GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BANGLADESH

3/27/2018

Environmental Assessment Report

***Construction of Road, Drain and Street Light at Different Location of Narsingdi Pourashava*.**

BANGLADESH MUNICIPAL DEVELOPMENT FUND

(BMDF)

MUNICIPAL GOVERNANCE AND SERVICES PROJECT (MGSP)

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ABBREVIATIONS

AP (AP's)	Affected Person
BDT	Bangladeshi Taka
BOQ	Bill of Quantity
BMDF	Bangladesh Municipal Development Fund
CC	Cement Concrete
CIP	Capital Investment Plan
CP	Contingency Planning
EA	Environmental Assessment
ECR	Environmental Conservation Rules
EMP	Environmental Management Plan
EPP	Emergency Preparedness Planning
ES	Environmental Screening
EMF	Environmental Management Framework
FGD	Focal Group Discussion
GoB	Government of Bangladesh
GRC	Grievance Redress Committee
GRM	Grievance Redress Mechanism
GRP	Grievance Redress Procedure
MGSP	Municipal Governance and Services Project
MD	Managing Director
PPEs	Personal Protective Equipment's
PMU	Project Management Unit
RCC	Reinforcement Cement Concrete
RP	Relevant Reports
OHWT	Over Head Water Tank
ULB	Urban Local Body
WB	World Bank
XEN	Executive Engineer

EXECUTIVE SUMMARY

BACKGROUND

This Road and Drainage Subproject comprises 8 roads that will be reconstructed in their original right-of-ways and alignments with improved subgrade, sub base, base course, and surfacing. Most (3) will be constructed including drain and footpath within the available right-of-way widths. The remaining road will cover the drainage and road network. The existing right-of-way is mostly clear, and for which no acquisition for land is required. In some locations it may be difficult to obtain the full roadway design width, Pourashava will manage the problem locally with the landowner, or reduce the dimension of gutter or hard shoulder.

Typical construction related impacts are associated with this type of civil works. Impacts are of limited intensity and short duration, and can be mitigated by appropriate measures including enforced traffic management by the contractor and adoption of good construction practices related to protection of community health and safety. None of the subproject interventions are proposed within locations in or near sensitive ecosystems. The subproject has been categorized as 'Orange-B category as per ECR-97 and as well as accordance with WB Safeguard Policy and an EA is carried out that provides mitigation measures for impacts and a monitoring and reporting protocol.

SUMMARY OF SUBPROJECT-RELATED IMPACTS AND BENEFITS

The following presents a summary of the potential impacts to natural, social, economic, and cultural resources as a result of the proposed roadway improvement project.

Impact Category	Impact Assessment
Land Use	• Existing land use adjacent to the roadways will not change as a result of the subproject (but the land value will be increased). • The subproject will involve partial right-of-way acquisitions from residential, agricultural zone.
Site Clearing Work	• Road sides trees and natural grown vegetation to be cut down for the road widening.
Noise	• Moderate adverse impacts to adjacent residential and commercial properties, during construction works. • Change in noise levels will not exceed State regulatory thresholds at any location
Tribal People	• No minority, or tribal populations exist on site or within the immediate area and, therefore, no impacts will fall on such populations. The subproject will not adversely impact the character of the community surrounding the roadway.
Air Quality	• No measurable impacts are anticipated
Water Quality	• Though, the drains are designed only for the storm water; however, storm water may carry wash-out materials which may disturb the aquatic environment of the outfall. In addition, dumping of solid wastes, household wastewater into the drain and illegal toilet connections may create pollution in the aquatic environment.

Threatened and Endangered Species	• There is no threatened and endangered species in the subproject area. So, no impacts are anticipated to threatened or endangered species habitat.
Drainage Congestion	• Drainage congestion is minor. However, erratic rainfall may create drainage congestion for short term.
Pollution of Construction Debris	• Improper collection and disposal of the generated wastes materials may degrade the quality of the surrounding environment and degrade the aesthetic value.
Benefit Category	**Benefit Assessment**
Traffic Safety	• Substandard roadway elements will be eliminated, reducing potential crashes. Additional roadway features such as lighting, and pavement drainage will contribute to the improvements in motorized vehicles and pedestrian safety. • Separate walk way will reduce the probable accident by avoiding speedy vehicle path way.
Water logging	• RCC drain will improve drainage facilities and prevent the accumulation of the stagnant water on the road surface. • This will prevent formation of muddy and slippery surface on the road.

CONSULTATION, DISCLOSURE AND GRIEVANCE REDRESS

The stakeholders were involved in developing the EA through discussions on-site and public consultation, after which views expressed were incorporated into the EA and in the planning and development of the subproject. The EA will be made available at public locations in the Pourashava and will be disclosed to a wider audience via WB, BMDF and Pourashava websites. The consultation process will be continued and expanded during subproject implementation to ensure that stakeholders are fully engaged in the subproject and have the opportunity to participate in its development and implementation. A grievance redress mechanism is described within the EA to ensure any public grievances are addressed quickly.

MONITORING AND REPORTING

The PMU-BMDF, and PIU (Pourashava), will be responsible for safeguard monitoring. The PIU (Pourashava) will submit monthly monitoring reports to PMU-BMDF, and the PMU-BMDF will send quarterly monitoring reports to WB.

BASELINE ENVIRONMENT

Baseline environment is concerned with existing physical, chemical and biological conditions of the area where the plant is going to be set up. The surface water, and noise level have been analyzed to evaluate the primary baseline of the area. The data of air quality will be analyzed prior to the construction, to evaluate the baseline data. The main objective of examining the present environment is to provide an environmental baseline against which potential impacts from development and operational phases of the project can be compared. In physicochemical component, parameters are included as; land, water quality, soil quality, air quality, climate and noise. Biological environment covers general description on floral and faunal species in the study area. Socio-economic environment presents social structure, housing pattern, etc.

FORECAST AND EVALUATION OF IMPACTS

To maintain logical sequence of the EA process, the possible mitigation/enhancing measures for significant impacts are discussed in the chapter-6. Beneficial impacts and enhancement during development and operation phase have been identified and found that the subproject will ensure safe potable water to the dwellers of Pourashava.

ENVIRONMENTAL MANAGEMENT PLAN

Environmental management is concerned with the implementation of the measures necessary to minimize or offset adverse impacts and benefit enhancement measures identified. In order to be effective, environmental management must be fully integrated with the overall project management effort. A monitoring program needs to be put in place to assess any adverse impacts on the environment. Sections **7-1**and**7-2** set out the management measures to be taken with regard to controlling the potential impacts which could occur during the construction and operational phases of the subproject, and indicates responsibilities for the various actions concerned.

INSTITUTIONAL ARRANGEMENTS

BMDF is the Executing Agency (EA) responsible for management, coordination and execution of all activities funded under the loan. BMDF has established a Project Management Unit (PMU) to manage all aspects of loan project implementation, coordinate construction of subprojects across all towns, and ensure consistency of approach and performance. The Environmental and Social Safeguard Specialists have been appointed to coordinate social and environmental issues. Environmental review of subproject and monitoring implementation of mitigation measures are primary functions of the Environmental and Social Safeguarded Specialist within the PMU.

The EA has been prepared by the Environmental Consultant of ULB assisting the PMU-BMDF at the time of the detailed design. Costs for mitigation measures and monitoring are considered at the time of bid document preparation and in contract procurement. A Project Implementation Unit (PIU) will be established at the Narsingdi Pourashava, staffed by Narsingdi Pourashava and supported by PMU-BMDF staff. The PIU-engineers are trained in ensuring the environmental safeguard compliance issues during implementation (capacity building has already ensured by BMDF).

The PIU will hire Construction Contractors (CC) to build elements of the infrastructure. Environmental Specialists within the PMU will assist PIU to ensure that the construction packages comply with environmental safeguards and the Environmental Monitoring Plan contained in the EA. Inspection of progress in construction will be undertaken locally by the PIU, supported by the PMU-BMDF. During implementation, the contractor will submit monthly progress reports to the PIU, which includes a section on EMP implementation. The PIU will submit reports to the PMU for review. The PMU will review progress reports to ensure that all the mitigation measures are properly implemented. The PMU will consolidate monthly reports and submit quarterly reports to WB for review.

CONCLUSIONS AND RECOMMENDATIONS

The present EA report finds that though there are certain adverse environmental impacts associated with the construction activities under consideration, these are manageable.

The impact on the social environment is positive through creation of job and business opportunities for local residents from the subproject. The subproject will help in the accelerating socioeconomic growth,

and improving quality of road and drainage network. The subproject has been designed to comply with the country's environmental laws and regulations, and WB environmental safeguard policy especially on physicochemical, Ecological and socio-economic parameter. The subproject management will take steps to ensure that the interventions meets the World Bank's environmental standards. Given the management measures and monitoring commitments by the ULB for the subproject, environmental impact of the subproject will be manageable.

1 INTRODUCTION

1.1 Background of the Project

The Government of Bangladesh (GoB) intends to enhance the capacity of urban local bodies (ULBs) in development and management of urban infrastructure, and improve municipal governance and services through undertaking the Municipal Governance and Services Project (MGSP) in selected Pourashava and City Corporations. The Local Government Engineering Department (LGED) and the Bangladesh Municipal Development Fund (BMDF) will implement the project with participation of the selected ULBs. The project will be financed by IDA, with GoB contribution for land acquisition and management, and Municipalities equity for accessing BMDF competitive finance. Under the MGSP the LGED will implement about 20 types of subprojects in 26 ULBs, which include 22 Pourashava and 4 City Corporations; while the BMDF will implement about 13 types of sub-projects in 119 Pourashava.

Both the LGED and the BMDF intends to ensure that the proposed infrastructure takes into account the environmental concerns in accordance with the Environment Conservation Rules 1997, and the World Bank Safeguard Policies. In this regard under MGSP a framework approach has been adopted for EA; the EA has two major components: (a) Overall environmental assessment, and (b) Development of Environmental Management Framework (EMF). Hence, to meet the regulatory requirement EA is mandatory to implement any subproject under MGSP.

1.2 Subproject Background

Narsingdi Pourashava stands on the bank of the Branch of Meghna and located at adjacent to the Dhaka-Sylhet National Highway. Narsingdi Municipality was established in 1972.Geographically the Narsingdi district is located in the central area of Bangladesh. It is located 50 km north-east of Dhaka, the capital city of Bangladesh. It is a part of the Dhaka Division. The district is famous for its textile craft industry. Narsingdi is bordered by Kishoregonj in the north and north-east, Brahmanbaria in the east and south-east, Comilla in the south and south-east, Narayanganj in the south and south-west and Gazipur in the west. The Pourashava area is 10.32 sq.km with its 9 Wards. The present population is 164,115 (ref. Narsingdi Pourashava).

Urbanization is considered to be closely and positively associated process, with complex and mutually reinforcing links. In sustained economic growth, it is essential to develop urban areas. Urban centers are the places of agglomeration of economic activities, important hubs of production, processing, innovation and employment. In recent days, there has been a trend of growing importance of urban areas. This subproject emphasizes on the planning to address the problems and to guide future planning of Narsingdi Pourashava. The present urban planning exercises for Narsingdi Pourashava with the subproject introduced plans of different nature and styles. A well-integrated spatial and sectorial plan with sound financial and institutional policies facilitates refurbish urban environment not only healthy and better but also efficient and safer. Without adequate infrastructure and services provision, it would be difficult to turn urban centers as environmentally friendly livable places.

Moreover, in the Narsingdi Pourashava, traffic volume is increasing day by day with the increase in population and vehicles. The substandard infrastructures cannot cope with the growing demand. Hence, planned development of road network, drainage system with street light is essential to meet the emergent demand. Hence, this subproject directly will contribute for the infrastructure development of the Pourashava.

This subproject includes the following components: BC Road, RCC Road, Pipe Drain, RCC Cover Drain and Street Light. The significant features of the subproject are mentioned below:

Name of the Subproject	A) Improvement of BC Road &Construction of Pipe Drain with Footpath including Street Light from Pourashava Office to Brahmondi Mor via Shikkha Chattar (Effective Length-2500m). B) Construction of RCC Road from Hemendra Saha (Lokman Chattar) to Hazipur Bridge (Effective Length-400m). C) Construction of RCC Drain & Improvement of CC road from east Brahmondi h/o Reporter Adam Ali to h/o Mojid Mia via Professor Surjakanta. D) Improvement of BC Road &Construction of Pipe Drain with Footpath including Street Light from Upazilla Mor to Battala Rail Line (Effective Length-350m). E) Improvement of BC Road &Construction of RCC Drain from Comilla Colony Mor to Mughal Bhuiyan Mor (Effective Length-700m). F) Construction of RCC Pipe Drain and Improvement of CC Road at Bank Colony Area with Link Road (Effective Length-3100m). G) Construction of RCC Pipe Drain and Improvement of CC Road at Eidgah Para of Dattapara (Effective Length-600m). H) Improvement of BC Road &Construction of Pipe Drain with Footpath including Street Light from Rajanigandha Chattar to Kamargaon Last Border of Pourashava via UMC Jute Mill.(Effective Length-1400m).
Package No.	MGSP/Narsingdi/ 2017-18/W-02
District Name	Narsingdi
ULB Name	Narsingdi Pourashava
Structural Design Option	BC Road, RCC Drain, Pipe Drain, RCC Road and Street Light
Jurisdiction area:	Wards no. 2, 3, 4, 5, 8 and 9
Beneficiary Population	About 70,000
Tribal People	None
Land Acquisition	Not required
Estimated Cost	584 million in BDT
Subproject Duration	18months
Tentative Start Date	June-2018
Tentative Completion Date	Dec-2019

1.3 Aims of the Study

This report presents the finding of an Environmental Assessment (EA) of road, drain and street light subproject. The objective of the study is to provide an examination and assessment of the principal

environmental impacts of the subproject activities. The outline of an environmental management plan also suggested with an indication of the extent of work to be done to keep the development and environment compatible. In this context, it should be noted that the term "environment" and its derivatives have been used in a wide sense, which covers not only physical and chemical aspect, but also the human dimension. The specific objectives of this EA are to:

- Present a brief discussion on the EA process and its role in the planning and implementation of development subprojects;
- Present a general description of the subproject and the process;
- Present a description of the pre-project environment;
- Delineate the significant environmental issues found and believed to be involved;
- Identify the environmental impacts of the subproject and quantify them to the extent possible;
- Suggest plan for management of the environment, during the implementation and operation.
- To present the findings for public input.
- To provide sufficient information to serve as a record for environmental approvals and consultations as required by law.

1.4 Scope of the EA

The EA report was prepared on the basis of proposed engineering works, field investigations, stakeholder consultation, primary and secondary data collection, screening of all baseline environmental parameters, environmental quality baseline monitoring, and review of other similar project reports in Bangladesh. The study conducted on 3 March in the year of 2018. The EIA covers the general environmental profile of the subproject area including physical, ecological, environmental, social, cultural and economic resources. Baseline environmental monitoring (primary data) was carried out on water (surface), and noise quality measurements. The EA includes an overview of the potential environmental impacts and their severity, and proposes necessary mitigation measures and environmental management plan for each of the identified and anticipated impacts. Three numbers of public consultations were conducted as part of the EA.

1.5 Methodology of the EA

The methodology used for this study is based on the procedures described in Environmental Guidelines, (Volume 1 and 2) published by Local Government Engineering Department (LGED) and Bangladesh Municipal Development Fund (BMDF) and the other relevant regulation of Bangladesh as well as World Bank Guidelines for Environmental and Social Considerations

- Scoping workshop organization with various stakeholders at the beginning of the subproject preparation activities;

- Reconnaissance survey was taken up to collect baseline information in devised formats;
- Analysis of collected data was carried out;
- Documentation of baseline conditions was done by doing on site environmental monitoring
- Analysis and assessment of various alternatives was taken up;
- Identification and assessment of various impacts was done;
- Formulation of mitigation, and avoidance measures was done for identified impacts;

2 SUBPROJECT DESCRIPTION

2.1 Setting of the Subproject Site

The subproject package consists of road, drain and street light component at different jurisdiction area (ward-2, 3, 4, 5, 8 and 9) of the Narsingdi Pourashava. Locations for various improvements are shown in Figure 2.1. All improvements will be constructed within existing right-of ways of Narsingdi Pourashava.

