Government of the People's Republic of Bangladesh
Ministry of Local Government, Rural Development and Co-operatives
Local Government Division
Local Government Engineering Department (LGED)

City Region Development Project (CRDP)
ADB Loan No. 2695-BAN

Environmental Safeguards Assessment
Initial Environmental Examination (IEE) Report

WATER SUPPLY, SANITATION AND DRAINAGE SUBPROJECT
DRAINAGE COMPONENT
Package Nos: CRDP/LGED/GCC/GAZIPUR/NCB/2012/W-01
And CRDP/LGED/GCC/GAZIPUR/NCB/2012/W-02
Gazipur City Corporation

August 2013

CURRENCY EQUIVALENTS

(as of 31 March 2013)

Currency unit	–	BDT
BDT 1.00	=	$ 0.0127
$1.00	=	BDT 79

ABBREVIATIONS

ADB	–	Asian Development Bank
CEO	–	Chief Executive Officer
CDIA		Cities Development Initiative for Asia
CRDP	–	City Region Development Project
DOE	–	Department of Environment
EARF	–	Environmental Assessment and Review Framework
ECR	–	Environmental Conservation Rules
EMP	–	Environmental Management Plan
GCC	--	Gazipur City Corporation
GRC	–	Grievance Redress Committee
GRM	–	Grievance Redress Mechanism
IEE	–	Initial Environmental Examination
KCC	–	Khulna City Corporation
KCPA	–	Khulna City Planning Area
KMP	–	Khulna Master Plan
LGED	–	Local Government Engineering Department
LGI	–	Local Government Institution
MDSC	–	Management, Design and Supervision Consultant
NGO	–	nongovernment organization
NOC	–	no objection certificate
O&M	–	operations and maintenance
PIU	–	Project Implementation Unit
PMCU	–	Project Management Coordination Unit
RCC	–	Reinforced Concrete Construction
ROW	–	right of way
RPM	–	respiratory particulate matter
RSS	–	resettlement support staff
SPS	–	Safeguard Policy Statement
SWM	–	Solid Waste Management
UTM	–	Universal Transverse Mercator (coordinate)

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I. INTRODUCTION

A. Background

1. The Government of Bangladesh (GOB) has undertaken the City Region Development Project (CRDP) (the Project) with financial assistance from the Asian Development Bank (ADB) (Loan No. 2695-BAN) together with co-financing from KfW. The CRDP emphasizes economic growth in Dhaka and Khulna city regions of Bangladesh through (i) creation of an enabling environment towards improved governance and capacity building of the local governments, and (ii) prioritized investments in infrastructure sectors in the two regions. The objectives of CRDP are: (i) to improve the regional economic and social context through long-term development plans and investment programs, set within an institutional and regulatory context that will ensure implementation and review; (ii) to improve the capacity and mandate of local government to govern and to invest in improved economic activity at local level; (iii) to improve the economic context for sustainable commercial and industrial growth; and (iv) to meet the economic and social needs of the urban population, as an inclusive aspect of the CRDP. The Project is active in the following City Corporations: Dhaka City Corporation (North), Dhaka City Corporation (South), Narayanganj City Corporation, Gazipur City Corporation and Khulna City Corporation; pourashavas are: Tarabo, Sonargaon, Kanchon, Narshingdi, Kaliakoir, Singair, Manikgonj, Savar, Jessore, Jhikargacha, Mongla Port, and Nowapara, as well as in 36 smaller urban centers (in upazilas) of Dhaka and Khulna City Regions.

2. The Project is formulated to provide opportunities for replication of subprojects in other Local Government Institutions (LGIs) within the identified city regions. The initial environmental examination (IEE) for the proposed Water Supply, Sanitation and Drainage Subproject: Drainage Component conforms to the requirements of the Environmental Assessment Review Framework (EARF) prepared under the Project Preparation Technical Assistance (PPTA), and complies with Government environmental rules and the Safeguard Policy Statement (2009) of the Asian Development Bank (ADB).

B. Purpose of the IEE

3. The purpose of the IEE is to describe the assessment of environmental impacts due to the Subproject and to specify measures to address impacts. This is an update of the Gazipur Water Supply Sanitation and Drainage IEE prepared during the PPTA, focusing on the drainage component only. The IEE is based on information obtained during detailed design, a review of the previous IEE; subproject site plans; a field visit; and secondary data to characterize the environment and identify potential impacts. It contains the results of interviews and consultations with stakeholders. The IEE includes an environmental management plan (EMP) outlining mitigation measures and monitoring requirements. Environmental specifications will be included in procurement documents to support integration of provisions into construction.

4. The Subproject takes place within the built up environment of Gazipur City within the area passing by Dhaka-Mymensingh National Highway and the Dhaka-Mymensingh railway line that connects to the northern part of the country. It involves construction of rectangular reinforced concrete construction (RCC) drains of varying sizes along streets, roadways, and back lanes; top slabs as footpaths and with load bearing strength in the city area. The work aims to improve drainage conditions within the city.

5. The subproject will be implemented by the Gazipur City Corporation (GCC), which is owner in the Gazipur City Corporation. LGED and the MDS Consultant maintain offices at LGED Bhabon, Dhaka to support the Drainage component of Water Supply, Sanitation and Drainage Subproject and other components taking place within Gazipur City Corporation.

C. Environmental Regulatory Compliance

6. Government of Bangladesh. The provisions for environmental protection and pollution control in Bangladesh are contained in the Environmental Conservation Rules (ECR) 1997. This legislation also provides the principal mechanism for assessing and mitigating the environmental impacts of projects. Projects are classified as green, orange, or red. Roadway and drainage improvements under the Subproject are categorized as Orange B category projects, in accordance with Schedule 1 of the ECR. The Department of Environment (DoE) has granted an Environmental Clearance Certificate (ECC) to the CRDP that applies to all subprojects with the exception of those in the Red Category (water treatment plants and distribution line laying/relaying/ extensions, sanitary landfills, and bus and truck terminals), by means of a letter No. DOE/Clearance/5194/2013/180 dated 21/07/2013.

7. Asian Development Bank. ADB categorizes projects as A, B or C depending on severity of impact and level of required environmental assessment, a process that is extended to subprojects. The Subproject has been categorized as B, necessitating preparation of an IEE with elements consistent with the ADB SPS: an EMP describing specific mitigation measures to be taken during construction and operation, monitoring and reporting requirements and procedures; requirements for information disclosure; the result of public consultations undertaken during subproject preparation; and a description of the grievance redress mechanism established under the Project.

8. The IEE report is prepared by the Project Management and Coordination Unit (PMCU) for review by the ADB. Reporting on the findings of subproject IEEs will be made available by ADB via the depository library system and the ADB website.

II. DESCRIPTION OF THE PROJECT

A. Subproject Scope and Components

9. The subproject aims to improve existing problems related to drainage, waterlogged areas in Gazipur City. Construction of roads / footpaths follows on the traditional and appropriate approach of combining drainage channels and pedestrian arteries. In nearly all cases the proposed works are replacements of existing degraded and undersized drainage features extension of primary drain or construction of secondary or tertiary drain to connect primary drain which was constructed in UGIIP. All these component of works have been taken from Gazipur Drainage Master Plan done by UGIIP. The drainage improvements to be installed under the subproject are listed in Table 1.

