	15
18.	Mantribari Road	Temple 	15
19.	Barjala Road	Temple	10

Sr. No.	Road Name	Sensitive Receptor	Approx. Distance from Centerline of Road (m)
			
20.	Barjala Road	Shakti Temple 	20
21.	Barjala Road	Temple 	30
22.	Barjala Road	Temple	15

Sr. No.	Road Name	Sensitive Receptor	Approx. Distance from Centerline of Road (m)
			
23.	Barjala Road	Temple 	15
24.	Barjala Road	Ashram 	20
25.	Ronaldsay Road	Puran Shani Mandari	15