The subproject area consist of mixed land use pattern of commercial, administrative and residential area of the Pourashava. However, Pourashava to Brahmondi Mor and Lokman Chattar to Hazipur Bridge are the busy area due to commercial and administrative work. Remaining part are mostly belong the residential area while Dattapara area is the slum area of the Pourashava. Topographic view of the subproject sites area shown in Figure 2-2, 2-3, .2-4 and 2-4.

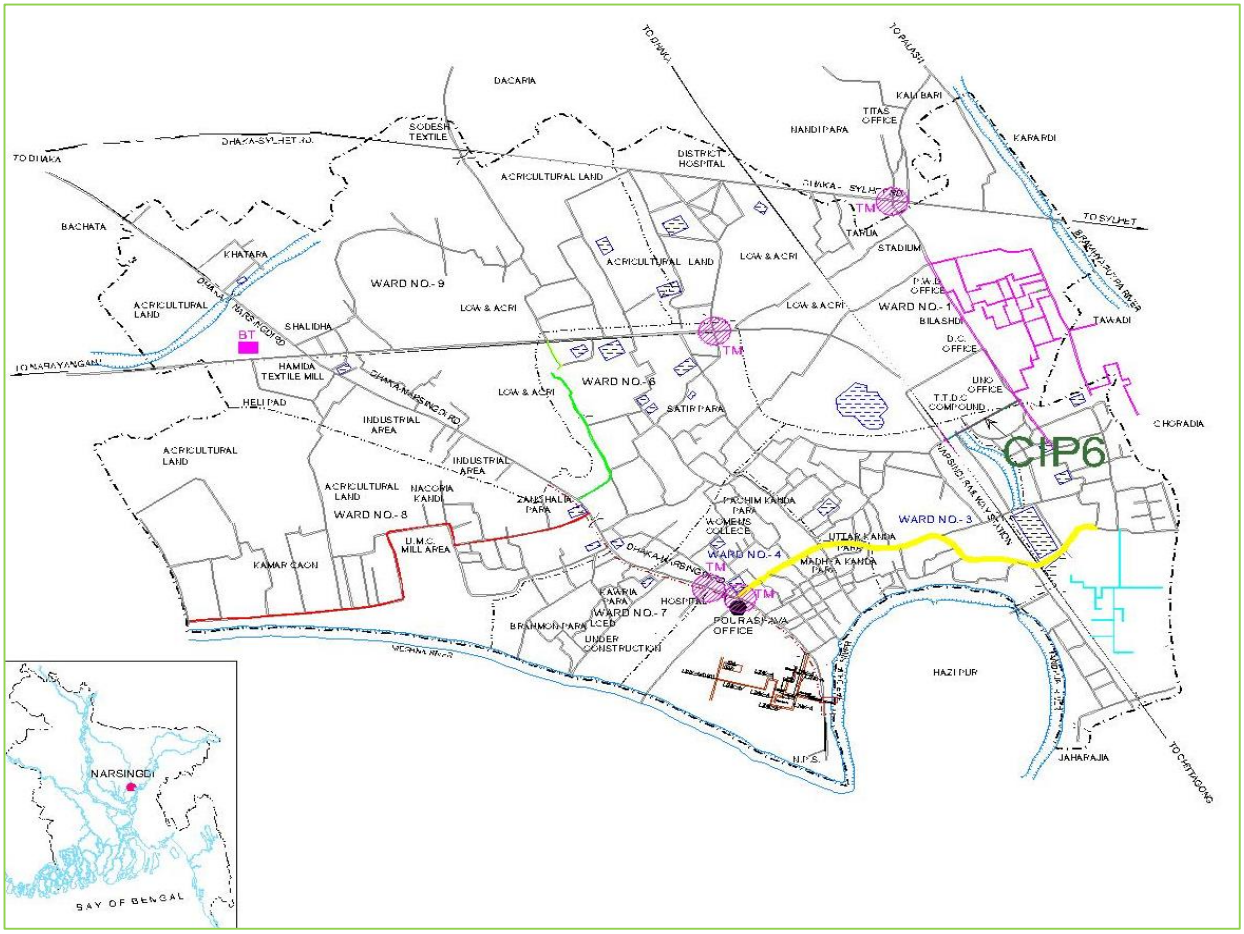

Figure 2-1: Location of various improvements in Base Map of Pourashava

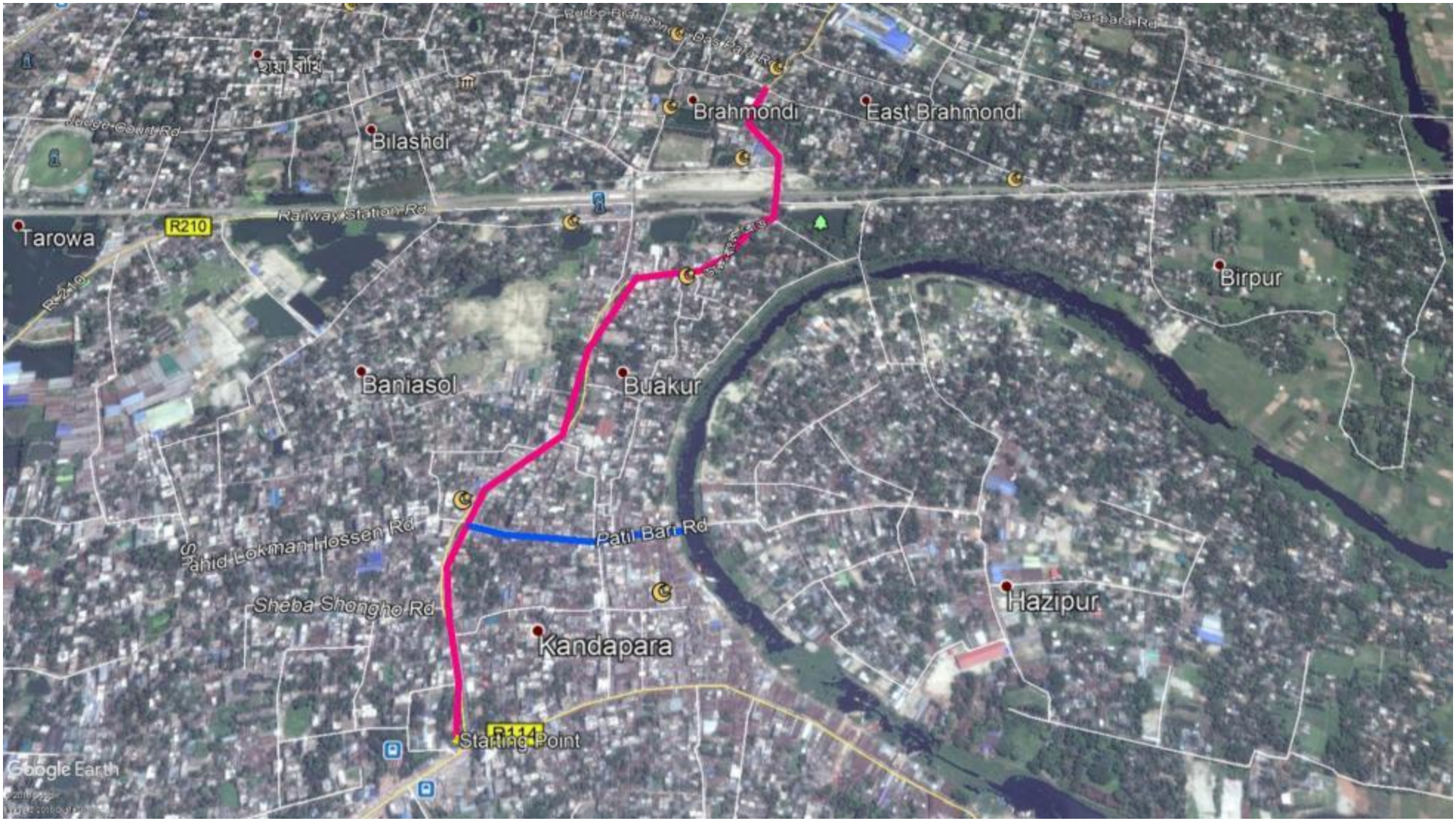

Figure 2-2: Topographic View of the Pourashava to Barramundi Road and Lokman Shorak

Figure 2-3: Topographic View of Bank Colony Area and Upazilla Battala Road

Figure 2-4: Topographic View of Dattapara Area

Figure 2-5 : Topographic View of Rajanigandha Mor to Pourashava Boundary Road

2.2 Subproject Scope of its Components

Depending of the availability of space road and drain width may be variable. The road improvements total 11.02 km in length while drain is 10.62 km.

Drains will be constructed along all roadways on one or both sides or median of the road depending on site condition and to meet the design criteria, being 600-1000 mm wide reinforced concrete slot drains with concrete cover plate and 600-900mm diameter of RCC Pipe drain. On the other hand, except Pourashava Mor to Brahmondi Mor most of the road width will varies from 4.5-5m while Brahmondi Mor road will be four lane which width is 12m. Solar street lighting also will be installed along the proposed road.

Subgrade and base courses of the existing road will be rebuilt on some roads and as well as for the road widening work, whereas elsewhere new materials will be placed on top of the existing roadway and extension portion materials

2.3 Present Status, and Need for the Subproject

At present, the existing BC road from ***Pourashava to Brahmondi Mor*** is partially damaged in the different section of the road. On the other hand, link road (***Lokman Chattar to Hazipur Bridge***) is currently in poor repair (bituminous carpeting) and in many locations are nearly impassable. Due to long time use by the heavy vehicles the bituminous carpeting roads severely damaged containing cracks, pot holes, edge broken and depressions are prevalent. The proposed narrow roads (varies from 4-8m) have become inadequate to accommodate the growing high volume of traffic and thereby causing severe traffic jams and frequent accidents. After implementation of the subproject the problems will be alleviated and road users will be benefitted. The single lane road could be widened (four lane) with walkway, new roads has been proposed to be BC for Pourashava to Brahmondi Mor and RCC road for Lokman Chattar to Hazipur Bridge to cater for increased traffic volume. This will reduce the existing traffic congestion, will reduce journey time and will also enhance the connectivity of the road network to meet the forecast economic and traffic growth targets. On the other hand, the drainage facility is

inadequate and inappropriate in this road. The existing drain (mostly pipe and brick drains in few segments) are narrow, damaged and discontinuous. Thus, existing does not functioning properly to drain off the storm water. Moreover, during monsoon period, heavy and continuous rainfall causes delay discharge of the storm water. Therefore, delay discharge of the storm water creates drainage congestion and water stagnation at adjacent roads which hampers the normal traffic operations by damaging the roads, daily lives and livelihood of the influence area individuals. To improve the drainage congestion, construction of new RCC drain is needed. Hence, under this subproject, the proposed RCC pipe drain will be constructed at both side of the road from Pourashava to Brahmondi Mor. The storm water of the proposed rain will be discharged in to the Haridoa River.


Figure 2-6: Current Situation of Pourashava to Brahmondi Mor Road and Drain


Figure 2-7: Current Situation of the Haridoa Outfall

At ***East Brahmondi H/O Reporter Adam Ali to House of Mojid Mia Road,*** the existing road is BC raod. Most of the road section is partially damaged and few section is totally damaged due to loss of wearing surface. Loss of wearing surface has created potholes in the road. Therefore, traffic movement are interrupted. Hence, 1970m long and 5m width of BC road has been proposed from H/O Reporter Adam Ali to House of Mojid Mia Road. On the other hand, in the subproject are there are brick drain exist. However, the existing drain is discontinuous. Moreover, the drain is also damaged and capacity of the drain is insufficient. Thus, after rain storm water cannot drain out properly, resulting due to delay discharge of water subproject are become flooded especially at monsoon period. Hence, a well-designed RCC drain has been proposed from H/O Reporter Adam Ali to House of Mojid Mia Road.

At ***Upazilla Road,*** the existing BC road is badly damaged in the entire road containing cracks, pot holes, edge broken and depressions are prevalent. The road surface is also uneven and width of the road is narrow and uniform which varies from 3.5-9m. Hence, the normal traffic operation and pedestrian movement is hampering. Additionally, this damaged roads creates dust which have discomfort felling to the road user and nearby residents. So, for better traffic operation damaged BC road will be replaced by new BC pavement .Therefore, new BC road of uniform width (5m) and 350m length has been proposed from Upazilla Mor to Battala. The box culvert near at bottala will be used outfall of this drain. The capacity of the existing drain of this road is very poor due to substandard designed. Even the existing drain is discontinuous and blocked (most of the section where drain is open) by various wastes materials. Therefore, most of the times this drain retain waste water in stagnant condition. Thus, bad smell from the decomposition of blocked organic solid waste of the drain is degrading the surrounding environment which also feels discomfort to the local community people. The proposed drain outlet is box culvert near Bottala. However, ultimately this water will be discharged in to the branch of Meghan River.

Figure 2-8: Current situation of the Road and Drain at Upazilla Road


Figure 2-9: Current Situation of the Outfall

At ***Comilla Colony Road***, there are existing drain from Ch.0-100m (approximately) and Ch. 350-550m (approximately)shown in Figure 2-10. Between this Chainage and last few portion there are no drain. This discontinuous drain is also less capacity to drain out the catchment area runoff water.


Figure 2-10: Current Situation of the Subproject Area (Comilla Colony) Drain and Road

Therefore, after heavy rainfall delay discharge of the storm water creates drainage congestion and water stagnation in the subproject areas which hampers the normal traffic operations. To improve the drainage congestion, construction of new RCC drain is needed. Hence, under this subproject, 700m long RCC drain has been proposed from Comilla Colony Mor to Mughal Bhuiyan Mor. The existing drain near Bitultala Mosque will be act as outfall of this drain. Finally, storm water will be discharged in to the branch of Meghan River. On the other hand, the existing BC road is of the Camilla Colony area is narrow in width (varies from 3.4 -5m).and partially damaged at different section of the road. Resulting, traffic and pedestrian movement are interrupted. Therefore, 5m uniform width of BC road has been proposed.

At ***Bank Colony Area,*** the exiting road from B.M school Mor to Belnagar road about 200m is BC road. Remaining road length is including as link road of the subproject site. However, most of the link road

is currently CC road and few are BC road. The existing roads are badly damaged which containing cracks, pot holes, edge broken and depressions are prevalent. Therefore, subproject area traffic have been woe for long time for the bad condition of the road. To accommodate the normal traffic operation improved road is needed. Hence, 3100m CC road of uniform 4.5 m width has been proposed in the subproject area. On the other hand, in the subproject area there is only 200m drain from B.M school Mor to Belnagar road while reaming large portion of the subproject area no drain exist. Therefore, during monsoon period, the subproject area become inundated after rainfall and livelihood of subproject area community have been severely affected. To overcome the adverse impact and provides integrated well-designed drainage network 3100m RCC pipe drain at the median of the road have been proposed.

Figure 2-11: Current Situation of Road and Drain at Bank Colony Area

At ***Rajanigandha Chattar to last boundary of Pourashava,*** there is BC road which is in bad condition due to worn out of wearing surface and creating potholes entire the total length of the road. This is the important road of the Pourashava because by using this road subproject are people can reach the Madhabdi Upazilla and nearby Meghna Bazar. But currently due to bad condition of the road motorized vehicles movement are interrupted. To establish a good connectivity with adjacent area of the subproject area and minimize the suffering of the people, new BC road

(Effective Length-1440m and uniform width 5m) has been proposed.

On the other hand, about first half of the road there brick drain and the existing drain is also partially damaged and capacity of the drain is inadequate. Therefore, after heavy rainfall storm water cannot drain out from the subproject area. Resulting drain side's residents and road become inundated. To improve the situation RCC drain with footpath has been proposed from Rajanigandha Chattar to last boundary of Pourashava (Ch.0-1400m). The storm water will be discharge into the branch of Meghna River.