Table 1: Gazipur City Drainage Component Improvements

Package	Lot	Description	Total Length (m)
CRDP/LGED/GCC/GAZIPUR/NCB/2012/W-01	DW-01	a) Construction of RCC drain start from Shibbari to Fishery Bhabon (Ch. 00 - 800m); b) Construction of RCC Drain starts from Shibbari to Laxmipura (Rest Portion) (Ch.00 - 1690m)	2,490
	DW-02	a) Construction of RCC Drain start from Gazipur Bus Terminal to Railway Bridge (west side of the road) (Ch.00 - 870m); b) Constructions of RCC Drain start from BMTF High School to Railway Borrow pit (west side of the road) (Ch.00 – 1629)	2,499
	DW-03	a) Construction of RCC Drain from Left side of Shahid Srity School via Chandra Cinema Hall road newly constructed UGIIP drain (Ch.00-531m) b) Construction of RCC Drain Starts from south of the Shahid Srity School road Lakkhipara to Chandra Cinema Hall (Ch.00 - 660m) c) Construction of RCC Drain Starts south of the Shahid Srity School road Lakkhipara to Box Culvert (Ch.00 - 193m)	1,384
	DW-04	a) Construction of RCC Drain starts from Shibbari Afaz bhabon to Hospital road bridge via Rail Bridge (Ch.00 - 985m)	985
	DW-05	a) Construction of RCC drain start from Bottola mour to Railway Bridge (East Side of the road) (Ch.00 - 500m) b) Construction of RCC drain start from BMTF High School to Railway Borrow pit (East Side of the road) (Ch.00 - 1952m) c) Construction of RCC drain start from Bilashpur Mosque to Railway Borrow pit (Ch.00 - 600m)	3,052

Package	Lot	Description	Total Length (m)
	DW-06	a) Construction of RCC Drain start from Nur General Store to Harinal road Box Culvert via Zorpukur (Ch.00 – 533m); b) Construction of RCC Drain start from Nur General Store to Shasan Ghat Bridge (Ch.00 – 526m); c) Construction of RCC Drain start from Shahid Waliullah road UGIIP drain to Chirni khal (Ch.600 - 889m) d) Construction of RCC Drain start from Shasan road to Kali Sikdar Ghat (Ch.00 - 338m) e) Construction of RCC Drain start from Gias house to Zorpukur Shasan road at Sunu mia house (Ch.00 - 350m) f) Construction of RCC Drain start from Nuru mia house to Khan villa (Ch.00 - 62m) g) Construction of RCC Drain start from Nuru mia house to Zorpukur Shasan road UGIIP drain (Ch.00 - 64m)	2,162
CRDP/LGED/GCC/GAZIPUR/NCB/2012/W-02	DW-07	a) Construction of RCC drain start from Zorpukur Mosque to Joydevpur Pubail road via A.K.M Mozammal Hoque MP'S house (Ch.00 - 331m) b) Construction of RCC drain start from Dr. Lutfar Rahman's house to Madhobbari road via Alauddin's house (Ch.00 - 250m) c) Construction of RCC drain start from Shohel's Shop to Bangalgas Bridge (Ch.00 - 300m) d) Construction of RCC drains in Ordinance Factory Gazipur (Ch.00 - 1134m)	2,015
	DW-08	a) Construction of RCC Drain start from Alya General Store via Bilaspur road to Bankers road to UGIIP Drain (Ch. 00 - 700m) b) Construction of RCC Drain start from H/O Mr. Samur to Momtaz Mohila Madrasha (Ch.00 - 90m) c) Construction of RCC Drain start from East Chandana Madrasa mour to Kazipara Khal (Outfall-1) (Ch.00 - 260m) d) Construction of RCC Drain start from East Side of Dhirassam road East Chandana Madrasa more to North Side of Graveyard side Khal (Outfall-2) (Ch.00 - 474m) e) Construction of RCC Drain start from West Side of Dhirassam road Existing drain to Graveyard side Khal (Outfall-2) (Ch.00 - 291m) f) Construction of RCC Drain start from East Side of Dhirassam road from Zilla Parisad Pond more to Graveyard side Khal (Outfall-2) (Ch.00 - 208m) (Link) g) Construction of RCC Drain start from West Side of Dhirassam road from Zilla Parisad Pond more to Graveyard side Khal (Outfall-2) (Ch.00 - 200m) (Link-1) h) Construction of RCC Drain start from West side of Pourashava Gate to Zilla Parisad Pond more (Outfall-3) (Ch.00 - 193m)	2,416
	DW-09	a) Construction of RCC Drain start from BIDC road to West Bhurulia Jonokallayan Office along Abul Hossain road (Ch.00 - 568m) b) Construction of RCC Drain start from BIDC road to Raij Uddin on North Side of DUET (Ch.00 - 358m) c) Construction of RCC Drain start from Shahid Raishuddin road to BIDC road via Talukdarpara (Ch.00 - 937m)	1,863

B. Description of Improvements

10. The environmental staff of the PMCU along with Sub-Assistant Engineer, GCC visited and inspected subproject improvements, which provides the basis for the following descriptions. Photographs of representative installations illustrate the basic purpose and issues at stake.

11. Lot 1 (under Package 1) consists of a 1000-1650 mm wide rectangular drain that will pass by the side of Gazipur Chowrasta and extend to Pourashava Road. The proposed alignment for Lot 1a is on the opposite side of the road from the Bangladesh Rice Research Institute and starts from Shibbari at the existing newly constructed drain. Surface water comes from the rice fields of the research institute and crosses the road, passing through an existing earthen canal to the Railway Borrow Pit via the newly constructed Primary Drain completed under UGIIP. The other drain (Lot 1b) consists of a 1500-2000 mm wide rectangular drain that will start from Shibbari and run west to connect another primary drain at Laxmipura that was constructed under UGIIP, ending also at the Railway Borrow pit. Current conditions along these alignments and the existing point of discharge are shown in Figure 1. These conditions are representative of numerous locations in the project area.

Figure 1: Existing Conditions at Interventions Lot 1

a) Proposed Drain will start here (Existing Drain)	Surface water coming from BRRI Rice research field area
	
End point of Lot 1.a	b) Existing earthen canal flowing discharge
	

12. Lot 2 (under Package 1) consists of a 1000 mm wide rectangular drain (Lot 2a and b) constructed in a densely populated area where there is currently no drain along the west side of the road. Houses and shops suffer from standing water. Surface runoff cannot discharge smoothly due to blockage from the road. The proposed drains with footpath will improve drainage and facilitate easy movement of pedestrians. The outfall of both drains will be to the Railway Borrow Pit. Current conditions along these alignments and the existing point of discharge are shown in Figure 2.

13. Lot 3 (under Package 1) consists of three drains that are situated in the same area and adjacent to each other. These will be 600-800 mm wide rectangular drains installed along roadways in a generally sparsely populated commercial and institutional area. These drains will discharge to the newly constructed UGIIP drain that serves as the main drain. All

these are tertiary drains by the side of existing roads. The roads are comparatively narrow, about 4.00—5.00m and also congested with vehicular movement. Standing water in the roadways during the monsoon is the common phenomena in this area. Due to the narrow width of the roads, a load bearing top slab will be provided to support traffic loads. Current conditions along these alignments and the existing point of discharge are shown in Figure 2.