Figure 2-12: Current Situation of the Subproject Area (Rajanigandha Mor to Boundary of Pourashava)


Figure 2-13: Current Situation of the Outfall (Branch of Meghan River)

At ***Eidgah para at Dattapara,*** there is no drainage system. This area is the densely (except first few portion) populated slum area of the Pourashava. There is no adequate space to drain out the runoff water after rain fall. Therefore, during monsoon period this area become flooded and seems island as per information of the local individual. This water logging creates health hazard and degreed the total surrounding environment. To improve the situation, 600m RCC Pipe drain has been proposed at Dattapara.

On the other hand, the existing road in the Dattapara area is damaged CC road and width of the

road is not adequate to meet the present demand. Hence, 4.5m uniform width of CC road (600m) has been proposed in the Dattapara area.

Figure 2-14: Current Situation of the Subproject Area (Dattapara)

Furthermore, there are no street light facilities in the subproject area. It also interrupts traffic operation and pedestrian's safety at night. Hence, street light will be fixed at one side of the Brahmondi Mor road, Rajanigandha Mor road, and Upazilla roads.

2.4 Justification of Selection of the Subproject

The subproject has significant importance because all the roads are in core area of the Pourashava. Hence, this subproject has been considered as priority subproject in the CIP.PMU (BMDF) representative, and consultant of Pourashava visited the subproject sites to assess the sites condition. From the site visit, it is revealed that this road is very much inconvenience for the movement of the motorized vehicles. The subproject is located mostly on the right of way. Hence, private land acquisition is not an issue for implementation of this subproject. From the site inspection, it is also revealed that roadside built-up infrastructure will not be severely affected due to the implementation of the subproject.

From the environmental screening it is revealed that the ecological impacts due to this subproject is not significant, though 279 numbers of trees to be felled down. The subproject has adverse impacts on the physicochemical environment. However, it is anticipated that the adverse impact is not significant and limited in the subproject boundary.

It should be noted that 558 numbers of tress will be planted under this subproject to compensate the ecological impact caused by the subproject and to enhance the ecological condition.

The subproject has significant benefit to the community people. After completion, the road subproject will provide uniform width. By eliminating pot holes and providing smooth road surface it will provide better, easy and safe movement facilities for the travelers. On the contrary, new drains will minimize the drainage congestion and water logging problem. Furthermore, street lighting will ensure safe movement of the pedestrians and non-motorized vehicles. It will provide streetscape enhancements i.e. municipal beautification work and stimulation of the night-time trade. Hence, considering the benefits that will derive, the subproject is selected for implementation

2.5 Key Subproject Activities and Implementation Process

The general activities for the subproject includes: Site clearing & grubbing works, construction of the semi-pucca site office, construction of the labor shed and relocation of the electric poles and GI poles.

The key activities for BC Road include:

- Dismantling of the damaged BC and CC road;
- Earth work in box cutting;
- Earth filling work;
- Sand filling on the road bed;
- Mechanical compaction;
- Brick work on edging;
- Compacted aggregate sand sub base course;
- Preparation of compacted WBM base
- Providing prime coat;
- Laying pre-mixed dense bituminous surfacing wearing course

The key activities for CC Road include:

- Dismantling of the damaged BC and CC road;
- Sand filling on the road bed;
- Mechanical compaction;
- Laying of Polythene Sheet
- Casting of pavement by CC mixture

The key activities for RCC Box Drain and Pipe Drain include:

- Earth work in excavation of the foundation;
- Pumping and bailing out of water as per requirement;
- Lying of polythene sheet;
- Sand filling for the preparing foundation bed;
- Plain cement concrete work in foundation;
- Manufacturing and placing of CC blocks;
- Fabrication of the ribbed or deformed bar;
- Reinforced cement concrete work.
- Manufacturing and laying precast RCC pipes for pipe drain,

- Fitting and fixing of pipe joint.

The key activities for Street Light include:

- Assembling, fitting, fixing, installation, testing and commissioning of the GI pole;
- Erection of tubular pole;
- Earthling the electrical installation;
- Fixing of the wire rack;
- Fixing of the overhead conductor;
- Providing, fixing and fitting of the water tight street light;
- Fitting and fixing main and sub-main switch with fuse;
- Supplying and fitting of sub-distribution board.

2.6 Category of subproject

For BC road and RCC Drain

- According to ECR 1997: Orange B
- According to WB classification : Category B

Considering the anticipated environmental impacts, primarily drain and BC road can consider as Orange-B as per ECR-97. According to the WB classification, it can classify as Category *B.*

For Street Light

- According to ECR 1997: Green
- According to WB classification: Category

Considering the environmental impacts, the street light can be considered as Green category as per ECR-97. According to the WB classification, it can be classified as Category C.

2.7 Analysis of Alternatives

This section examines alternatives to the proposed subproject site, technology, design, and operation in terms of their potential environmental impacts, and the feasibility of mitigating these impacts. It also states the basis for selecting alternative options for the component. The analysis of alternatives for the subproject components was carried out as part of the feasibility study, and has been taken forward.

a) Analysis of the Alternative Routes/ Alignments/ Location

(i) Analysis of alternative routes/ alignments for BC Road:

This is a reconstruction subproject where the existing BC and CC road will be replaced by the new BC and CC pavement using the same alignment. Therefore, analysis of alternatives routes/ alignment is not really applicable

(ii) Analysis of alternative routes/ alignments for RCC drain:

The following three alignments can primarily be considered for alternative analysis.

Route/Alignment	Advantages	Disadvantages
Alternative-1 (both sides of the road)	-Easier house connection -Ease of construction without much disruption to traffic	-Two drainage lines need to be constructed -Expensive-it needs more money, area and time.
Alternative-2 (median/center of the road)	-Single drain needs to be constructed along the median	-Difficult to make house connection
Alternative-3 (one side of the road)	-Single drain needs to be constructed -It is suitable for single lane road	-Difficult to make house connections from other side of the road -It is not suitable for more than single lane road.

As per sites requirement three alternative has been recommended. Designer will be decided with the assistance of ULB engineer which one is suitable for the subproject areas.

(ii) Analysis of alternative routes/ alignments for street light

The following four alignments can be primarily considered for alternative analysis.

Routes/ Alignment	Advantages	Disadvantages
Alternative -1 (both sides of the road)	-Easier lighten both sides -Ease of fixing and fitting without much disruption to traffic	-Two street light lines to be fixed and fitted -Expensive- it needs more costing and area
Alternative -2 (median/ center of the road)	-Single street light needs to be fixed and fitted along the median -It lighted both sides of the road	-Difficult to make electric connection -Economical, costing and area
Alternative -3 (One side of the road)	-Single street light need to be fixed and fitted -It suitable for single lane road	-It is lighted one side of the road more than other side -It is not suitable for more than one lane road
Alternative -4 (Staggered)	-Street light are fixed and fitted at the zigzag position -It cover both sides of the road	-Difficult to make electric connection

The selected design is alternative 2 and 3. Because there is one and two way both road. Hence to meet the demand of one way road selected alternative is 2 and for two way road selected alternative is 3.

b) Analysis of the Alternative Designs

(i) Analysis of the Alternative Designs for BC road:

For a road subproject, alternative designs may include asphalt road and RCC road. Through a comparative study considering the advantages of the BC road and RCC road, the consultants examined which one is feasible. General advantage and disadvantage of the BC, CC and RCC roads are shown in following table.

Design Alternatives	Advantages	Disadvantages
Alternative 1: Bituminous Carpeting (BC) Road	• Low Construction cost • Provide smooth surface • Aesthetic value is high	• Frequency of maintenance is relatively high; • Early damaged in heavy rainfall
Alternative 2: CC Road	• Do not require frequent repairing like BC roads. • Durability is more than BC road but less than RCC road	• Concrete roads do not require frequent maintenance but if damaged the whole concrete slab needs to be replaced. • Costly higher than BC road
Alternative 3: RCC Road	• Capacity of passing heavy loaded vehicles • RCC road is not damaged in heavy rainfall • Frequency of maintenance is relatively low.	• High construction cost • Provide relatively less smooth surface

From environmental point of view RCC and CC road is more feasible. However, bituminous road provides comparatively smooth surfaces which have more aesthetic value than rough surface that provided by RCC and CC road. Most importantly, provision of the further expansion of the utility services for instance water supply line, gas line is key issue for road selection which is complex and difficult for RCC and CC road. Therefore, considering the low construction cost and high aesthetic value and as a whole to meet the Pourashava demands, BC road is recommended by the designer. However, only at Bank Colony road CC road is recommended as the existing road of the bank Colony is CC road. So, in this cases no alternative is considerable against CC road.

(ii) Analysis of alternative designs for drain:

For a RCC drain subproject, alternative designs may include RCC drain and earthen drain. The following table discusses the general advantages and disadvantages of RCC drain and earthen drain.

Design	Advantages	Disadvantages
Alternative 1: RCC drain	• Not prone to encroachment • Area above RCC drain could be used as a part of	• Higher cost of construction
Alternative 2: Earthen drain	• Less construction cost	• Need more land for construction of open earthen drain • Prone to encroachment, disposal of solid waste/ debris
Alternative 3: Pipe drain	• Require less time to construction	• Maintenance is difficult

The selected design is alternative 1 and 3 i.e. because old exiting pipe drain and RCC drain will be replaced by the new pipe drain and RCC drain.

(iii) Analysis of alternative designs for street light:

For a street light subproject, alternative design may be include CFL energy bulb and LED bulb. The following table discusses the general advantage and disadvantage of the CFL bulb and LED bulb.

Design Alternatives	Advantage	Disadvantages
Alternative 1: CFL Bulb	It is four time more efficient than any other bulbs CFL are less expensive for the long run	Sensitive to temperature Most alarming thing for environmental due to mercury CFL are not suitable for focused or spot light
Alternative 2: LED Bulb	It does not emitted any toxic metal Long life time Low maintenance cost	Expensive compared with other light sources Very small size The color may be change due to age and temperature. Correct voltage and current at a constant flow

For environmental point of view, LED bulb is more feasible than CFL bulb. However, LED bulb is about three times expensive than CFL bulb. Hence, the designer is recommended CFL bulb considering the cost effectiveness.

c) Analysis of the Alternative Technologies/ Methods of the Construction

Method of the construction should be selected based on the available technologies in Bangladesh and with the assistance of the consultant, the Pourashava Officials. However, to minimize occupational health and safety risks and for effective use of the human labors, it is highly recommended to adapt mechanical system where possible for instance concrete mixer machine for casting, mechanical vibrator machine, and other electro-mechanical equipment as per requirement. From the field investigation, it is revealed that, the existing road width is not enough for the Dattapara road and Bank Colony area to use the mechanical excavator. Hence, it is recommended to use manual trenching work for these sites.

3 DETAILED ENVIRONMENTAL AND INFRASTRUCTURAL FEATURES

The major environmental and infrastructural features in the subproject area have been collected from the field investigation. The survey team has also performed the conditional survey. Hence, the survey data is also used for preparation of the report. The finding of the site inspection and investigation at: (A) Construction of Pipe Drain with Footpath and BC Road including Street Light from Pourashava Office to Brahmondi Mor via Shikkha Chattar; (B) Construction of RCC Road from Lokman Chattar to Hazipur Bridge (Effective Length-400m) (C) Construction of Pipe Drain with Footpath and BC Road including Street Light from Upazilla Mor to Battala (Effective Length-350m).Street Light from Upazilla Mor to Battala (Effective Length-350m). (D) Construction of RCC Drain from Comilla Colony Mor to Mughal Bhuiyan Mor (Effective Length-700m). (E) Construction of RCC Drain and CC Road at Bank Colony Area (Effective Length-3100m).(F) Construction of Drain with Footpath and BC Road including Street Light from Rajanigandha Chattar to last boundary of Pourashava (Effective Length-1400m).(G) Construction of RCC Drain all over Eidgah para at Dattapara (Effective Length-600m).Effort has been given for getting major environmental and infrastructural features within 100 m of both sides from the center of the road at 100 m longitudinal intervals. The major environmental and infrastructural features are given below Table 3.1.

Table 3-1(A)Major Environmental and Infrastructural Features of Pourashava Office to Brahmondi Mor via Shikkha Chattar

Chainage (m)	Right	Left	Key Environmental and Infrastructural Features
0-100	√		Pucca, Semi-pucca and Tin shed Structure, Electric pole. Boundary wall, Fire Service Brigade Office, J. D. paradise, Narsingdi Zila Awamileague Office, Pipe drain
		√	BRTC market, BRTC Office, Samsung Show Room, Grameen Phone Center, Boundary wall, Electric Pole, Sher-e –Bangla, Steel Furniture Shops, Apollo Private Diagnostic Hospital, CP
100-200	√		Narsingdi Vogobot Ashrom, Pathology Center, Boundary wall, Fonix by Cycle Show Room, Steel Furniture Shops
		√	Narsingdi Pushpaloy, Electric Pole, Ful Koli Misti Ghor, Tin shed and Semi-pucca Structures
200-300	√		Janata Bank, Madinova Diagnostic Center, Pucca, Semipucca and Structure, Boundary wall, Trees, Narsingdi Community Center, Electric City
		√	Bangladesh Mohila Parishad, Oppo Mobile Show Room, Pucca, Semipucca and Tin shed Structure, Boundary wall, Trees
300-400	√		Sree Anukul Chandra Shot Shango, Pucca, Semipucca and Tin shed Commercial Place, Boundary wall, Trees, Holy Crescent Hospital
		√	Post Office, Islam Plaza, Pucca, Semipucca and Tin shed Commercial and Residential Structure, Boundary wall,

400-500	√		Bata Show Room, Shamrat Offset Papers, H.R Corporation, Pucca, Semipucca and Tin shed Commercial and Residential Structure,
		√	Pucca, Semipucca and Tin shed Commercial and Residential Structure, Fakir Dental Clinic, DBBL Bank
500-600	√		Best Electronics, Pucca, Semipucca and Tin shed Commercial and Residential Structure, Bhuiyan Shopping Mall, Hitachi Show Room,
			Pucca, Semipucca and Tin shed Commercial and Residential Structure, LG Show Room,
600-700	√		Life Dental Care, Baby Shops, Prime bank Pucca, Semipucca and Tin shed Commercial and Residential Structure
		√	Roman Plaza, Pucca, Semipucca and Tin shed Commercial and Residential Structure ,Dorjibari, Verities Shops,
700-800	√		Tin Shed and Semipucca Shed commercial and Residential Structure, Electric Pole, Shop, Boundary Wall, Central Hospital
		√	Provat Model School, Saw Mill, Pucca, Semipucca and Tin shed Commercial and Residential Structure
800-900	√		Horticulture, Central BTCL, Narsingdi Diabetics and General Hospital, Pucca, Semipucca and Tin shed Commercial and Residential Structure, Boundary Wall, Connecting Road
		√	Saw Mill, Pucca, Semipucca and Tin shed Commercial and Residential Structure, Chowdhury Diagnostic Center, Central Insurance Co. Ltd.
900-1000	√		Telephone Office, Halima and Sadia Madrasa, Pucca, Semipucca and Tin shed Commercial and Residential Structure,
		√	Index Plaza, Pucca, Semipucca and Tin shed Commercial and Residential Structure, Electric Pole
1000-1100	√		Agrani Bank, Pucca, Semipucca and Tin shed Commercial and Residential Structure, Trees, Electric pole
		√	Semipucca and Tin shed Commercial and Residential Structure, Trees, Electric pole
1100-1200	√		Mosque, Semipucca and Tin shed Commercial and Residential Structure, Trees, Electric pole
		√	Varieties Shops, Semipucca and Tin shed Commercial and Residential Structure, Trees, Electric pole
1200-1300	√		Boundary Wall, Central Hospital, Munshi Hazrat Ali Co. Ltd. Pucca, Semipucca and Tin shed Commercial and Residential Structure,
		√	Varieties Shops, Pucca, Semipucca and Tin shed Commercial and Residential Structure, Boundary wall, Trees,
1300-1400	√		Pucca, Saw Mill, Semipucca and Tin shed Commercial and Residential Structure,
		√	Pucca, Semipucca and Tin shed Commercial and Residential Structure, Trees, Electric pole