Figure 2: Existing Conditions at Interventions Lot 2 & 3

Lot 2.a: Proposed Drain alignment	Lot 2.b: Proposed Drain alignment
	
Railway Borrow Pit	Lot 3: Existing road condition
	

14. Lot 4 (under Package 1) consists of a 3000-4000 mm wide rectangular open drain that starts from Shibbari Afaz Bhabon near the railway station. It is the continuation of a main drain constructed under UGIIP. The first portion of the drain runs parallel to the Gazipur-Dhaka railway line at the western side. The drain crosses a railway bridge at Ch. 0+380m from the starting point. It also crosses Dhirasram road bridge at Ch. 0+635m and descends to Gazipur Hospital road bridge and finally to the Turag River. The drain will pass through low marshy land that remains submerged during the monsoon, and may require special design considerations for the foundation through this area. Some portion will pass by the side of the BRRI area and another length will pass between paddy lands. This drain will be the core drain of the town and also a main drain for removing water logging and improvement of drainage system of the city. The proposed drain will be constructed with RCC rectangular sections with provision for recharging ground water in the canal bed, including weep holes at drain walls with filter materials. The RCC rectangular section is proposed as there is a limitation in right of way width. Necessary box culverts and cross drains have been provided in the design. Current conditions along these alignments and the existing point of discharge are shown in Figure 3.

Figure 3: Existing Condition of Interventions Lot 4

Starting point of the proposed drain (End point of Existing UGIIP Drain)	Drain alignment by the side of BRRI area
	
Drain alignment view from Hospital Road Bridge towards west	Drain alignment view from Hospital Road Bridge towards east
	

15. Lots 5a and b (under Package 1) consist of 1200 mm wide rectangular drains with top slabs that will act as footpaths starting from Bottola Mour to the Railway Bridge and BMTF High School to Railway Borrow Pit, respectively. There is an earthen canal from Bottola Mour to the Railway Bridge and water cannot flow smoothly, causing standing water

in the surrounding area during rains. This drain will discharge to a khal at the Railway Bridge. The other drain (5b) originates at the Ordinance Factory area and runs to the Railway Borrow Pit, but has insufficient sections of brick masonry drain. This section cannot drain out the rain water during the rainy season causing serious standing water in the surrounding area. A RCC rectangular drain will be installed with cover slab that will act as a footpath. Designs of these drains provide openings through steel grating for drop inlets from the road and houses, and will minimize standing water in the area. Another drain (5c) consists of a 600-800 mm wide rectangular section with load bearing cover slab. This drain will serve as a side drain along the road passing through a densely populated area where the road width is narrow. Current conditions along these alignments and the existing point of discharge are shown in Figure 4.

Figure 4: Existing Condition of Interventions Lot 5

Lot 5.a: Bottola Mour to Railway Bridge	Lot 5.b: BMTF to Railway Borrow Pit
	
Lot 5.c: Bilashpur Mosque to Railway Borrow Pit	Out Fall to Railway Borrow Pit
	

16. Lot 6 (a, b, c, d, e, f, and g) under Package 2 consists of 600-800 mm wide rectangular drains with top slabs that serve as footpaths and in some cases load bearing where road widths are narrow. These drains will be at the side of existing roads that pass through densely populated areas. Residential and commercials buildings are in surrounding areas. In some road alignments, drains are constructed on the opposite side by UGIIP. Without drains in the other side (and in some cases no drain on either side) standing water occurs during rains. All these drains will be secondary or tertiary drains and will connect to existing primary drains or to a defined outfall. RCC rectangular drains will be constructed with cover slabs to act as footpaths. Design of these drains provide openings through steel grating for incoming water from road surfaces and surrounding areas, and will minimize standing water in the surrounding area. Surfaces of drains will be designed as load bearing slabs. Current conditions along these alignments and the existing point of discharge are shown in Figure 5.

Figure 5: Existing Condition of Interventions Lot 6

Lot 6.b:Nur General Store to Shashan Ghat	Lot 6.e: Giasuddin House to Shashan road
	
Lot 6.d: Shashan road to Kali Sikder ghat	Existing Out Fall done by UGIIP
	

17. Lot 7 (a, b, c and d) under Package 2 consists of 600 mm wide rectangular drains with top slabs that act as footpaths and for three of them provide load bearing strength where road widths are narrow. These drains will be at the side of existing roads that pass through densely populated areas surrounded by residential and commercial buildings. On some road alignments, drains have been constructed on one side by UGIIP. Without drains on the other side (and in cases no drain on some roads) standing water occurs during the monsoon. Lot 7.d drain is located along the perimeter of the Bangladesh Ordinance Factory. There are 11 drainage outlet points in the area. Internal drainage is good due to sufficient drains. When heavy rain occurs over a long duration rain water cannot move out due to insufficient lined drains outside the factory area. In order to improve the drainage condition in the ordinance factory, the drains at DP-01,DP-05, DP-08, & DP-09 will be constructed up to outlets running along the existing khals and pipe drains. RCC rectangular drains will be constructed with cover slabs to act as footpaths. Designs provide openings through steel grating for incoming water from road surfaces and surrounding areas. Some slabs are load bearing where located in narrow roadways. Current conditions along these alignments and the existing point of discharge are shown in Figure 6.

Figure 6: Existing Condition of Interventions Lot 7

Lot 7.a:Zorpukur Mosque to Pubail road	Lot 7.b: Dr. Lutfar Rahman House to Madhobbari road
	
Lot 7.c: Shohel's Shop to Bangagas Bridge	Lot 7.d: Outside the Ordinance Factory
	

18. Lots 8 & 9 (under Package 2) consist of 400-900 mm wide rectangular drains with top slabs that act as footpaths and have load bearing strengths where road widths are narrow. Drains run alongside existing roads that pass through densely populated areas with residential and commercials buildings. In some road alignments, drains have been constructed in one side by UGIIP. Without drains on the other side (and no drain in some roads) standing water occurs during the monsoon. All these drain will be secondary or tertiary and will connect to existing primary drains or to defined outfalls. RCC rectangular drains will be constructed with cover slabs to serve as footpaths, steel grating for incoming water from road surfaces and surrounding areas, with some slabs load bearing. Current conditions along these alignments and the existing point of discharge are shown in Figure 7.

Figure 7: Existing Condition of Interventions Lot 8 & 9

Lot 8.d:Dhirassam road East side of road	Lot 8.f: Zilla Parisad Pond to Graveyard
	