1400-1500	√		Dutch Bangla Bank Both, Pucca, Semipucca and Tin shed Commercial and Residential Structure,
		√	Pucca, Semipucca and Tin shed Commercial and Residential Structure, Electric pole, Varieties Shop
1500-1600	√		Food Godown, Boundary Wall, Pucca, Semipucca and Tin shed Commercial and Residential Structure, Electric pole, Varieties Shop
		√	Pucca, Semipucca and Tin shed Commercial and Residential Structure, Electric pole, Varieties Shop
1600-1700	√		Pucca, Semipucca and Tin shed Commercial and Residential Structure, Electric pole, Varieties Shop
		√	Pucca, Semipucca and Tin shed Commercial and Residential Structure, Electric pole, Varieties Shop
1700-1800	√		Pucca, Semipucca and Tin shed Commercial and Residential Structure, Varieties Shop, Brick Drain,
		√	Pucca, Semipucca and Tin shed Commercial and Residential Structure, Electric pole, Varieties Shop
1800-1900	√		Pucca, Semipucca and Tin shed Commercial and Residential Structure, Varieties Shop, Brick Drain,
		√	Pucca, Semipucca and Tin shed Commercial and Residential Structure, Electric pole, Varieties Shop
1900-2000	√		Boundary Wall, Pucca, Semipucca and Tin shed Commercial and Residential Structure, Electric pole, Varieties Shop
		√	Trees, Boundary wall, Pucca, Semipucca and Tin shed Commercial and Residential Structure, Varieties Shop
2000-2100	√		Pucca, Semipucca and Tin shed Commercial and Residential Structure, Varieties Shop, Electric Pole, Brick Drain
		√	Boundary Wall, Pucca, Semipucca and Tin shed Commercial and Residential Structure, Electric pole, Varieties Shop
2100-2200	√		Connecting Road, Open Space, Pucca, Semipucca and Tin shed Commercial and Residential Structure, Varieties Shop, Electric Pole,
		√	Open Space, Pucca, Semipucca and Tin shed Commercial and Residential Structure, Varieties Shop,
2200-2300	√		Pucca, Semipucca and Tin shed Commercial and Residential Structure, Varieties Shop, Electric Pole,
		√	Pucca, Semipucca and Tin shed Commercial and Residential Structure, Varieties Shop, Electric Pole,
2300-2400	√		Pucca, Semipucca and Tin shed Commercial and Residential Structure, Varieties Shop, Brick Drain,
		√	Pucca, Semipucca and Tin shed Commercial and Residential Structure, Electric pole, Varieties Shop
2500-2600	√		Pucca, Semipucca and Tin shed Commercial and Residential Structure, Varieties Shop, Brick Drain,
		√	Pucca, Semipucca and Tin shed Commercial and Residential Structure, Electric pole, Varieties Shop

Table 3-2Major Environmental and Infrastructural Features at from Lokman Chattar to Hazipur Bridge

Chainage (m)	Right	Left	Key Environmental and Infrastructural Features
0-100	√		Futonto Golpo Shops, Pucca, Semipucca and Tin shed Commercial Structure, Electric Pole
		√	Pucca, Semipucca and Tin shed Commercial, Means Clubs, Futonto Golap, Electric Pole
100-200	√		Master Jeans, Sur Musical and Tal Torongo, Pucca, Semipucca and Tin shed Commercial and Residential Structure
		√	Tailor Shops, Pucca, Semipucca and Tin shed Commercial and Residential Structure
200-300	√		Under Constructed Building, Varieties Shops, Pucca, Semipucca and Tin shed Commercial and Residential Structure
		√	Pucca, Semipucca and Tin shed Commercial and Residential Structure, Electric Pole, Doctor's Chamber
300-400	√		Rant Furniture Shops, Popular Timber and Auto Door Shops, Semipucca and Tin shed Commercial and Residential Structure, Electric Pole
		√	Habib Furniture Shops, Restaurants, Semipucca and Tin shed Commercial and Residential Structure, Electric Pole, Pucca and Semi Pucca Residents, Trees, Shops ,Electric Pole

Table 3-3: Major Environmental and Infrastructural Features at **Upazilla Mor to Battala (Effective Length-350m).**

Chainage (m)	Right	Left	Key Environmental and Infrastructural Features
0-100	√		Bangladesh Krishi Bank, Bangladesh Krishi Bank Kormochari Union, Pucca and Semipucca Structure. Varieties Shops, Brick Drain, Electric Pole,
		√	Mosque, Boundary Wall, Pucca and Semi Pucca Residents and Shops, Electric Pole
100-200	√		Boundary Wall, Pucca and Semi Pucca Residents and Shops, Electric Pole, Beauty Parlor, Brick Drain
		√	Boundary Wall, Pucca and Semi Pucca Residents and Shops, Electric Pole,
200-300	√		Boundary Wall, Pucca and Semi Pucca Residents and Shops, Electric Pole, Brick Drain
		√	Boundary Wall, Pucca and Semi Pucca Residents and Shops, Electric Pole,
300-350	√		Brick Drain, , Pucca and Semi Pucca Residents and Shops, Electric Pole,
		√	Poultry Shops, Trees, Pucca and Semi Pucca Resident

Table 3-4: Major Environmental and Infrastructural Features at Comilla Colony Mor to Mughal Bhuiyan Mor (Effective Length-700m).

Chainage (m)	Right	Left	Key Environmental and Infrastructural Features
0-100	√		Narsingdi Holy Child, Coaching Center School, Pucca and Semipucca Residents and Shops, Brick Drain,
		√	Mosque, Pucca and Semipucca Residents, Trees, Boundary wall
100-200	√		Jennies Coaching Center, Moon Light Kinder Garden, Pucca and Semipucca Residents,
		√	Boundary Wall, Pucca and Semipucca Residents, Junaid Departmental Shops
200-300	√		Varieties Shops, Pucca and Semi Pucca Shops, Trees, Boundary wall
		√	Boundary Wall, Pucca and Semipucca Residents, Junaid Departmental Store
300-400	√		Brick Drain, Boundary Wall, Pucca and Semipucca Residents,
		√	Varieties Shops, Pucca and Semi Pucca Shops, Trees, Connecting Road, School
400-500	√		Shops, Boundary Wall, Pucca and Semi Pucca Shops, Trees, Brick Drain, Pond, Open Space
		√	Electric Pole, Shops, Boundary Wall, Pucca and Semi Pucca Shops, Trees,
500-600	√		Boundary Wall, Pucca and Semi Pucca Shops, Trees, Brick Drain, Pond, Open Space
		√	Pucca and Semi Pucca Shops and Residents, Trees, Boundary Wall
600-700	√		Pond, Open space, Pucca, Semi Pucca and Tin shed Resident, Shops
		√	Ditch, Open Space, Boundary wall , Auto Garage, Shops, Trees
800-900	√		Tin shed and Semipucca Residents, Boundary wall, Trees
		√	Tin shed and Semipucca Residents, Trees, Electric Pole
900-1000	√		Low land, Pucca, Semipucca and Tin shed Residents
		√	Boundary wall, Pucca, Semipucca and Tin Shed Residents, Trees

The environmental and infrastructural features of the Bank Colony, East Brahmondi road and Eidgah para area are not shown in tabular form. Because bank colony area and East Brahmondi is the totally residential area where road side environment and infrastructure features are mainly planted trees and pucca, semipucca and tin shed resident. On the other, hand at Eidgah road, in the first 100m there are Eidgah filed, one primary school and one high school. Remaining part is the slum area where road side infrastructure belong the mostly tin-shed and few semipucca residents.

Table 3-5: Environmental Features, Rajanigandha-Poura-boundary road (Length-1400m).

Chainage (m)	Right	Left	Key Environmental and Infrastructural Features
0-100	√		Baitun Nur Jame Mosque & Pucca/Semipucca/Tin Shed Residents,
		√	Stationary Shops, Boundary Wall, Trees, School and College Electric Pole, Pucca, Semipucca and Tin Shed Residents,
100-200	√		Pucca, Semipucca and Tin Shed Residents, Boundary Wall, Trees, Shops, Fuska Dokan, Lowland , Vegetation Coverage
		√	Shawon Traders, Pucca, Semipucca and Tin Shed Residents, Boundary Wall, Electric Pole
200-300	√		Baitul Mamur Jame Mosque, Semipucca and Tin Shed Residents, Agricultural field, Boundary wall, Trees, Shops
		√	Varieties Shops, Pucca, Semipucca and Tin Shed Residents, Boundary Wall, Electric Pole
300-400	√		U. M .C Darul Ulum Madrasa, Open space, Semipucca and Tin Shed Residents, Agricultural field, Trees
		√	Varieties Shops, Pucca, Semipucca and Tin Shed Residents, Boundary Wall, Electric Pole, K.N B Club,
400-500	√		Blue Bard, Jamtola Poura Sromik Moncha, Semipucca and Tin Shed Residents, Boundary Wall, Pond
		√	Shops, Semipucca and Tin Shed Residents, Boundary wall, Trees,
500-600	√		U.S.M Jute Mill, Boundary Wall, Trees, Pucca, Semipucca and Tin Shed Residents,
		√	Babul Enterprise, Shahin Pharmacy, Semipucca and Tin Shed Residents, Boundary wall, Trees, Mosque
600-700	√		Boundary wall, Trees
		√	Pucca, Semipucca and Tin Shed Residents, Shops, Boundary wall,
700-800	√		Boundary wall, Trees
		√	Nagarkania Pre Cadet School, Pucca, Semipucca and Tin Shed Residents,
800-900	√		Boundary wall, Trees, Dust Bin,
		√	Pucca Semipucca and Tin Shed Residents , Boundary Wall, Shops, Under Constructed Building,
900-1000	√		Boundary Wall, Pucca Semipucca and Tin Shed Residents , Boundary Wall, Shops
		√	Nagarkania Bitursher Mosque, Brick Drain, Pucca, Semipucca and Tin Shed Residents, Trees,
1000-1100	√		Tofazzal Hague Smriti Pathagar, Low Land, River, Pucca, Semipucca and Tin Shed Residents, Trees, Workshops
		√	Drain, Pucca/ Semi-pucca/ Tin Shed Residents, Trees, Workshops
1100-1200	√		Pucca, Semipucca and Tin Shed Residents, Trees, Low Land, River,
		√	Brick Drain, Pucca, Semipucca and Tin Shed Residents, Trees,
1200-1300	√		Low Land, River, Shops, Trees
		√	Residential houses, Trees, Connecting Road, Open Space
1300-1400	√		Low Land, River, Shops, Trees
		√	Baitul Aman Jame Mosque, Kamargaon Pucca, Semipucca and Tin Shed Residents, Trees,

4 BASELINE ANALYSIS OF THE ENVIRONMENTAL CONDITION

4.1 General Consideration

Baseline condition of environment states the present status of different components of environment in absence of the subproject. The main objective of examining the present environment is to provide an environmental baseline against which potential impacts from construction and operational phases of any subproject can be compared. A second important function of establishing a baseline for parameters such as air, noise and water quality is to ensure that any problems arising from existing sources are not erroneously attributed to the subproject under study. In the present study the different environmental components examined for setting baseline conditions of the subproject area, are physico-chemical, biological and socio-economical. In physico-chemical component, parameters included are land, water quality, air quality, climate, and noise.

4.1.1 Physical environment

4.1.1.1 Geology, topography and soils

The sub-project area mainly comprises of plain land and almost flat with few undulations. The depressions and canals in the region are dominated by organic clay and peats. The average ground elevation of the subproject area is about 13m. The soil of the district is mainly formed with recent and sub recent alluvial sediments of low parts of the old Brahmaputra floodplain and the new Brahmaputra floodplain. Tract upland soil mixed with the old Brahmaputra floodplain is found in the north eastern part of the District. The central part is formed with the ridges and basins of the Brahmaputra floodplain having grey-clay loam. The soil of the southern part of the District is formed by grey silty complex clay for the young Brahmaputra floodplain. The soil condition of the district is very favorable for producing different types of vegetables and high yielding varieties of crops. Most of the areas under the Narsingdi District are occupied by compacted, pale brown, sandy soils on the ridges and shallow, dark grey, compact clays overlying sand in the shallow basins. Topsoils are acidic when dry but near neutral when flooded. Sub-soils are often slightly acid at the top but all become moderately alkaline below.

According to Soil Resource Development Institute (SRDI), soil of the Narsingdi Pourashava varies from non-calcareous and calcareous brown floodplain soil. Non-calcareous alluvium is similar to calcareous alluvium, except they are non-calcareous in soil profiles. They are sandy or silty, grey or olive, neutral to slightly alkaline. Calcareous Brown Floodplain soils comprise pale brown to olive brown, friable, loamy and clay soils. According to earthquake zone classifications, Narsingdi lies on zone-2 which is the second most vulnerable earthquake region of Bangladesh (GSB, 1978).

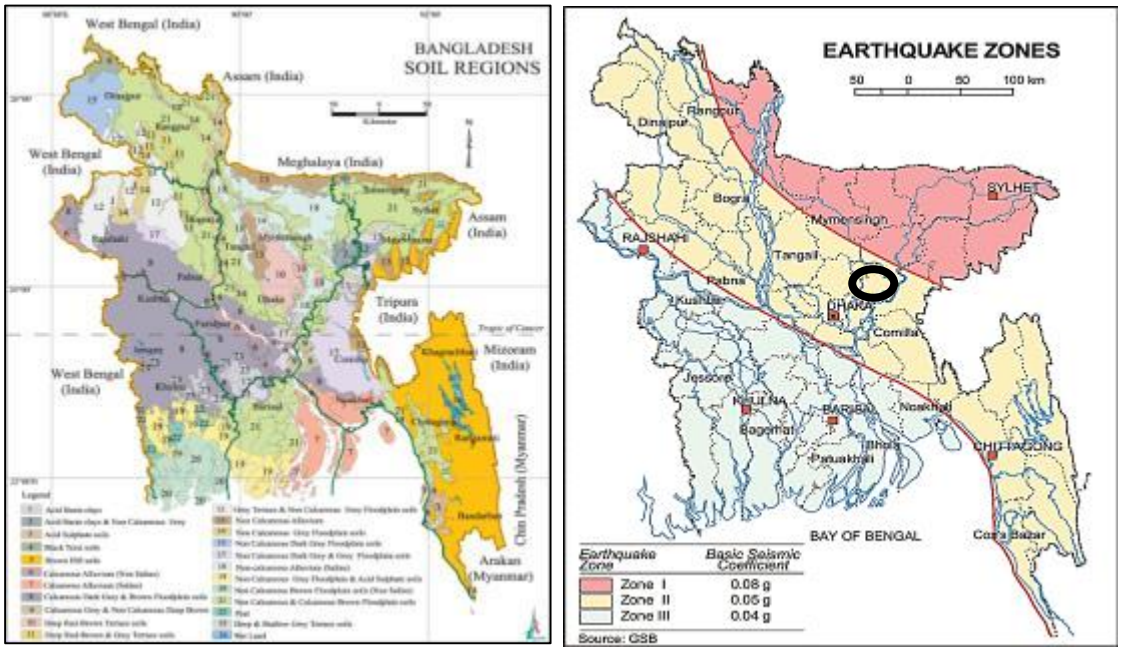

Figure 4-1: Soil Region Map and Earth Quake Zone Map of Bangladesh

4.1.1.2 Climate and meteorology

The climate of the district is relatively mild both in the summer and the winter. The maximum and minimum mean temperatures during the winter vary from 19°c to 23.7°c. During the summer maximum and minimum mean temperatures vary from 26°c to 29°c. The dry winter season starts from November and continues up to the end of February. Summer comes from mid of March and continues up to the mid of June. The rainfall is generally heavy during July and August. Heavy rainfall occurs during the monsoon. Annual average rainfall of this district is 2376 millimeters.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. Temperature (°C)	19.1	21.8	25.7	28.7	28.9	28.6	28.6	28.8	28.7	27.5	24	20.3
Min. Temperature (°C)	12.6	15.1	19.3	23.2	24.7	25.7	26.1	26.2	25.9	24	18.9	14.3
Max. Temperature (°C)	25.7	28.5	32.2	34.2	33.1	31.6	31.1	31.4	31.6	31.1	29.1	26.4
Rainfall (mm)	10	20	59	142	266	407	380	311	260	162	37	4

Source: Bangladesh Meteorological Department, 2018

4.1.1.3 Hydrology (surface water, ground water, and rainwater)

There are some ponds and low lands in the subproject area. In addition, there two rivers flow (Haridoa and Branch of Meghna River) within the influence area of the Pourashava. All the ponds are man-made and used for fishing, water supply and domestic uses. Some small and medium industries observed near

the subproject area which remarkable sources are of water pollution. The depth of ground water level varies from 4m to 7m. Potable ground water is available at an average depth of 130m to 220m.