Lot 9.a: BIDC road to Janokallayan office	Lot 9.c: Raishuddin road to BIDC road
	

Figure 8:- Gazipur Sadar Upazila Map

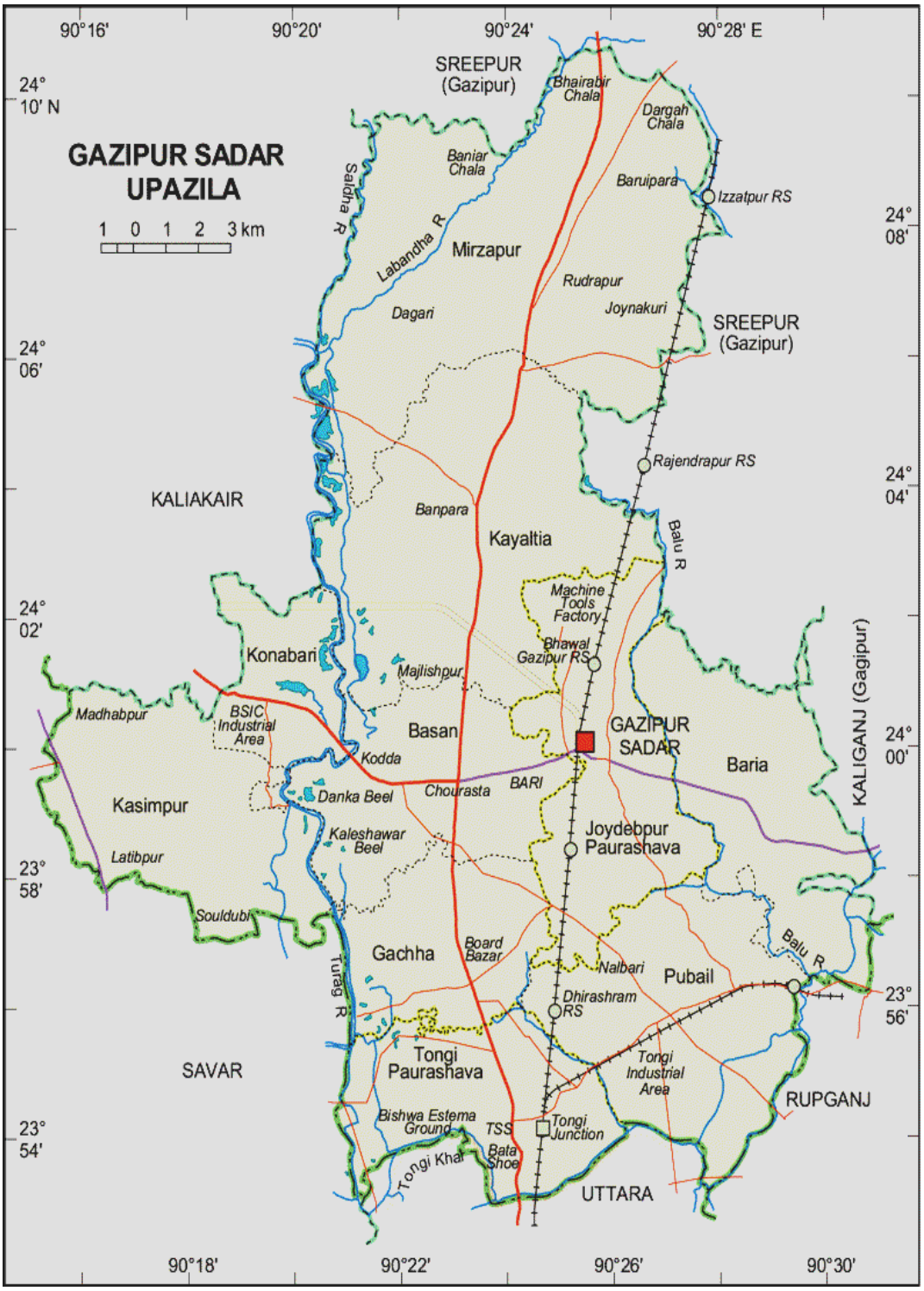
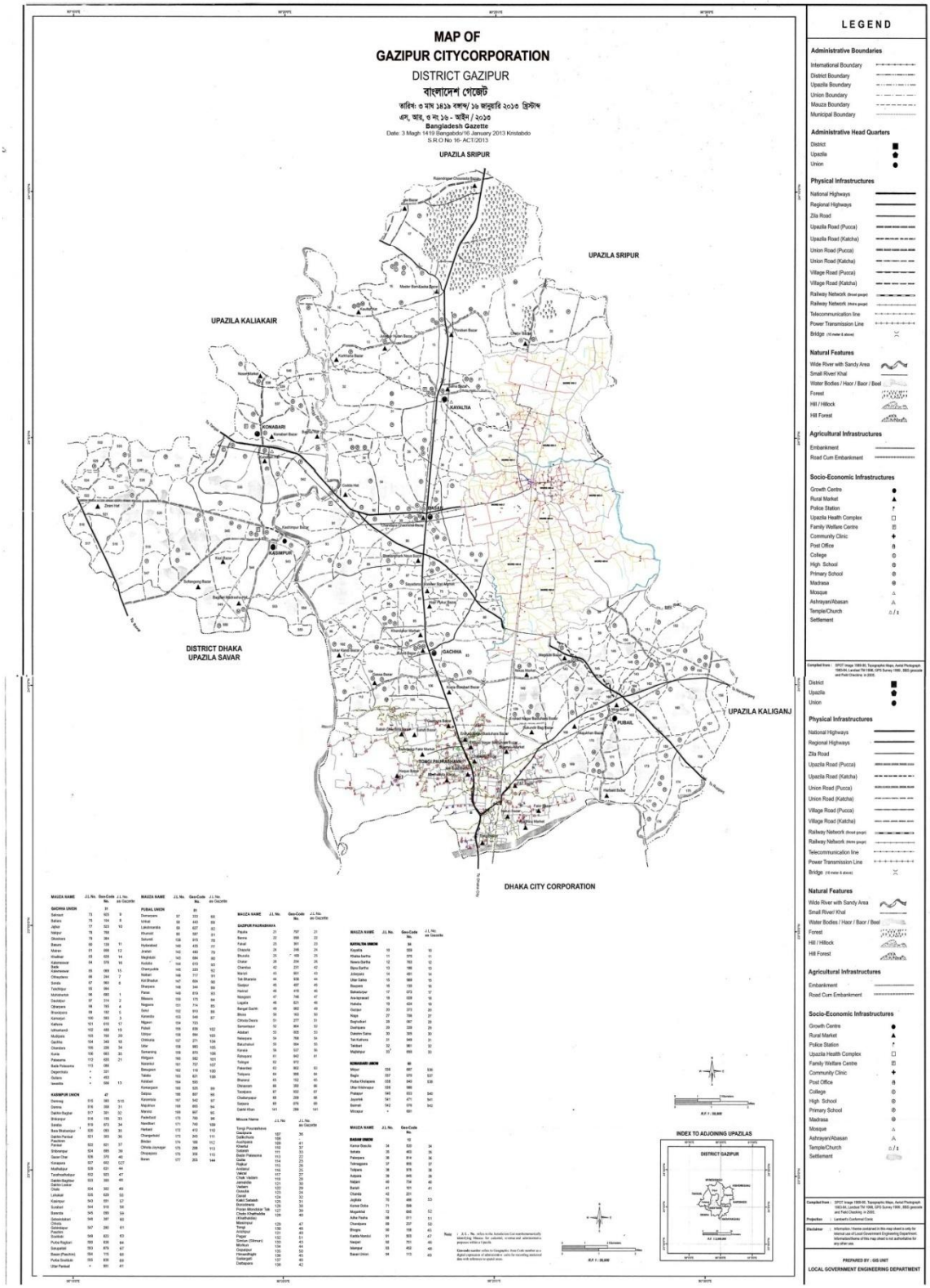


Figure 9:- Gazipur City Corporation Map



III. DESCRIPTION OF THE ENVIRONMENT

A. Physical Resources

1. Location

19. The location for the subproject is the jurisdictional area of Gazipur City some 34 km by road north-east from Dhaka, at 24°00″N 90°26′0″E, in between the river Turag and Balu. Gazipur City Corporation formed in January 16, 2013 covers a total area of 329.53 km² and is composed of 57 wards. All the proposed improvements are located within the City Corporation boundaries (only in Gazipur city area), and most fall within what can be considered urban landscapes, with the balance located in peri-urban, or semi-rural environments.

2. Topography, Soil and Geology

20. Gazipur City, in the vicinity of Dhaka, is situated in the Madhupur tract. Two characteristic geological units cover the city and surroundings, including Madhupur Clay of the Pleistocene age and alluvial deposits of recent age. The Madhupur Clay is the oldest sediment exposed in and around the city area having characteristic topography and drainage. The major geomorphic units of the city are: the high land or the Dhaka terrace, the low lands or floodplains and depressions and abandoned channels. Low lying swamps and marshes located in and around the city are other major topographic features.