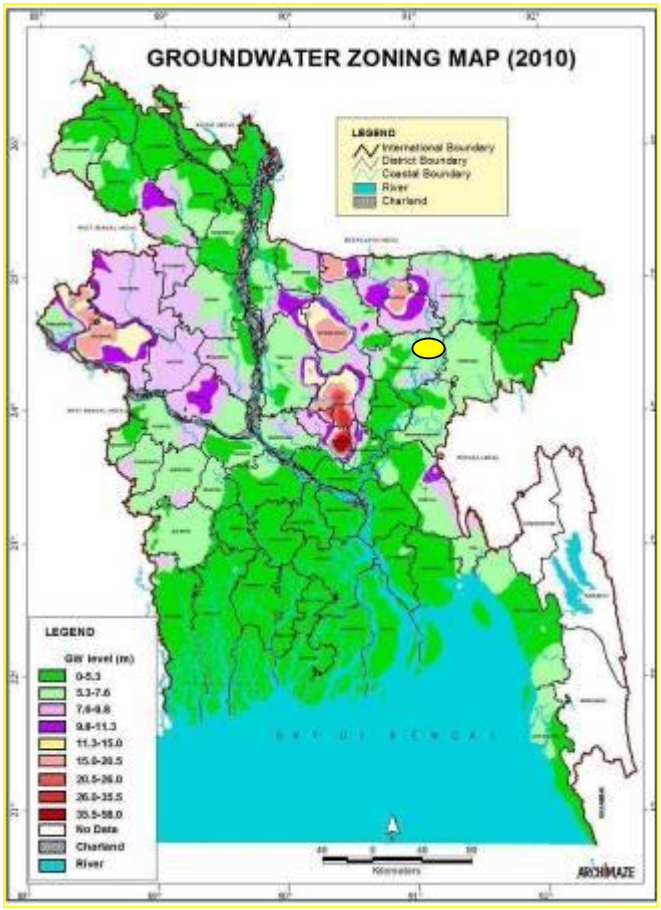

Figure 4-2: Subproject Area Location in the Groundwater Zoning Map of Bangladesh

A lots of textile industries are present in the Pourashava area. Though these industries are not located nearby subproject sites. But they are disposing there industrial effluent into the river through drain. In addition to the point sources, the discharge from non-point sources include those from engine boats, shipping (oil and grease) and run off from agricultural activities containing pesticides and chemical fertilizer residues are also drained into the river. Resulting, the water quality of Haridoa is badly degraded. However, the existing water quality of Meghan River is relatively better than Haridoa River shown in table 4-1. The water quality parameters investigated are within the Bangladesh standards. It is noted that, the water quality of the outfall has already been contaminated by untreated discharge of the industrial effluent. Hence, anticipated impact on the aquatic environment from the discharge of the storm water is minor.

Table 4-1: Existing condition of the surface water quality of the subproject area

Sl.	Water Quality Parameter	Bangladesh Standard	Concentration Present of Haridoa River	Concentration Present of Branch Of Meghna River	Unit	Analysis Method
1	Biochemical Oxygen Demand(BOD)	0.2	31	14	mg/L	5 days Incubation
2	Coliform(Total)	0	112	68	N/100ml	MFM
3	Color	15	7.5	2.1	Hazen	UVS
4	Dissolved Oxygen(DO)	6.0	2.38	4.88	mg/L	Multimeter
5	P^H	6.5-8.5	9.0	7.7	-	P^H meter
6	Hardness	200-500	80	46	%	Multimeter
7	Total Dissolved Solid(TDS)	1000	119	546	mg/L	Multimeter
8	Turbidity	10	21	5.2	NTU	Turbidity Meter
9	Ammonia	0.5	2.49	0.15	Hazen	UVS

4.1.1.4 Flooding, water logging, and drainage pattern

There isn't any significant flooding in the region. Although, during the wet season, heavy rainfall can cause water logging due to lack of proper drainage systems in the city. The City has a few narrow drains that are not enough to carry storm and domestic waste water. The existing drainage system is not functional because people throw and dispose wastes in the drains. Also, because of paving, there isn't open surfaces for the water to be soaked by the ground.

4.1.1.5 Air quality and dust

Air quality data of the sub-project area is not readily available. However, from visual observation air seems to be clear in the subproject area. The possibilities of air pollution from the industries is insignificant as there is no notable amount of air polluting industries in the subproject area. Major atmospheric pollution is caused by man induced activities like - burning fossil fuels, construction works and transportation. During construction period use of subproject vehicles and construction equipment may degrade the air quality. However, proper implementation of mitigation measure which are addressed in the EMP is good enough to control the expected air pollution to be raised from construction activities. Moreover, to evaluate the existing condition of air quality contractor will perform the air quality test prior to construction. Following Table shows the Bangladesh National Ambient Air Quality Standard comparing the WHO Guideline standard.

Parameter	Environmental Conservation Rules,1997				WHO
	microgram/m^3				
	Industrial	Commercial and Mix use	Residential and Rural area	Sensitive area	
SPM	500	400	200	100	-
PM 2.5	65				10
PM10	150				20
SO_2	120	110	80	30	20
NO_2	100	100	80	30	40
Pb	.5				

4.1.1.6 Noise level

The major source of noise in the area is from transportation. However, the main mode of transportation in the Pourashava area is electric auto-rickshaws and few private car. Beside this to carrying the industrial goods heavy truck and cargo van is used in the Pourashava area. In addition, sophisticated machineries will be used at construction period which will produce little significant noise. But it would be temporary and site specific. Even, if proper measure are taken it would be within tolerable limit. The ambient noise level data were collected from different location of the subproject sites by noise level meter and has been given below in Table 4-2.

Table 4-2: Ambient Noise Quality Analysis

Noise level measurement locations	**GPS Co-ordinate**	**Day-time**	
		Equivalent Noise level (dBA),L_{eq}	**Maximum Noise level (dBA),L_{max}**
Near Pourashava Office	23°55'16.89"N 90°43'9.96"E	71.30	73.45
Madinova Diagnostic Center	23°55'22.82"N 90°43'9.01"E	67.12	71.13
At Brahmondi Mor	23°56'1.72"N 90°43'28.23"E	69.67	70.33
Near Riaz Abashik Hotel at Lokman	23°55'28.56"N 90°43'17.27"E	73.00	74.43
At Rajanigandha Moar	23°55'7.37"N 90°42'56.66"E	66.34	70.43
Near at Poura Boundary	23°54'46.60"N 90°43'0.20"E	55.55	61.73
Near Eidgah Gate	23°55'6.32"N 90°43'24.46"E	51.65	53.12
Near Stadium at Bank Colony Road	23°56'0.49"N 90°42'57.46"E	61.37	62.33
Near Upazilla Gate	23°56'1.66"N 90°43'0.79"E	63.56	65.31
Near Station Battala	23°55'51.47"N 90°43'4.80"E	58.58	59.76
Bangladesh (DoE) Standard			
Zone	Max	Min	
Industrial	75	70	
Commercial	70	60	
Mixed Area	60	50	
Residential Area	55	45	
World Bank Standard			
Industrial	70	70	
Commercial, Residential, Educational	55	45	

4.1.2 Biological Environment

4.1.2.1 Flora and fauna

Flora

The proposed subproject is in a mix commercial & rural setting with greenery. This includes homesteads, horticulture, roadside plantation, natural vegetation, and agricultural crops.

Due to roadside plantations and certain homestead forests, the area is rich with floral diversities. Different fruit, fuel wood trees along with various shrubs are abundant. Among the trees, the most widely available ones are Shilkoroi, Mehagani, Akashi, etc. The following table represent the subproject areas flora species

Name of Trees	Scientific Name	Name of Trees	Scientific Name
Mango	*Mangiferaindica*	Coconut	*Cocos nucifera*
Lichi	*Lichi chinensis*	Papaya	*Carica Papaya*
Date Palm	Phoenix	Banana	*Musa Sapientum*
Black Berry	*Sylvestris Syzygium*	*Lemon*	*Citrus Sp*
Jackfruit	*Artocarpus heterophyllus*	Guava	*Psidium guajava*
Mahogany	*Swietenia macrophylla*	Akashmoni	*Acacia auriculiformis*
Neem	*Azadirachta indica*	Rain Tree	*Samanea saman*
Babla	*A. nilotica*	Shimul	*Bombax ceiba*
Jarul	*Lagerstroemia speciosa*	Supari	*Areca catechu*
Tetul	*Tamarindus indica*	*Bakul*	*Mimosas eleng*
Eucalyptus	*Eucalyptus teritocornis*		

Fauna

Fish is still reasonably available in the subproject influence area (Branch of Meghna River, Haridoa River and ponds), given the overall and increasing scarcity of fish in the country. Small fishes, which are very popular also in overall Bangladesh, are available and caught and used widely, particularly during early monsoon and pre winter season.

The fishes include catfishes (Magur and Shing), major carps (Katla, Rui and Mrigel), minor carps (Puti), other (Tengra, Boal, Mola, Taki, Shol). Among birds, Bok, Shalik, Finger House crow, House sparrow, etc. were found during site visit. All bird is terrestrial bird species were observed within the subproject area. The common types of reptiles are found in the area, water snake, house lizard, soft-shell, turtle etc.

4.1.3 Socio-economic environment

4.1.3.1 Land use

The subproject sites are located mostly in the core area of the Pourashava and its consist of mix land use pattern includes commercials and residential. The built up infrastructure includes apartment buildings, personal homes, supermarkets, malls, government offices, NGO, Offices, hospitals, clinics, jute mill etc.

4.1.3.2 Beneficiary population

This subproject goes through the Ward number, 2 3, 4, 5, 8 and 9 .As per information by the municipality, considering the ward population about 70,000 people will benefit directly and many others indirectly.

4.1.3.3 Education

Narsingdi Pourashava has an average literacy rate of 50.9% with 52.5% for Male and 49.1% for Female (Bangladesh Bureau of Statistics, 2011).There are a few government and private schools and colleges present in the city. A notable amount of students of Narsingdi move to Dhaka for better education.

4.1.3.4 Tribal communities

This is no significant tribal population present in the Municipality. So, there is no expectation of affecting tribal communities through the sub-project.

4.1.3.5 Archeological/Historical places

No known remarkable archeological or historically important structure or sites are reported in the survey area. So, no cultural impact is expected.

4.1.3.6 Land acquisition and resettlement

The entire sub-project area is mostly owned by the Municipality and land acquisition is not needed. However, most of the sites at different location few amount road side people has encroached the Pourashava land. Prior the construction, these encroached land which is built up with boundary, semi-pucca and tin shed structures need to be cleared. The Pourashava will clear the site by amicable with the owners of the structure prior to the works. In addition, the social experts will evaluate the anticipated social issues regarding the subproject intervention and measures will be given accordingly.

4.1.3.7 Local economies such as employment, livelihood

The subproject area is inhabited by the people of mixed occupations. In the Pourashava area, major income comes from business, enterprises, small trades, private sector jobs and government jobs in the town.

4.1.3.8 Housing pattern and ownership

In the subproject area maximum people live on their own houses but a few in rented houses. As more urbanization more households will reside in the rented house in future.

5 ENVIRONMENTAL SCREENING

Environmental Screening (ES) for the subproject have been conducted with the purpose of fulfilling the requirements of GOB and WB. ES ensures that environmental issues are properly identified in terms of extent of the impacts. Environmental Screening Checklist, as adopted in Appendix C of the Environmental Management Framework of the MGSP, was administered for identifying the impacts and their extents. The screening data and information for the **BC Road, RCC Drain, RCC Pipe and allied work have** been formulated and are shown in below.

1) Potential Environmental Impact during Construction Phase:

(a) Ecological Impacts:

➢ Felling of trees	Significant □√	Moderate □	Minor □	Number of trees 279
➢ Clearing of vegetation	Significant □	Moderate □	Minor □√	
➢ Potential impact on species of Aquatic (i.e., water) environment	Significant □	Moderate □	Minor □ √	

The subproject area goes through developed mixed zone of residential, commercial and administrative area. However, for site clearing work, 6 nos. of trees at Brahmondi Mor Road, 61 numbers at Comilla Colony Road, 11 numbers at Bank Colony Road and 201 nos. of trees at Rajanigandha Mor Road to be cut down. The trees to be cut down are: Mahogony, Plum, Banyan, Eucalyptus, Shisho, Kathbadam, Jackfruits, Coconut and Jam. There will be needed few vegetation clearing work for the implementation of the subproject. There are some surface water bodies like ponds, low ditches, and khals nearby subproject area. These surface water bodies may be polluted due to accidental leakage and spillage of oil, grace etc. or throwing of waste material into the road side water bodies. Taking the amount of trees to be felled down, overall ecological impact is considered as significant.

(b) Physicochemical Impacts:

➢ Noise pollution	Significant □	Moderate □√	Minor □
➢ Air pollution	Significant □	Moderate □√	Minor □
➢ Drainage congestion	Very likely □	Likely □	Unlikely □√
➢ Water pollution	Significant □	Moderate □	Insignificant □√
➢ Pollution from solid/ construction wastes	Significant □	Moderate □√	Insignificant □
➢ Water logging	Significant □	Moderate □	Insignificant □√

The subproject sites consists of four components and it's sited at different seven location. Most of the subproject will have negative impact on the physicochemical parameter (noise and air) due to use of hydraulic excavator, mechanical compaction machine, concrete mixer machine, vibrator machine, and mobilization of the equipment, vehicles movement for the transportation of the materials. However, the potential impact on air and noise from these subproject activities is manageable because these impact are site specific and context of impact is limited. Moreover, the construction work will be performed section wise to minimize the impact. Therefore, anticipated impact on noise and air is considered as moderate. The generated construction waste like loose soil, dismantling debris perhaps disturb the nearby community people if proper measure are not taken. Additionally these generated debris may also get worse condition for the road side water bodies if not properly collected and disposed. In addition, aesthetic landscape value and surrounding environment may be degraded from the improper collection and disposal of the generated wastes materials. Generally there will be no drainage congestion or water logging because most of earth work will be performed at dry season. Even there will provision for submergible pump to drain off the water if required.

(c) Socio-economic Impacts:

➢ Traffic congestion	Very likely □	Likely □√	Unlikely □
➢ Health and safety	Significant □	Moderate □√	Insignificant □
➢ Impact on archaeological and historical	Significant □	Moderate □	Insignificant □√
➢ Employment generation	Significant □√	Moderate □	Insignificant □

Except Pourashava to Brahmondi Moar road, most of the roads are used for the few motorized vehicles movement. In addition, for all the roads there are adequate connecting and alternatives road. These roads can be used to diversify the traffic to avoid the traffic congestion. The proposed construction activities does not require use of heavy equipment and construction work will follow simple procedure with commonly used equipment. Hence, anticipated impact on health and safety is moderate. There is no archaeological and

historical site within the influence area. The subproject has positive impact by generating work opportunities for the local people.

2) Potential Environmental Impact during Operational Phase:

(d) Ecological Impacts:

- Potential impact on species of aquatic (i.e., water) environment — Significant □ Moderate □ Minor □√

During operation of road, there will be no impact on ecology. On the other hand, as the drains are designed only for the storm water, there will not be any impact on the aquatic environment if the drains are to be used properly. However, dumping of solid wastes and household wastewater directly into the drains from the households beside the drains may create pollution in the aquatic environment of the outfall by the discharge water through these drains.

- Potential air quality — Improvement □ No-improvement □ Deterioration □√
- Noise Level — Improvement □ No-improvement □ Deterioration □√
- Drainage congestion — Improvement □ √ Minor Improvement □ No Impact □
- Risk of water pollution — Significant □ Moderate □ √ Minor □
- Pollution from solid waste — Improvement □ Minor improvement □√ Minor □

During operation phase, improved and widened road may increase traffic volume. This may degrade the air quality and noise level due to black smoke emission and un-due use of hydraulic horn from the vehicles. The new drain will minimize drainage congestion and water logging problem. The storm water to be discharged through the drain may degrade the water quality of the outfall if it carries pollutants from any sources. Pollution from solid waste will be improved by restricting the throwing of the household waste material in to the drain.