21. The height of the land gradually increases from the east to the west. The southern part of the project area is composed of the alluvium soil of the Bangshi and Dhalashwari rivers. The land feature of the project area bears uneven elevation. Once, the area was covered with green vegetation. Now, due to rapid growth of population and industrialization, land has been converted to urban uses.

3. Climate

22. The climate of the project area, is average tropical monsoon with alternating dry/wet seasons. Including the pre-rainy season, there are three marked seasons:

- **(i)** **November to February.** The dry (winter) season is the coolest and driest period. Monthly average temperatures are below 29$_0$C with a minimum at 13$_0$C. Rainfall is very rare during this period (below 30 mm/month). Winds are predominantly blowing from the Northwest but with a high frequency of calm wind situations.
- **(ii)** **March and April.** In the pre-rainy season (summer) and the early months of the west seasons, the highest temperatures are reached. The monthly average temperature can rise up to 34$_0$C. During this period, air becomes more humid, rainfall increases, and heavy rains with thunderstorm occur. This period is locally called as “Kalbaaishakhi”. Sometimes the rain falls with hail.
- **(iii)** **May to October.** In the west season (“monsoon period”) more than 85% of the total annual rainfall occurs. Monthly average temperatures remain high with a maximum of 33$_0$C. The period of periodic heavy thunderstorms lasts until June. June to mid September to early November is the transitional period with decreasing rainfall, often thunder. During the wet season, the winds are predominantly blowing from the South. Monsoon rains are generally not stormy, but downpours of 50 mm to 75 mm per day are not uncommon and rainfall with more than 250mm per day is occasionally experienced.

23. Total mean annual rainfall occurring in the area is about 2,102 mm. About 75% of the total annual rainfall occurs during the monsoon period.

4. Air Quality

24. While there are no major air polluting industries within the Gazipur urban area, there are small and medium industries including various textile dyeing and other industries which are polluting sources outside the City Corporation boundaries. In addition to the industries, the brick kilns located in the banks and flood plains are a major source of air pollution.

5. Surface Water

25. Dhaka is enclosed between the Turag-Buriganga River in the west and the Balu-Sitalakhya River in the east, both of which drain into the Meghna in the south, along with the Dhaleswari, old Brahmaputra and other rivers outside the city limits. Like other inland waterways these rivers support a fish fauna that includes carp, catfish, loach, hilsa and shrimp, plus a variety of invertebrates and insects that have been little studied. There is no permanent surface water body within the project area, except Bansi River in Gurail Mouza. Bansi River is used for local navigation and for seasonal fishing purposes. The Danka Khal is on the West Side of the Gazipur, is mainly used by the local peoples for navigation, and other purposes. Regarding pollution load concern, Danka khal receives discharges from all the industries situated along the Joydebpur-Tangail road and Konabari Industrial Zone, which include textiles, footwear, food, chemical, pharmaceutical, detergent, and steel re-rolling mills.

6. Groundwater

26. There are three main aquifers in the central region of Bangladesh:

(i) An upper (composite) aquifer, which can reach depths of 50 m and is covered with an upper silty clay layer of less than 20 m;
(ii) A middle (main) aquifer of fine to heavy sands, which is generally 10 m to 60 m thick and in most areas is hydraulically connected with the composite aquifer above; and
(iii) A deep aquifer of medium, medium-to-fine or medium-to-coarse sand, which is generally found at depths below 100 m.

B. Ecological Resources

Forests and Natural Habitats

27. While there are no forests or protected areas within Gazipur City area, the Bhaval National Park is located 10km to the north of the Gazipur urban area. The Bhaval National Park in Dhaka Forest Division is easily accessible throughout the year by road. It has been kept under International Union for Conservation of Nature (IUCN) management category as a protected landscape. This Bhaval National park (24°01'N, 90°20'E), Gazipur was established and maintained as a national park in 1974 but not declared officially until 1982 under the Bangladesh Wildlife Act, 1974. This national park covers 5,000 ha but sometimes for development works, it extends to the middle of the park's core area of 940 ha. The present feature of the forest area is actually honeycombed with habitations and rice fields. The topography is characterized by low hills, which rise 3.0 m to 4.5 m above the surrounding paddy fields locally known as 'chalas' are intersected by numerous depressions or baids. The dominant forest trees Sal Shorea robusta of the national park have been almost completely removed, but now protection programs have planted sal which covers 90% of the area.

28. The wildlife at Bhaval National Park was well known for its peacocks, tiger, leopard (black panther also) elephant, clouded leopard, sambar deer, etc. However, the overall

situation is that these wild lives have disappeared[4] and few mammals (squirrel, mongoose, jackal, civet, jungle cat, etc.), few reptiles (monitor lizard, snakes) and some indigenous birds remain (Sarker and Fazlul Huq, 1985).

29. Within Gazipur City, there are little or no natural terrestrial habitats, because in most cases vegetation was cleared many years ago to provide land for development, and for agriculture in the suburbs. The project area is similar to the character to many areas of alluvial delta in Bangladesh with mixed crop vegetation. Rice, other grains and seasonal vegetables are the main crops in this area. Other than monoculture tree plantations, no forestland is involved in this area. Terrestrial plants are now mainly limited to trees, shrubs and flowers grown along side roads and in parks and gardens, and the crops and fruit trees planted in agricultural areas. The composition of plant community includes low growing grasses and herbaceous vegetation as well as other flora. No wild animals inhabit and endangered species are present in this area. The common birds like crow, sparrow, mayna, etc and some domestic cattle, no other wild animals inhabit the area.

C. Economic Development

1. Land Use

30. In Gazipur City Corporation (Gazipur area) total land area is 41300 hectares; cultivable land 30645 hectares, fallow land 1140 hectares, forests 5052 hectares; single crop 49.3%, double crop 26.2% and treble crop land 24.5%; land under irrigation 42%. Land control Landless 21.1%, marginal 49.4%, intermediate 24.3%, and 19.20% rich; per capita land 0.05 hectares. Value of land Market value of land of first grade is Tk. 12500 to Tk. 25000 per 0.01 hectare.

2. Industry and Agriculture

31. Various establishments are in Gazipur City Corporation area such as Bangladesh Rice Research Institute (BRRI), Bangladesh Agricultural Research Institute (BARI), CERDI, Seed Certifying Agency, Security Printing, Machine Tools Factory, Bangladesh Ordnance Factory, Diesel Plant, Bangladesh Institute of Technology (BIT), BRAC Dairy Farm, Cremation Ghat etc. are located here. Manufactories include an aluminum factory, textile mills, pharmaceutical industry, cosmetics industry, machine tools factory, diesel plant, security printing press, ordnance factory, ceramics factory, packaging industry, brick field and garments industry; the BSIC industrial area 2 (Tongi and Konabari) is located in the area. Cottage Industries include weaving, goldsmith, blacksmith, potteries, bamboo and cane work, tailoring, bidi, woodwork. Numerous hats, bazars and fairs are in the area. Hats and bazars number 36, most noted of which are Tongi, Pubail, Mirzapur, Kasimpur, Joydebpur; Baruni Mela (Kaddar) and Rath Mela (Joydebpur).

D. Social and Cultural Resources

1. Demography

32. Gazipur City area covers an area of 48.50 km². This City area is sub divided into a core area, covering 16 km2 around the middle of the City area, and a fringe area, covering the remaining 32.5 km2. The highest population densities are found towards the centre of the core area but rural or semi rural enclaves are found around the periphery. There is some industrial clustering and unplanned urban residential and other urban fringe land uses scattered across the rural hinterland. Agriculture and other related uses are under pressure from unplanned urban development. As such the rural hinterland increasingly houses a large migrant population.

33. According to Census of 2001, the population of Gazipur City area was 128,429. Gazipur City carried out a further population count in the year 2005 and the total population of that time was estimated at 300,112 among which 156,586 were male and 143,526 were female. The large proportional increase of population is due mainly to migration attracted to employment opportunities provided by the expansion of commercial and industrial activities in the City Corporation.

34. Several of the industries in Gazipur do not comply with pollution control requirements of the Government, enforced by the Department of Environment (DOE). The Industrial Policy of the Government, 2005 mandates particular strategies towards improvement of the environmental performance of the industries that have been less than successful in bringing about compliance:

(i) **Section 2.11.** Provide all necessary assistance for producing environment friendly product with the objective for creating a pollution-free environment in the industrial sector.

(ii) **Section 17.1.** Help attain competitive efficiency by developing technology, reducing consumers costs by using cost-effective technology, and assisting in the development of an environmentally friendly industrial production system.

(iii) **Section 18.6.** The Environmental Protection Act 1995 and other relevant legislation are gradually implemented to control environmental pollution. Those industries that pollute the environment and endanger public health must ensure safety measures in respect of environmental pollution control. Industrial enterprises will be encouraged to obtain ISO-14000 certificates.

35. Based on the national average growth rate of 3.3%, a conservative population estimate for 2010 is some 353,008 persons and projected to rise to 371,380 and 422,530 in 2015 and 2020 respectively. The current expectation is however, that the growth will continue to be greater than the national average and the population of Gazipur may exceed 500,000 over the next ten years (2020).

2. Educational Facilities

36. Literacy stands as follows: average literacy 43%; male 51.3%, female 34.7%. Educational institutions include the following: University 3, Technical institution 2, Agricultural institution 4, Government college 3, Non-government college 1, Government secondary school 2, Non-government secondary school 62, Junior school 6, Government primary school 126, Non-government primary school 41, Primary teacher's training institute 1, Telecommunication staff college 1, Agricultural training institute 1, Postal academy 1.

3. History, Culture and Tourism

37. Cultural organisations are as follows: Club 6, Library 68, Mosque based library 107, Museum 3, Theatre stage 1, Theatre group 5, Literary society 1, Women's association 3, Women's co operative society 89, Cinema hall 10, Community centre 10, Shilpakala Academy 1, Shishu Academy 1, Dakbungalow 2, Circuit house 1, Park 1, (Bhawal National Park), Biswa Ijtema Ground 1, Nuhash Chalachehitra Palli (film shooting location) 1.

IV. ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

A. Planning, Location and Design

38. The interventions proposed under this component are the outcome of Drainage Master Plan of the previous Gazipur Pourashava under Urban Government and Infrastructure Improvement Project (UGIIP), ADB Loan No. 1947 BAN (SF). Drainage congestion in Gazipur city area is an acute problem of the city. Some drains from this Drainage Master Plan are constructed under UGIIP, some of those remaining are taken up in this project. Following the UGIIP, City Corporation has requested improvement in main open RCC drain and secondary and tertiary RCC rectangular drain with top slab designed footpath or load bearing surface. Some of these drains will connect with existing UGIIP drains, some of them will discharge to Chirni khal and Railway Borrow Pit and finally to Balu and Turag River. All the proposed improvements have been identified through field work to verify that there are downstream points where flows can discharge freely.

39. The typical designs for drainage appurtenances follow the standard approach used in Bangladesh. Existing street drains will be replaced where the old structures are broken, worn and of insufficient cross section. In some cases no drains exist along the roadside, and in some cases earthen canals already exist. Remediation work will upgrade facilities through use of improved construction specification and better quality control than used initially.

40. Sufficient planning has gone into the targeting of improvements to assure their usefulness and functionality within the overall drainage scheme for GCC. There are no adverse impacts that need to be counteracted through alternatives in the planning, location and design of the facilities.

B. Construction

41. Construction presents the greatest potential for the subproject to cause adverse impacts. These are generally associated with safety, convenience, and local air quality impacts (dust). Most construction impacts can be mitigated through environmental measures that are set out in the construction contract tender documents. Additional provisions are set out for handling excavated materials in a manner that limits the effect of the activity on local people and environmental quality.

42. Construction specifications address the following key areas: worker provisions; use of land for construction purposes; community health and safety; site conditions, materials handling. A set of these provisions for use in the subproject tender documents is found in Appendix 2.

43. Worker Provisions set out in construction insure that the GOB and ADB policies are complied with regarding employment and worker health and safety, and insure that other aspects of worker provisions are met, such as availability of first aid equipment, potable water services and other facilities at the jobsite. Since the work is done under National Competitive Bidding (NCB), and firms are likely to be based in Gazipur, or if not, to obtain workers using Gazipur-based labor contractors, there is little likelihood that worker housing will be necessary. Workers will be hired locally, and will travel to the job site from their homes on a daily basis. In any event, construction crews are not expected to be large for any of these packages, consisting of at most 15-20 on any single lot.

44. Use of land for construction purposes requires that local authorities be consulted on locations for storage yards and other temporary land requirements. Approval must be obtained from landowners for temporary use and payments, if required, made to legitimate

owners. Disposal of wastes at construction or temporary use sites is prohibited, and final cleanup of sites is required.

45. Community health and safety provisions relate to transport of materials along roadways, accident prevention, dust and noise control and use of flagmen to control traffic flow in the construction zone, as follows:

1. Consecutively perform construction on segments of drains and excavation of khals of no longer than 100 m in built-up or settled areas, and complete each length, including removal of waste and debris, before moving to the next length.
2. Locations for storage of equipment will be approved in advance by the PIU.
3. Provide temporary access to shops and homes.
4. Provide passage through the construction area for pedestrian traffic in commercial areas and near schools.
5. Employ flagmen to control traffic flow through construction zones in settled areas and narrow roads that may be blocked due to convergence of oncoming vehicles.
6. Sand for concrete mixing and for fill should be hauled to sites in covered dumps.

46. In order to maintain safe and environmentally acceptable site conditions, the Contractor will provide a Site Environmental Management Plan for conducting work in the construction zone that minimizes interference with ongoing activity, noise and air pollution, congestion and visual impact.

47. The Contractor should close newly installed drains as quickly as possible (e.g. install covers on slot drains) and use other means to limit the amount of dirt that enters the drain. The contractor at completion of the work should turn over to the GCC a newly installed drain free of obstruction and significant amount of dirt or silt deposits.

C. Operations Phase

48. The project will improve drainage in an area populated by urban and peri-urban communities. The GCC should regularly inspect and maintain the drains by removing residual dirt and repairing broken concrete work, including the covers of drains, so that the drains do not become clogged and so that they continue to function as originally intended. GCC should:

- Establish a program of regular visual inspection to identify problems early, before they become critical (breakage, plugging, etc.)

- Perform repairs on street drains promptly, and clear sediment and other material that could cause blockage. Limit entry of waste oil and grease to drains.

V. INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

A. Process of Consultation

49. During Project preparation, consultations have been held with the officials / elected representatives of the Gazipur City Corporation, apart from the communities in the subproject locations. The issues covered during these consultations included selection of subprojects and identification of key issues including addressing the current needs related to drainage in the Gazipur urban area. These consultations provided inputs in identification of the felt needs of the communities, and the relevant stakeholders.