(f) Socio-economic Impacts:

- Traffic — Improvement □ √ No-improvement □ Adverse □
- Safety — Improvement □ √ No-improvement □ Adverse □
- Employment generation — Significant □ Moderate □ Minor □ √

After completion, these roads will improve the transportation facilities. By providing uniform pavement, it will also enhance traffic safety. New drain will improve drainage facilities and prevent the accumulation of the stagnant water on the road surface. This will prevent formation of muddy and slippery surface on the road. Consequently, it will enhance traffic safety.

3) Summary of the Possible Environmental Impacts of the Subproject:

The ecological impact due to the subproject implementation is mainly due to felled down of the 279 trees 6 nos. of trees at Brahmondi Mor Road, 61 numbers at Comilla Colony Road, 11 numbers at Bank Colony Road and 201 nos. of trees at Rajanigandha Mor Road .Though, it is limited; however, the possible disturbances of the aquatic environment due to the discharge of the storm water which carries washed out waste material may have ecological impact. There will be temporary negative impacts on air and noise quality during construction. Solid wastes generated from the construction activities should be disposed in a designated dump site. Some earthwork will be involved; however, no agricultural productive soil will be used for the purpose. The inputs will be mainly at construction phase and limited within the subproject boundary. Moreover, mitigation measures will be taken according to the EMP for minimizing the air, dust, and noise pollution.

The socio-economic component mainly includes health and safety and employment generation. Safety concern is an important issue during both the construction and operation phases. This subproject will have positive impacts in terms of the generation of the employment and business activities by supplying construction materials and equipment.

6 SPECIFIC IMPACT, MITIGATION AND ENHENCEMENT MEASURES

The impacts, which are likely to be occurred in the different phases of the subproject, are identified in this section. In addition, evaluation of these impacts was done mentioning their origin and characteristics along with their possible mitigation/enhancing measures.

6.1 Impact Due to Subproject Location/ Preconstruction Phase

6.1.1 Loss and Displacement from Agricultural Land

Cause of Impact

There is no agricultural land involved with this subproject sites. Most of the roads goes through right way of the Pourashava. However, for road widening at different segments of the sites need to be cleared by demolishing the existing infrastructure (boundary wall, semi-pucca, and tin shed structure). Thus, there is no loss of agricultural land as well as agricultural product in the country.

Mitigation Measures

For economic development of the country, Pourashava has no option other than going for developing of road, drain infrastructure. To do so, some portion land of Pourashava would have to be cleared which is used by the encroachers. Hence, in this regard Pourashava will clear the site with the amicable with the concerned land owner. Detail mitigation for this issues has been incorporated in the SMP (Social Management Plan) report.

6.1.2 Disorder of Earth Surface

Cause of Impact

After site clearing work, to elevate the cleared land up to the existing road level a part of land filling would be required to develop the site. This land filling will be from its original level which will not disrupt the natural surface of earth and obstruct the natural drainage system of the area.

Mitigation Measure

The subproject intervention will not create any water logging and drainage problem as the Pourashava authority collects the soil to develop the area by carried sand from different places. Cross drainage works should be constructed to bypass the surface water and other discharges if required.

6.1.3 Constuction of Labour Shed

Cause of Impact

To meet the subproject basic demand, labor shed need to be constructed which will have to be constructed prior to the construction. The proposed location for the labor shed is at Pourashava owned

vacant place near rail crossing at ward no. 2. Unhygienic condition at the labor shed and generation of sewage and solid waste at the labor shed may cause degradation of the surrounding environment.

Mitigation Measures

To meet the workers basic needs labor shed will be constructed which will contains adequate ventilation facilities and standard living condition and it never be overcrowded. In addition, safe potable drinking water will be provided. Furthermore, contractor will construct two sanitary latrine considering 15 persons for one toilet at the labor shed (one for male and other for female).Proper health and safety of workers will be ensured through providing health and hygiene training to the workers by the Municipality and the contractor. Waste bins will be present at the labor shed, and the workers will be encouraged to dispose of all their garbage at the waste bins. All the waste will be collected daily and taken to the Municipality waste treatment plant at Khatiyara.

6.1.4 Ecological Impact Due to Felling of Trees and Clearing of Vegetation

Cause of Impact

Due to site clearing work for the road widening, total 279 numbers of trees need to be cut down at different sites. Beside this few amount of vegetation clearing will be needed to implement the subproject.

Mitigation Measures

558 nos. of trees will be planted to compensate the felled down trees (preferably local fruits, flowers, medicinal and ornamental trees- Mango, Jackfruit, Jam, Neem, Amloki, Horitoki, Bohera, Palash, Krishnachura, Bakul, Mahogany, Rain Tree, Koroi at both sides of the Rajanigandha Road and anywhere suitable Pourashava owned places within the influence area of the subproject. Planting trees will enhance the ecological balance of the subproject area after their successful growth.

6.2 Impact at Construction Phase

6.2.1 Earth Work and Site Clearing Work for the Site Clearing

Cause of Impact

Each development project more or less requires site preparation. The preparation works for road and drain generally done during constriction stages includes-cut and filling work, soil export or import work and demolition of the existing brick drain, damaged BC and CC road. The mentioned activities will arise the following impact- noise, generation of dust, soil erosion, drainage congestion and safety concern.

Mitigation Measures

Cutting and filling operation should be kept minimum. During earth work, will try to avoid loss of the topsoil. In addition, for backfilling work use of sand will be ensured. The subproject contractor should ensure construction of proper drainage facility. Regular water sprinkle should be ensured by the contractor to minimize elusive dust emission. Cover the exposed earth works with much fabric to minimize the dust. Moreover, proper care will be taken by the contractor during earth work and disposal work to avoid any undue disturbances to the nearby people. As a part of safe working procedures contractor should be ensured used of PPEs as per requirement. Undertaking construction work during dry seasons to minimize the water congestion. The heavy equipment should be operated at day time. The generated waste from the dismantling work will be deposed regularly and quickly in to the designated dump site of Pourashava at Shalida Madongonj which is located at ward no-9.

6.2.2 Pollution from the Construction Materials' Transportation and Storage

Cause of Impact

Lack of proper guideline for the construction material transportations, handling and storage may lead the occupational health and safety risk. On the contrary, dumping of the construction spoils, including accidental leakage of the oil, grease, and fuel in equipment yards is a significant hazard. These substances can be washed-out by the storm water and can be discharged in the surface water. Even the people to be engaged for the construction activities and local communities might endanger the physical and human habitats of the area.

Mitigation Measures

Safe transport, storage, and disposal of the construction materials, and the equipment have to be carried out in order to avoid the accidental spillage and loss and to minimize any health risk. Fuels, lubricants, and other hazardous materials should store over raised platforms and not directly on the ground. Place storage areas for fuels and lubricants away from any drainage leading to water bodies. Maintain adequate moisture content of sand during transportation, compaction and handling. Carry the materials especially loose soil and sand with adequate cover. Contractor will responsible to avoid head loads for carrying soil, construction materials and construction equipment and disposal of the wastes at the designated dump site which is at Shalida Madongonj.

6.2.3 Air Quality and Dust

Cause of Impact

The air quality in the subproject area may slightly deteriorate for the time being during construction activities. The major construction activities from which air emission mostly dust emission may occur are; unpaved road width, transportation of construction materials (especially fine aggregate), Opening-up of cement bags and empting the cement in order to mix with other construction material; black smoke

emission from the subproject vehicles and equipment's, handling of sand, stone/brick chips may contain loose dust particles. These activities will temporally disturb the nearby resident and associates construction worker by creating eye irritation, skin irritation, respiratory difficulties and difficulties of breathing. However, emissions are temporary and not expected to contribute significantly to the ambient air quality and will be within prescribed limits.

Mitigation Measures

Regular sprinkling of water to be done on open surface and dust grounds until paving is done. Maintain adequate moisture content of soil and sand for transportation, compaction, bed preparation, backfilling and handling. Avoid use of dust generating equipment which produce significant amount of particulate matter far from the local residents. Contractor will responsible to ensure that all subproject vehicles and equipment are in good operating condition. Even periodically air quality test near subproject vehicles will be performed. The subproject management and contractor to enforce strictly use of personal protective as per requirement especially face mask and proper clothing to minimize the skin irritation, respiratory difficulties and difficulties of breathing.

6.2.4 Noise and Vibration

Cause of Impact

Noise and vibration caused by the equipment (concrete mixture machine, vibrator, asphalt plant, road cutter and excavator etc.) and movement of the construction vehicles, may temporarily disturb nearby residents and the sensitive areas. In the subproject, sensitive areas like roadsides houses, shops, administrative office and educational institutes are likely to be affected from the roadside noise, though the impacts are limited to the premises and very short-term.

Mitigation Measures

Transportation of the construction materials and noisy construction work have to be carried during the scheduled times, and mainly during the day. Even transportation of construction materials have to be carried with scheduled time. Where applicable and possible exceptionally noisy machines to be fitted with noise abating gear such as mufflers for effective sound reduction. Providing suitable hearing protection to all workers exposed to noise levels where it is more than regulatory limit.

6.2.5 Water Quality

Cause of Impact

The water quality may deteriorate if the construction materials, sand, construction wastes, effluent from the work camps, and food wastes are dumped in the roadside water bodies.

Mitigation Measure

Proper construction management including waste management as well as training of the operators and other workers should provide to avoid pollution of the water bodies. In addition, construction waste will carefully remove and taken to the municipal waste plant at Khatiyara for organic waste and Shalida Madongonj for inorganic waste (not in the water bodies or lowland), for which contractor will be responsible.

6.2.6 Drainage and Impact on surface water

Cause of Impact

The potential impacts on local hydrology are mainly those of altered patterns as a result of onside construction and earthwork activities. The proposed subproject will affect natural drainage, surface and ground water quality if not managed the construction works properly. There could be siltation of water system or drainage from uncovered piles of construction materials.

Mitigation Measure

To avoid the drainage, earthwork of the subproject will mostly cover in the dry season. Additionally surface drainage shall be controlled to divert surface runoff away from the construction area. Even at construction sites pumping provision will be ensured by the contractor. Stock piling of spoil soil shall be selected at a safe distance from the drainage system. Containment of sanitary waste from camp site should be adequately disposed off to avoid surface and ground water contamination.

6.2.7 Impact on host comminutes from out sides worker

Cause of Impact

The differences in the cultures of workers (in case hiring is required) and local community may create some problems. Therefore, the unknown identity of the hired labor to the host communities has possibilities to create social crisis by involving with local politics, eve teasing or sexual abuse the campsite female worker or campsite nearby neighboring people may be affected.

Mitigation measures

The subproject proponent and his organization have practice of working with the workers of different cultures. It is recommended to aware of the out sides workers about the social & religious actability in the area so that they could maintain those when they will have touch with local community.

6.2.8 Occupational Health, Aesthetics and Safety

Cause of Impact

Construction activities lead to generation of dust, unpleasant view, obstruction in access of public properties due to excavation etc. which may have negative impact. Adequate waste management plan, air, soil, noise and water pollution controls are required to be adopted to prevent any impact on society.

Also various health hazards are associated with construction activity which may significantly impact the workers if not taken care like as mechanical failure of the equipment, traffic collision or accidents during operation of the equipment such as hydraulic excavator, steel cutter, head loads for carrying soil, construction materials and construction equipment; the sudden bad weather working conditions such as storm, thunder storm and earth quake etc, hazardous substances and wastes pose risks of the infections and diseases.

Mitigation Measures

- Provision of proper training to all workers for handling the construction equipment
- Provision of cautionary and guiding signage in local and English language indicating the hazard associated with the site
- Provision of the adequate latrines and separate toilets for the women;
- Wastewater from the toilet should be disposed off in septic tanks and soak pits and should not be allowed to accumulate at labor camp site or construction site
- Dustbins should be provided at labor camps for collection of waste and waste should be regularly disposed off through the concerned agency
- Temporary storm water drainage system should also be provided at camp site so as to drain the storm water and prevent accumulation of storm water at site and thus breeding of mosquitoes/flies
- Provision of personal protective equipment like safety jackets, helmets, gumboots, gloves, face mask, ear buds, goggles, safety shoes etc as per requirement and nature of job in which they are involved
- Job rotation should be carried out for workers exposed to high noise and dust areas
- Provision of First aid facility at the site and the labor camp
- Labor camps should be located at neat and clean location with no water logging issues
- Proper sanitation facility including toilets, bathing facility and washing facility should be provided at site and at labor camps for workers
- Clean drinking water supply should be provided to labor
- Brest feeding facility should be provided for kids if female workers are employed
- Regular inspection for hygiene and safety in labor camps should be done
- Construction debris should not be allowed to enter into aquaculture ponds located along the road
- Entrance to any road/structure should not be blocked for construction material
- Contractors will bear medical treatment costs. If any sever accidents such as loss of hands, legs or loss of working ability or any case of death needs compensation-(the amount of the compensation should be fixed considering the type of accidents).

6.2.9 Impacts on Social Environment

The positive impacts from the subproject are from the engagement of local labor force during construction works. All the positive and adverse impacts and mitigation measures for the social environment have been described in the social impact assessment (SIA) report.

6.2.10 Traffic Management

Generally, traffic congestion due to drain construction is comparatively less because drain construction work does not require closing of the entire road. In addition, Pourashava to Brahmondi is only busy for traffic movement. Remaining sites are located at residential area. So, movement of motorize vehicles is also minimum. The road side storage of material will closely monitor. Beyond these, construction of drain will restrict the free movement of the vehicles and pedestrian. However, construction work will also perform at section wise. In addition, there are adequate alternative and connecting road in the subproject area. During construction, these roads will helps to diversify the traffic which will minimize the impact on traffic. Moreover, Pourashava will inform the local people about subproject activities and inspiring them to use the alternative road.

During construction phase, interruption of the traffic movement and impact on the local traffic system due to the subproject activities will be monitored closely. Then separate traffic management plan will be provided if required. However, the following safeguard measures are recommended to minimize the impacts associated to the traffic movement:

- Inform local people about the subproject activities;
- Inspire local people to use connecting and diversion roads;
- Ensure schedule deliveries of material/ equipment during off-peak hours;
- Place traffic sign/cautionary sign to avoid undue traffic congestion and associated traffic control measures to limit possible disruption;
- The place of construction works should be fenced off with fences if required and should be isolated from general public access and marked with signs to ensure safe movement.
- At the points where traffic is to deviate from its normal path (whether on temporary diversion or part of the width of the carriageway), the channel for traffic shall be clearly marked with the aid of pavement markings, painted drums, or a similar device to the directions of the vehicles.
- At night, the passage shall be delineated with lanterns or other suitable light source.
- For regulation of traffic, the flagmen shall be equipped with red and green flags especially near at intersection.
- For notification of construction activities, at least two signs shall be put up for each road, one close to the point of carriageway begins, and another will put on the end of the carriageway.

6.3 Impact on Operation and Maintenance

Cause of Impact

Once in operation the improved roadways may be responsible for an increase in noise and air emissions from increased vehicular traffic. There will be a tendency for increasing speed because of an improved driving surface, resulting possibilities of accidents. During operation phase, the throwing of waste material into the drain and silted up of outfall by various wastes may crates water stagnant in the drain and backflow of the drain.

Mitigation Measures

To control the probable accident beater traffic management need to be ensured. As a part of traffic management improved signage and speed barker near sensitive area need to be constructed. At operation, phase drain and out fall need to be cleared as per requirement to avoid backflow of the drain.

7 ENVIRONMENTAL MANAGEMENTPLAN (EMP)

The Environmental Management Plan (hereinafter, the Plan or EMP) aims to ensure the compliance of all activities undertaken during the preconstruction, construction and the operation of this subproject with the environmental safeguard requirements of WB and the Government of Bangladesh. Furthermore, it aims at integrating the environmental components of the subproject with existing initiatives and programs in these fields. The plan consists of mitigation, monitoring and institutional measures to be taken during preconstruction, construction and operation to minimize adverse environmental impacts, offset them, or reduce them to acceptable levels.