50. Informal public consultation was conducted routinely during inspection of the lots making up the subproject (see Figure 10). The approach taken was to introduce the project to a group of bystanders or residents near the site and to describe potential impacts that might be borne by the group during construction, such as: “during the construction of this drain, the access to your shop will be obstructed.” Inevitably the response was that the difficulty is gladly endured if the project will relieve flooding and improve drainage in the community area. Drainage is a serious concern for Gazipur residents and the project, performed according to best engineering and construction practice, is wholly welcomed.

Figure 10: Informal Public Consultation along Subproject Alignments

B. Plan for Continued Public Consultation

51. Various provisions are proposed to ensure continued public participation and stakeholder participation into latter stages of the project. This participatory process will ensure that all views of the people are adequately reviewed and suitably incorporated in the design and implementation process. Further, to ensure an effective disclosure of the project proposals to the stakeholders and the communities in the vicinity of the subproject locations, project awareness campaigns will be carried out.

52. The PMCU will disclose the IEE on its Project website, including any corrective action plans prepared during project implementation and environmental monitoring reports.

53. For the benefit of the community a summary of the IEE will be translated in Bangla and made available at: (i) Office of the PMCU; and (ii) Office of the Gazipur City Corporation. Hard copies of the IEE will be available in the PMCU/PIU, and accessible to citizens as a means to disclose the document and at the same time creating wider public awareness. On demand, the person seeking information can obtain a hard copy of the complete IEE document at the cost of photocopy from the office of the PMCU/PIU, on a written request and payment for the same to the Project Director. Electronic version of the IEE will be placed in the official website of the LGED.

VI. GRIEVANCE REDRESS MECHANISM

54. A grievance redress mechanism will be established in Gazipur City soon after subprojects commence construction. The first level and most accessible and immediate venue for resolving grievances is the PIU, through the resettlement support staff (RSS) and Project Manager, with assistance from the Resettlement Specialist (National and International-NRS and IRS) of the Management, Design and Supervision Consultant (MDSC). The contact phone number will be posted in the project areas. Grievances will be resolved through continuous interactions with affected persons and the PIU will answer queries and resolve grievances regarding various issues including livelihood impacts, entitlements, and environmental impacts that affect individuals and groups. Corrective measures will be undertaken at the field-level itself within seven days. All grievances will be documented with full information of the person and issue.

55. Should the grievance remain unresolved, the PIU's Project Manager, will activate the second level of the Grievance Redress Mechanism (GRM) by referring the issue (with written documentation) to the local Grievance Redress Committee (GRC) of the City Corporation, who will, based on review of the grievance, address them in consultation with the RSS of the PIU and PMCU, and affected persons. A hearing will be called, if necessary, where the affected person can present his/her concern/issues. The process will promote conflict resolution through mediation. The local GRC will consist of the following persons: (i) Chief Executive Officer of the City Corporation (GRC Chair); (ii) representative of the head of the City Corporation; (iii) representative of the affected persons; (iv) official of the land registry department; (v) official of the DOE's divisional office; (vi) town planner of the City Corporation; and (vii) Environmental Specialist/RSS of the PIU. The local GRC shall meet twice a month, unless the Project Director informs that there are no grievances to address, or they shall meet as needed as per the severity of the grievance. The local GRC will suggest corrective measures at the field level and assign responsibilities for implementing its decisions.

56. The functions of the local GRC are as follows: (i) provide support to displaced persons on problems arising from land acquisition (temporary or permanent); asset acquisition; and eligibility for entitlements, compensation and assistance; (ii) record grievances of displaced persons, categorize and prioritize them and provide solutions within a month; and (iii) report to the aggrieved parties about developments regarding their grievances and decisions of the GRC.

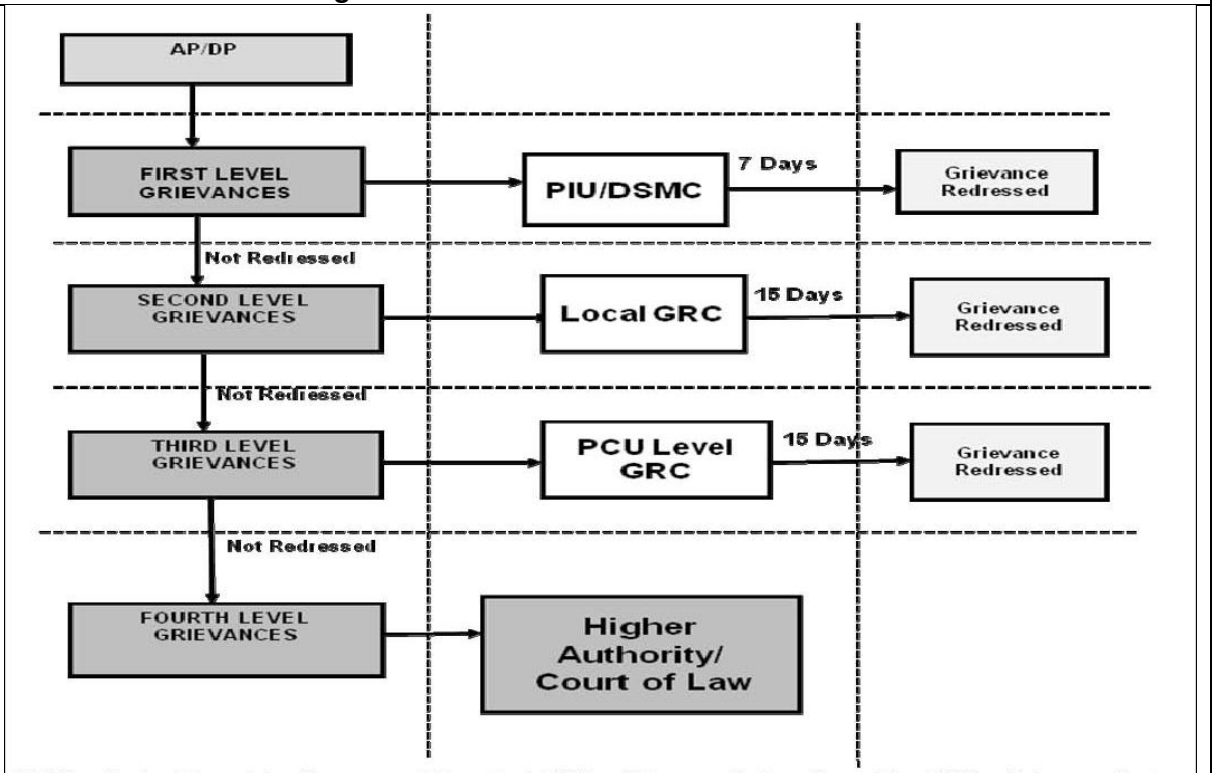
57. Should the grievance still remain unresolved, the PIU Project Manager, will activate the third level of the GRM by informing the PMCU Project Director who will, based on review of the local GRC minutes and consultation with the PIU Project Manager, activate the PMCU level GRC. This committee shall be comprised of: (i) Project Director PMCU, (ii) Environmental/Resettlement Officer of the PMCU; (iii) representative from Land Ministry, (iv) representative from DOE; (v) representative of the displaced persons; and (vi) Environmental/Social Safeguards officer of the PIU.

58. The GRC at the PMCU level shall meet based on the receipt of grievances, and the meeting shall be convened within 7 days of receipt of the grievance by the PMCU, and grievances redressed with 15 days. The Environmental / Resettlement Safeguards Officer of the PMCU will be responsible for processing and placing all papers before the PMCU GRC, recording decisions, issuing minutes of the meetings and taking follow up action to see that formal orders are issued and the decisions carried out.

59. In the event that a grievance is not addressed by the PIU, local GRC, or the PMCU GRC, the displaced person can seek legal redress of the grievance in the appropriate Courts

(the fourth level of the GRM). A grievance redress mechanism and procedure is depicted in Figure 11.