7.1 Access to Information

The environmental assessment report should be translated into Bengali and disseminated locally. The copies of the report (both in English and Bengali) will be sent to all the concerned personnel responsible for subproject implementation. It will also be made available to the public. The final assessment report will also be uploaded in the, Narsingdi Pourashava website, BMDF website and the World Bank website after approval.

7.2 Grievance Redress Mechanism

The project-specific Grievance Redress Mechanism (GRM) will be established by the PIU of Narsingdi Pourashava to receive, evaluate, and facilitate the solution of APs concerns, complaints and grievances concerning the social and environmental performance of the subproject. The GRM is aimed to provide a time-bound and transparent mechanism to voice and resolve social and environmental concerns linked to the subproject.

The grievance mechanism is related to resolve the risks and adverse impacts of the subproject. It addresses APs' concerns and complaints promptly, using an understandable and transparent process that is also gender responsive, and culturally appropriate. It is readily accessible to all segments of the affected people at no costs and without retribution. The mechanism should not impede access to the country's judicial or administrative remedies. The affected people will be appropriately informed about the mechanism.

BMDF has its own Grievance Redress Procedure (GRP), which it operates to address any dissatisfaction and complaints by the local people regarding its activities. This procedure is being applied to address any complaints or grievances through negotiations with the community leaders and representatives of the APs during implementation of the MGSP

7.2.1 Grievance Redress Committee (GRC)

The discussions and negotiations has been conducted by the PIU of Narsingdi Pourashava and will be involved the APs and Grievance Redress Committee (GRC) headed by the Mayor of Narsingdi

Pourashava. With the facilitation of Consultant, the Mayor nominated the GRC members and included representative from the Government Agencies, local NGO, and Civil Society. The GRC has been formed and established at Narsingdi Pourashava. The grievance box will be delivered to the Pourashava to receive complaints. The grievance response focal point will be available at Pourashava for instant response to an aggrieved person. The Focal Point of GRC committees will collect the written complaints or suggestions from the box, and produce them to the GRC for hearing and resolution. The members of the committee are:

1. Md. Kamruzzaman, Mayor, Narsingdi Municipality, Chairman of GRC
2. Member of Local Administration (TBD; awaiting appointment from District Commissioner)
3. Md. Nur Hossain Bhuiyan, Headmaster, Satirpara NK Institution, Member of GRC
4. Fahima Khanam, Local NGO Official, Member of GRC
5. AHM Jahangir, President, Narsingdi Inter-District Transport Owners Association, Member of GRC
6. Yesmin Sultana, Reserved Female Councilor, Member of GRC
7. Md. Tarequl Islam, Executive Engineer, Narsingdi Municipality, Member Secretary of GRC

7.3 Grievance Resolution Process

In case of grievances that are immediate and urgent in the opinion of the complainant, the contractor and PIU on-site personnel will provide the most easily accessible or first level of contact for quick resolution of grievances.

The phone number of the PIU official should be made available at the construction site signboards. The contractors and PIU safeguard focal person can immediately resolve on-site in consultation with each other, and will be required to do so within 7 days of receipt of a complaint/grievance.

All grievances that cannot be redressed within 7 days at site will be reviewed by the grievance redress cell (GRC) headed by Mayor of the Pourashava with support from PIU designated safeguard focal person. The PIU designated safeguard focal person will be responsible to see through the process of redressed of each grievance.

The PIU designated safeguard focal person will refer any unresolved or major issues to the PMU, BMDF. The PMU of BMDF in consultation with the MD of BMDF will resolve them within 30 days.

If the appellant is still not satisfied, he or she has the right to take the case to the public courts. Narsingdi Pourashava should also publish the outcome of cases on public notice boards. All costs involved in resolving the complaints (meetings, consultations, communication, and information dissemination) will be borne by Narsingdi Pourashava.

Records of all grievances received, including contact details of complainant, date the complaint was received, nature of grievance, agreed corrective actions and the date these were effected and final outcome will be kept by PIU. The number of grievances recorded and resolved and the outcomes will be disclosed in the PMU office, Pourashava office, and on the web, as well as reported in monitoring reports submitted to WB on a quarterly year basis.

7.4 Institutional Concern Person for Environmental Safeguard Compliance

The Pourashava Officials, especially engineer in charge will be responsible for supporting the construction supervision with the facilitation of BMDF. The civil works contractors will implement the environmental mitigation measures.

The BMDF, with the help of Environmental Specialist will submit the monthly monitoring reports on Environmental Compliances to the World Bank.

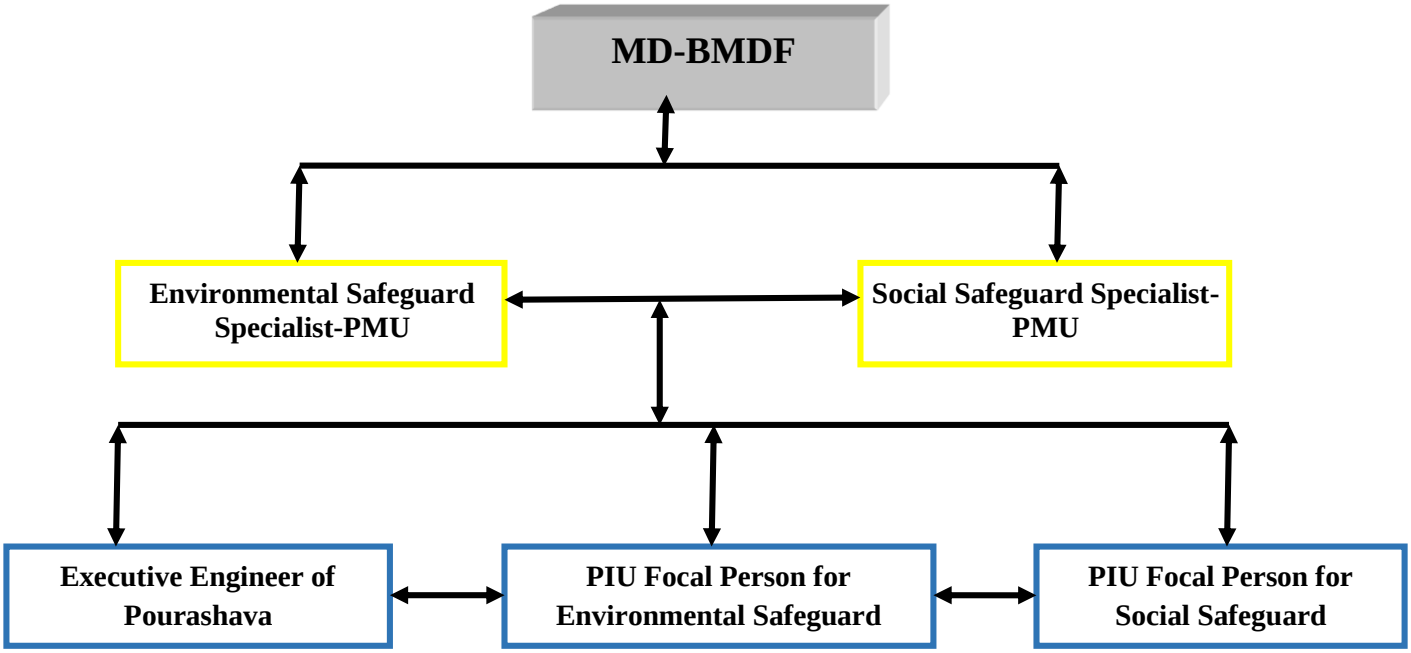

Figure 7-1: Environmental and Social Management Team (Tentative)

7.5 Capacity Building

A training program has been developed by the PMU of BMDF to build the capability of PIU of Narsingdi Pourashava. In addition, the hired consultants of Narsingdi Pourashava was also there. Under this training program PMU was organize an introductory course for the training of the Narsingdi Pourashava officials, preparing them on: (i) Environmental Screening, (ii) EMP Implementation, including environmental monitoring requirements related to mitigation measures; and (iii) taking immediate action to remedy unexpected adverse impacts or ineffective mitigation measures found during the course of the implementation. The contractor should be also included in the training program to enhance the Environmental awareness and orientation among the workers

7.6 Environmental Management Action Plan

The environmental management action plan has been outlined in ***Table 7.1.*** The mitigation measures as well as responsible parties to implement of the EMP are also incorporated in action plan.

Table 7-1: Anticipated Impacts during Construction and Corresponding Mitigation Measures with Monitoring guide line)

Activity/ Issues	Potential Impact	Proposed Mitigation &Enhancement Measure	Monitoring Method	Frequency of Monitoring	Responsible for Monitoring	
					Implement	Supervision
At Pre-construction stage						
Construction and operation of labor shed for the workers (Workforce and labor shed management)	Generation of sewage and solid waste may cause water/ environmental pollution/	• Ensure construction of the labor shed and stockyard at the designated place (Pourashava owned vacant place near rail crossing at ward no. 2.); • Construction of sanitary latrine considering 15 persons for one toilet at the labor shed and separate toilet for male and female; • Erection of "no litter" sign, provision of waste bins (introduce separate waste bins for organic and inorganic wastes); • Ensure wastes (solid wastes and other forms of the wastes) disposal at the dumping yard is located at the Shalida Madongonj which is located at ward no-9. • Ensure emptying and cleaning of the waste bins regularly; • Drum trucks are available in the Pourashava. Hence, drum truck should be used for transportation of the wastes; • Cleanliness of premises and workers living places and at the Labor Shed; • Arrangement of the proper ventilation and temperature at the Labor Shed; • Protection against dust by using masks and covering of the head and body; • Proper disposal of the wastes and effluents;	Visual Observation	Regularly	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF

	Health Hazard of Labor	• Conduct formal and unofficial discussion to increase awareness about hygiene practices among the workers; • Arrange for readily available first aid unit including an adequate supply of sterilized dressing materials and appliances • Ensure that all site personnel have a basic level of environmental awareness training. If necessary, the environmental management specialist and/or a translator shall be called to the sites to further explain aspects of environmental or social behavior that are unclear. • Comply with requirements of Government of Bangladesh Labor law of 2006 and all applicable laws and standards on worker's Health and Safety; • Provide construction workers and local people with basic information on infectious diseases including HIV/AIDS • Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal	Visual Observation	Regularly and As per requirement	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
	Possible development of labor camp into permanent settlement	• Contractor to remove labor camp at the completion of contract.	Visual Observation	End of the Construction work	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
	Outside labor force causing negative impact on health and social well-being of local people	• Ensure that contractor employ local work force to provide work opportunity to the local people and conduct formal and unofficial awareness program for the health and social well-being of the local people.	Visual Observation	Regularly	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
At Construction Stage						
General	Drainage congestion and flooding	• Ensure provision for adequate drainage of storm water, if needed;	Visual Observation	Regularly	Contractor	Primarily by PIU

construction works (Site Clearing, Earth work, Backfilling, fueling of subproject vehicles etc)		• Ensure provision for pumping of congested water, if needed; • Ensure adequate monitoring of drainage effects, especially if construction works are carried out during the wet season.				of Pourashava Secondarily by PMU of BMDF
	Air pollution	• Check regularly and ensure that all the subproject vehicles are in good operating condition; • Ensure contractor spray water on dry surfaces regularly to reduce dust generation; • Maintain adequate moisture content of soil and sand for transportation, compaction, bed preparation, backfilling and handling; • Ensure contractor sprinkle and cover stockpiles of loose materials (e.g., fine aggregates);	Visual Observation/Analytical	Regularly and Periodically	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
	Traffic congestion, effect on traffic and pedestrian safety	• Ensure schedule deliveries of material/ equipment during off-peak hours; • Avoid road side storage of the construction materials; • Place cautionary sign for the pedestrian and safety traffic movement. • Inform the local people about subproject activities and inspire them use to alternative road to avoid traffic jam. • Ensure flag man especially at road crossing • Increase workforce in front of critical areas such as institutions, establishment, hospitals, and schools.	Visual Observation	Regularly	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
	Noise pollution	• Check and maintenance the equipment properly; • Avoid using of construction equipment producing excessive noise at night; • Avoid prolonged exposure to noise (produced by equipment) by the workers;	Visual Observation/Analytical	Regularly and Periodically	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF

		• Regulate use of horns and avoid use of hydraulic horns in subproject vehicles. • Any noise generating equipment should be performed after office or school hour. • Arrange ear plugging or ear muff if noise level at the construction site is severe.				
	Water and soil pollution	• Prevent discharge of fuel, lubricants, chemicals, and wastes into adjacent water bodies and soil; • Vehicle maintenance and refueling should be confined to the designated areas with sealing to prevent the spillage of lubricants and fuels on the water bodies and soil; • Restrict disposal of any construction waste into the nearby water bodies. • Location of stockyards for construction materials shall be identified at a safe distance from watercourses.	Visual Observation/ Analytical	Regularly/ Periodically	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
	Accidents	• Conduct formal and informal discussion for creating awareness about the accident; • Provides PPEs and ensure using of the personal protective equipment by the workers. • Maintain the register to record accidental events if occur;	Visual Observation	Regularly	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
	Spills and leaks of oil, toxic chemicals	• Proper handling of lubricating oil and fuel so that it does not fall on the soil and adjacent water bodies; • Collection and disposal of spills; • Waste petro-chemicals must be properly collected, stored and not directly disposed on the ground.	Visual Observation	Regularly	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
Potential Impact of BC road Construction						
Dismantle work/ Excavation/Earth work/	Generation of solid and construction waste due to the dismantle works;	• Cover expose construction wastes and loose dry soil with fabric; • Disposal of soil and construction wastes at dumping site near Shalida	Visual Observation	Regularly	Contractor	Primarily by PIU of Pourashava

	Generation of loose soil due to the earth excavation work and earth work.	Madongonj which is located at ward no-9.				Secondarily by PMU of BMDF
IGS (improve sub grade) /sand filling	Air and dust pollution affecting nearby settlement	• Maintain adequate moisture content of the soil during construction transportation, compaction and handling; • Carry the materials especially loose soil and sand with adequate cover.	Visual Observation	Regularly	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
Setting up and operation of asphalt plant	Possible degradation of the air quality by the suspended particles and increase of the noise level from asphalt plant affecting nearby settlements.	• Locate plant away from residential settlements; • Consider use of emulsified bitumen.	Visual Observation	Regularly	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
	Possible water pollution (surface and ground water) by bitumen and solvents.	• Avoid spills and proper collection and disposal of the generated spills.	Visual Observation	Regularly	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
	Possible preparation of the bitumen in open air and using of charcoal and wood as fuel.	• Strictly prohibit bitumen preparation in the open air and use of charcoal and wood as fuel.	Visual Observation	Regularly	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
Potential impact of RCC Drain, RCC pipe drain and CC Road						
Dismantling work for site clearing and excavation work	Generation of loose and clay soil due to the earth excavation work.	• Cover exposed loose dry soil and wastes materials before disposal; • Disposal of soil and construction wastes at existing dumping site at Shalida Madongonj at ward no-9.	Visual Observation	Regularly	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
	Accidents from careless use of hydraulic excavator	• Carefully handle of the hydraulic excavator and hammer if needed.				

	and hammer if needed.					
	Possible damage of road side infrastructure due to earth excavation for drain construction.	• Ensure drum sheet palisading work for shallow depth to stabilize the structure; • Ensure plunk palisading work for shallow depth to stabilize the structure; • Bolly drive for deep depth construction works.				
	Air pollution due to black smoke emission from excavator.	• Regular maintenance of the equipment.				
Sand filling /Back filling work	Air and dust pollution affecting nearby settlement	• Maintain adequate moisture content of soil and sand during transportation, compaction and handling; • Carry the materials especially loose soil and sand with adequate cover.	Visual Observation	Regularly	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
Cutting & welding of the reinforcement for RCC work	Noise pollution due to using of rod cutter and welding machine	• Avoid using of rod cutter and welding machine at night; • Avoid prolonged exposure to noise (produced by equipment) by workers.	Visual Observation/ Analytical	Regularly/Periodically	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
	Potential health and safety risks from rod cutter and welding machine if any	• Ensure use of the personal protective equipment (helmet, goggles, gloves, safety boot); • Availability and access to first-aid equipment and medical supplies in case of any accidents.	Visual Observation	Regularly	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
RCC (reinforcement cement concrete) work	Air pollution due to black smoke emission from concrete mixer machine and vibrator machine	• Regular maintenance of the concrete mixer and vibrator machine to avoid any black smoke emission.	Visual Observation/ Analytical	Regularly/Periodically	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
	Noise nuisance from concrete mixer machine and vibrator machine	• Avoid operation of the concrete mixer and vibrator machine at night; • RCC work should be avoided at schooling time; • Inform local people about casting work and potential impacts.	Visual Observation/ Analytical	Regularly/Periodically	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
Potential impact of the Street light						

Setting up the pole and electrical connection	Potential health and safety risk	• Inform the local authority to switch off power during connection; • Ensure use of the PPEs.	Visual Observation	During setting of electric pole	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
Source of electricity and equipment	Reduce of resource i.e., use of electricity	• Provision of renewable energy (solar panel electrification)and use of environmental friendly bulb (LED bulb rather than CFL bulb)	Visual Observation	During Installation of bulb	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF

Table 7-2 Anticipated Environmental Impacts during Operation Phase and Corresponding Mitigation and Enhancement Measures

Activity / Issues	Potentials Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
Operation of the BC road	Increase in traffic speed and accidents; Increased traffic congestion due to movement of increased number of vehicles; Damage to road by movement of heavy vehicles; spillage of water to bitumen road surface.	• Better traffic management; • Control heavy traffic movement.	Primarily by Pourashava
	Increased air and noise pollution affecting surrounding areas	• Traffic management, increased vehicle inspection	
Operation of the RCC drain	Pollution of downstream water body due to disposal of polluted water from the drain	• Ensure installation of septic tank by the household people in all establishment; • Stop connecting sanitation facilities to storm drain directly.	Primarily by Pourashava
	Blockage in the drain due to disposal of solid waste/debris	• Creation of awareness, introduce SWM system and install and maintenance cover in open manholes; • Regular maintenance / cleaning of the drain; • Stop throwing of the wastes materials in to the drain by the community people.	
	Possible backflow of water due to blockage in the drain and at outfall	• Proper maintenance and cleaning of the drain and outfall on regular basis.	
Operation and maintenance for street light	Accident due to collapse of the arms, electric bulbs and poles	• Monthly checking and maintenance of the arms, switch box, electric bulbs; • Provision of automatic shut-down the switch, lamps during thunder storm and other natural disasters.	Primarily by Pourashava

	Traffic congestion, traffic problems for maintenance works	• Schedule deliveries of materials/ equipment during off-peak hours;	
	Beneficial impact on employment generation for maintenance works	• Engage local people for the maintenance activities.	

Most of the monitoring parameter evaluation will be done by visual observation except noise, air, and water quality parameter. These parameter will be monitored by analytically. Hence, analytical monitoring guideline are shown below in tabular form

Matrix Table of Monitoring Plan(Analytical Monitoring during construction phase)

Monitored Parameter/ Issues	**Monitoring Method/Key Aspects**	**Location of Monitoring**	**Period & Monitoring Frequency**
Noise level measurement	• Through digital instruments	• Sub-project site	• Two times at construction phase; • Reporting: Once in a month and immediately after measurement
Ambient air quality/ Stack Emission	• Visually-black smoke; • Sampling; • Analysis at laboratory; • Data analysis of merits determination by using quality standards; • Through digital instruments.	• Sub-project site	• Two times at construction phase; • Reporting: Once in a month and immediately after measurement
Waste Water quality	• Sampling; • Analysis at laboratory; • Data analysis of merits determination by using quality standards.	• At intake and outfall	• Two times at construction phase; • Reporting: Once in a month and immediately after measurement

7.7 Environmental Safeguard Cost during Construction Phase

Considering the environmental impacts and their mitigation measures for these subprojects, several items are included in the BOQ to address these issues. The estimated cost to implement the EMP is elaborated in ***Table*.7-6**

Table 7-3: Environmental Management Budget

Item No.	Description of the Items	Costs (Tk)
1	Establishment of labor camp (male shed - 15 ft x 30 ft and female shed 12 ft x 15 ft1) with living arrangement, drinking water facilities, cooking arrangement, mosquito net,, waste bin etc.	200,000.00
2	Masonry pucca platform (at least 100 sft size), providing brick soling and net cement finishing for keeping fuel and lubricants for machineries.	15,000.00
3	Dust suppression measures by water spraying in and around the subproject site, uncovered aggregates and loose materials such as stoke files of the roadside excavated earth etc. (lump sum)	60,000.00
4	Noise level measurement. It can be measured from the pre-approved public institute/ university two times during construction phase @Tk. 1,000.00 per measurement (3*7,000.00 Tk) and **one time after construction**	21,000.00
5	Air quality (SPM, PM10, and PM 2.5) measurement- it can be measured from the recognized environmental survey company, public institute/ university two times during construction phase and **one time after construction**	90,000.00
6	Water quality(pH, NH_3, BOD_5, COD, TDS,)- it can be measured two from the recognized environmental survey company, public institute/ university one times during construction phase and **one time after construction(**2*5*10000**)**	100000.00
7	Temporary camp site waste disposal facility: 2nos. (1no. of the organic waste and 1 nos. of the inorganic waste disposal facility) @Tk.20,000.00 (2*20,000.00 Tk)	40,000.00
8	Water supply (at the labor sheds):1nos. of tube well	60,000.00
9	Sanitation facilities (at the labor sheds): 3nos. of the toilets preferably portable toilets (1 no. for women and 2nos. for men) @ 20,000.00 (3* 20,000.00 Tk)	60,000.00
10	Providing safety gear packages like hand gloves, spectacles for eye protection, helmets, masks, ear plug, visible jacket, rubber shoes for 35 persons where 25 for workers and 10 for visitor (35*3,000.00Tk.) and one first aid box (1*2,500.00Tk)	107,500.00
11	Tree plantation for ecological enhancement work- preferably local fruits, flowers, medicinal and ornamental trees- (including protection and conservation during project defect liability period) 558 nos. of the trees @Tk 1,000.00 per tree (558* 700.00)	390600.00
	Total	**11,44100.00**

8 PUBLIC CONSULTATION AND PARTICIPATION

8.1 Methodology

Public consultation is one of the key components of the environmental assessment. The EA team conducted public consultations in the study area. The approach involved a mix of conventional as well as participatory, focus group discussions (FGD) and one-to one interviews. Public consultations were held during the site visit on 3rdMarch, 2018. For better understanding the socio-economic and environmental condition three focus group discussion has been conducted in the subproject study area(***Figure 8-1***).

Figure 8-2: Public consultation with local individuals, Pourashava officials and Pourashava male and female councilor at subproject sites.

The public consultations were conducted with the following objectives: (i) to intrude awareness of the stakeholders about the subproject and to collect their opinion, suggestions for planning and designing of the subproject (ii) to identify the need and concern of the public, (iii) to assess cultural patterns and behavior of local communities. Stakeholder consultation, was targeted at people/communities who may – directly or indirectly,

positively or negatively- be affected by the outcomes of a subproject. The consultations were conducted at two different tiers of stakeholders: local people and Pourashava Officials.

8.2 Issues Raised by the Participants

For the better traffic operation in the subproject area and to respite from water logging problem, subproject area peoples are highly interested about this subproject. They also said, they would help the Pourashava to implementing the subproject activities.

The participants raised the issues related to the infrastructure development of Narsingdi Pourashava. They emphasized on the subproject selection for the future development and also discussed about the procedure for the quality construction work. In the FGD, the participants discussed the requirements for the Pourashava future development through a list of the subprojects. The Key participants list of Focus Group discussion in the subproject study area is attached in the Appendis-2.

8.3 Feedback, Suggestions, and Recommendations of the Participants

The participants' feedback, suggestions, and recommendations from FGD can be cited:

- ✓ All the proposed infrastructure implementation is needed for Narsingdi Pourashava, all will provide benefit, no major environmental concern
- ✓ People expect employment generation for them from upcoming project
- ✓ All development works are essential but sound design and construction is necessary so that they are not affected by environmental pollution.
- ✓ Most of the participants expressed that the number of subprojects that have been selected for each financial year is not adequate.
- ✓ The participants also addressed the solid waste management issue to reduce environmental and public health hazards.
- ✓ Major problem is drainage congestion, less cleaning, drains are filled with solid waste
- ✓ The causes of water logging problem is mainly the inadequate drainage network, seasonal sub-mergence, clogging due to garbage dumping
- ✓ Special safety measures should be taken to avoid land subsidence due to heavy construction activities
- ✓ Flooding and water logging both affect access to key activities
- ✓ Traffic management is important
- ✓ During construction period public safety and workers' safety is important
- ✓ Noise and air pollution is required to be controlled

9 CONCLUSIONS AND RECOMMENDATIONS

9.1 Conclusions

Environmental impacts of the proposed road and drainage subproject have been assessed. The overall conclusion is that if the mitigation, compensation and enhancement measures are implemented in full, there should be no significant negative environmental impacts as a result of location, design, construction or operation of the subproject. Major improvements in quality of life and public welfare will result once the scheme is in operation.

9.2 Recommendations

Recommendations made for the subproject development on the basis of EA study are given below:

- Proposed environment management plan should be implemented strictly both during operation and construction phase of the project
- Compensatory plantation should be carried out for trees to be fell for off-site development minimum in ratio of 1:2
- Suggestions & requests made by public for water supply and employment shall be taken into consideration.
- Proper training of maintaining environment, health and safety should be given to subproject management unit in both construction an operation phase
- Environmental monitoring should be conducted as proposed in environment management plan

10 REFERENCE

- Web Site: Narsingdi Pourashava **http://www.Narsingdi**Pourashava.gov.bd/;
- Environmental Assessment Volume 1: Overall Environmental Assessment [Draft Final Report], September 2013.Municipal Governance and Services Project (MGSP), Local Government Engineering Department (LGED) and Bangladesh Municipal Development Fund (BMDF), Ministry of Local Government, Rural Development and Cooperatives, Government of the People's Republic of Bangladesh;
- Environmental Assessment Volume 2: Environmental Management Framework (EMF) [Draft Final Report], September 2013. Municipal Governance and Services Project (MGSP), Local Government Engineering Department (LGED) and Bangladesh Municipal Development Fund (BMDF), Ministry of Local Government, Rural Development and Cooperatives, Government of the People's Republic of Bangladesh;
- Geological Survey of Bangladesh, 1978. Earthquake Zoning Map;
- Bangladesh Meteorological Department, Flood Zoning Map;
- Population and Housing Census, 2011, National Volume-II: Union Statistics.

APPENDIX

Appendix 1: List of the Participants

P.2

Name of Subproject: RCC drain CC road Repater Adam Ali house to Mojid Mead house (97) (cip-07). BC road pipe drain (cip-06) - 350m. RCC drain uttar ... moar, Comilla Colony CC road Bank colony UMC Juti mill, Dattapara.

Package: 03.

Name of ULB : Narsingdi Pourashava Upazila: Nasingdi Sadar

District : Nasingdi Date : 03/03/2018.

Attendance of Local Participants in the Screening Exercise

Local Stakeholders, Community Members and WLCC/CBO

SL#	Name	Gender	Social Status	Contact Number	Signature
০১	মো: [illegible]		জনগণ	01854416554	[illegible]
02	[illegible]		গৃহিনী	01764480576	[illegible]
৩	[illegible]		[illegible]	01929615861	[illegible]
৪	[illegible]		গৃহিনী	01727251875	[illegible]
৫	[illegible]		গৃহিনী	01752329361	[illegible]
৬	[illegible]		গৃহিনী	01684793693	[illegible]
৭	মো: [illegible]		[illegible]	01[illegible]208877	[illegible]
৮	[illegible]		জনগণ	01746031765	[illegible]
৯।	[illegible]		[illegible]	01916271712	[illegible]
১০	[illegible]		জনগণ	01738100515	[illegible]
১১	মো: [illegible]		জনগণ	01[illegible]7591	[illegible]
১২	[illegible]		[illegible]	01711317575	Fahmida
১৩	[illegible]		জনগণ	01914813674	[illegible]
১৪	[illegible]		[illegible]	01781515642	হাবিবা

(Anukul Chandra Das)
Sub-Asst. Engineer
Narsingdi Pourashava

03/03/2018
মোঃ রিপন সরকার
নরসিংদী পৌরসভা

মাহাবুব আলম ভূঞা
কাউন্সিলর
ওয়ার্ড নং-০৯
নরসিংদী পৌরসভা।

03/03/18
(Md. Shahed Akhter)
Assistant Engineer
Narsingdi Pourashava

Name of Subproject: Construction of Recdrain, cc road, repair house RCC road pipe drain, comilla colony road, upz [illegible] road, UMC Jute mill & [illegible]

Package: BMJF/NARSINGDI/2017-18/W-03.

Name of ULB : Narsingdi Pourashava Upazila: Nasingdi Sadar

District : Nasingdi Date : 03/03/2018

Attendance of Local Participants in the Screening Exercise

Local Stakeholders, Community Members and WLCC/CBO

SL#	Name	Gender	Social Status	Contact Number	Signature
১৫	[illegible]		জনগণ	01728271592	[illegible]
১৬	[illegible]		[illegible]	01675841806	[illegible]
১৮	[illegible]		[illegible]	01954512553	[illegible]
১৯	[illegible]		গৃহিণী	01766709857	সুমিত্রা
২০	মো: [illegible]		চাকুরী	01720864765	[illegible]
২১	[illegible]		জনগণ	01740231893	[illegible]
২২	[illegible]		জনগণ	9988289244	রতন সাহা
২৩	ঝুমা		[illegible]	01912227837	Jhuma
২৪	[illegible]		কৃষি	—	[illegible]
২৫	মো: আবু হানিফ মিয়া		জনগণ	01933798232	মো: আবু হানিফ
	মো: [illegible]		[illegible]	0195399043	[illegible]
	মো: [illegible]		[illegible]	01635317226	[illegible]
	[illegible]		[illegible]	01718532902	[illegible]
	মো: [illegible]		ছাত্র	01911900721	[illegible]

(Anukul Chandra Das)
Sub-Asst. Engineer
Narsingdi Pourashava

মোঃ রিপন সরকার
নরসিংদী পৌরসভা

মাহাবুব আলম ভূঞা
কাউন্সিলর
ওয়ার্ড নং-০৯
নরসিংদী পৌরসভা।

030318

(Md. Shahed Akhter)
Assistant Engineer
Narsingdi Pourashava

Name of Subproject: Construction of RCC drain, CC road, Topatu house RCC road pipe drain, Comilla Colony road, UPZ Kenjore, Ume Juli mill e Ballybhoe

Package: BMBF/NARSINGDI/2017-18/W-03.

Name of ULB : Narsingdi Pourashava Upazila: Nasingdi Sadar

District : Nasingdi Date : 03/03/2018

Attendance of Local Participants in the Screening Exercise

Local Stakeholders, Community Members and WLCC/CBO

SL#	Name	Gender	Social Status	Contact Number	Signature
১৫	[illegible]		[illegible]	01728271592	[illegible]
১৬	[illegible]		[illegible]	01675841806	[illegible]
১৭	[illegible]		[illegible]	01954512553	[illegible]
১৯	[illegible]		[illegible]	01761709857	[illegible]
২০	[illegible]		[illegible]	01720864765	[illegible]
২১	[illegible]		[illegible]	01740231893	[illegible]
২২	[illegible]		[illegible]	9988289244	[illegible]
২৩	[illegible]		[illegible]	01912227837	Jhuma
২৪	[illegible]		[illegible]	—	[illegible]
২৫	[illegible]		[illegible]	01933798232	[illegible]
	[illegible]		[illegible]	0195399043	[illegible]
	[illegible]		[illegible]	01635317826	[illegible]
	[illegible]		[illegible]	01718532902	[illegible]
	[illegible]		[illegible]	01911900721	[illegible]

(Anukul Chandra Das)
Sub-Asst. Engineer
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