Figure 11: Grievance Redress Mechanism



DSMC = Design Supervision Management Consultant, GRC = Grievance Redress Committee, GRM = Grievance Redress Mechanism, PIU = Project Implementation Unit, PMCU = Project Management Coordination Unit.

VII. ENVIRONMENTAL MANAGEMENT PLAN

60. The IEE for this package has been prepared in accordance with ADB Safeguard Policy Statement's requirements for environment category B projects and provides mitigation and monitoring measures to ensure no significant impacts as a result of the subproject. The complete IEE can be downloaded from
< http://www.lged.gov.bd/ProjectLibrary.aspx?projectID=237>

61. The environmental management plan (EMP) describes the proposed mitigation measures in relation to potential impacts, and the means for assuring their implementation via monitoring. Institutional arrangements and costs related to mitigation and monitoring are described.

A. Summary of Environmental Impacts and Mitigation Measures

62. Table 2 lists the potential environmental impacts and the mitigation measures including the responsibilities for implementing the same. Costs associated with implementing the mitigation measures are incorporated into the contractor's cost estimate and, for measures during the operational period, into the budget of the GCC.

B. Institutional Arrangements for Project Implementation

63. LGED is the Executing Agency (EA) responsible for management, coordination and execution of all activities funded under the loan. LGED is assisted by a Project Steering Committee (PSC), to provide policy guidance and coordination across all towns and subprojects. LGED has established a Project Management Coordination Unit (PMCU) to manage all aspects of loan project implementation, coordinate construction of subprojects across all towns, and ensure consistency of approach and performance. An Environmental and Social Officer (ESO) has been appointed to coordinate social and environmental issues. Environmental review of projects and monitoring implementation of mitigation measures are primary functions of the ESO within the PMCU.

64. The PMCU is assisted by Design and Supervision Consultants (DSC) who assist in overall project implementation, preparation of master plans for infrastructure, design infrastructure improvements, manage contract tenders and supervise construction. International and domestic Environmental Specialists are staffed within the MDSC. The IEE has been prepared by the Environmental Specialists assisting the MDSC at the time of the detailed design. Costs for mitigation measures and monitoring are considered current at the time of contract procurement.

65. A Project Implementation Units (PIUs) has been established at the GCC, staffed by GCC and supported by local LGED and MDSC staff. An Environmental Officer has been appointed within the PIU to insure an understanding among bidders of the environmental components in procurement documents, and to monitor mitigation measures during construction and operation. Environmental specialists assisting the MDSC will provide capacity building, training and other forms of support to the PIU.

66. The PIU will hire Construction Contractors (CC) to build elements of the infrastructure. Environmental Specialists within the MDSC will assist the PMCU and PIUs to ensure that the construction packages comply with environmental safeguards and the Environmental Monitoring Plan contained in the IEE. Inspection of progress in construction will be undertaken locally by the PIU, supported by the PMCU and MDSC.

67. During implementation the contractor will submit monthly progress reports to the PIUs, which includes a section on EMP implementation. The PIUs will submit reports to the

PMCU for review. The PMCU will review progress reports to ensure that the all mitigation measures are properly implemented. The PMCU will consolidate monthly reports and submit semi-annual reports to ADB for review.

C. Environmental Monitoring Plan

68. Mitigation activities fall into three stages: pre-construction (location, planning and design), construction and operations. Mitigation of pre-construction impacts are the responsibility of the PMCU and MDSC working with the PIUs to prepare the subproject according to good engineering practice. Mitigation of impacts during construction is the responsibility of the Construction Contractors (CC), which will be monitored by the PIUs. Responsibility for the relevant measures will be assigned to the Contractors via the contracts through which they are appointed (prepared by the MDSC during the detailed design stage), so they will be legally required to take the necessary action.

D. Grievance Redress Mechanism

69. The Grievance Redress Mechanism, as described in Sec. VI, involves a three tiered process for registering and resolving complaints raised by project affected persons through intervention by the PIU (first level), the local Grievance Redress Committee (second level) of the LGU, or the PMCU (third level). The construction contractor has a role to deliberate along with the PIU and representatives of the PMCU (through the DSCM) solutions to complaints raised by individuals and groups, and to act promptly (within a period appropriate to the nature of the complaint) on executing agreed upon solutions to specific problems, then reporting back to both the PIU and the affected party on solutions undertaken by the contractor. The GRM serves dual functions to register complaints related to both environmental impacts and resettlement and compensation. The contractor will post notices announcing the grievance redress mechanism in local government offices (the City Corporation office) and in strategic places of the subproject's area of influence.

Table 2: Potential Environmental Impacts and Mitigation Measures

Potential Negative Impacts	Sig	Dur	Mitigation Activities and Method	Responsibility	Location
PLANNING, LOCATION & DESIGN					
Detailed design fails to incorporate good engineering design practice	S2	P	Analyze, survey and produce a technically and economically feasible designs	MDS, LGED	PMCU office
Spoils impact and mitigation measures	S2	T	Spoil management plan should be submit for approval from PIU for the disposal sites of excavated materials, spoils, construction debris and garbage prior to start of construction work.	MDS, LGED	PMCU office
CONSTRUCTION					
Awareness of surrounding people	S3	T	Inauguration meeting should be held at site headed by local representative	PIU	Project site
Traffic management plan for during construction period	S3	T	Submit a traffic management plan including but not limited to list of roads to be closed, number of flagmen to be designated along length of drainage per work day, type and number of signs/barricades to be used.	Contractor	Project site
Impact on air quality and noise levels due to construction activity	S2	T	Application of water to suppress dust where needed. Prompt removal of spoil materials	Contractor	All activities
Construction blocks access from failure to backfill trenches and removed materials and construction debris	S2	T	Provide means to bypass construction using detours, bridging trenches and providing pathways. Specific clauses in tender documents to complete construction promptly and remove excavated materials and debris.	Contractor	Project Site
Traffic congestion and blockage of paths of travel	S2	T	Provide signage, flagmen and detours around construction as appropriate; where pedestrian traffic is common, provide paths of travel through construction area.	Contractor	Project Site
Traffic and human movement may be disrupted by materials hauling	S3	T	Plan routes to avoid congested areas and narrow roads. Schedule transportation to avoid peak traffic	Contractor	Project Site
Quarters for workers in the proximity of worksites, and equipment/material yards	S3	T	Minimize need for workers quarters, equipment yard and onsite repair facility in work area; provide potable water supply and latrines for workers, and solid waste disposal	Contractor	All activities
Dirt, sediments and sludge causes an inconvenience by blocking pedestrian and vehicular access, nuisance to local residents, and impact on public health.	S2	T	Dispose of spoil material at a location agreed to by the PIU and the property owner. Use tarpaulins to cover dry materials during transport Provide walkways and metal sheets where required to maintain access across for people and vehicles Increase workforce in front of critical areas such as institutions, places of worship, business establishments, hospitals and schools Consult businesses and institutions regarding operating hours and factor this in work schedules and ensure there is provision of alternate access to businesses and institutions during construction activities, so that there is no closure of these shops or any loss of clientage;	Contractor	Project Site

Potential Negative Impacts	Sig	Dur	Mitigation Activities and Method	Responsibility	Location
			Ensure any damage to properties and utilities will be restored or compensated to pre-work conditions.		
			Materials excavated preceding construction of small drains to be removed from the site quickly.		
			Sediments and sludge excavated from drains, khals and rivers allowed to dewater and dry no longer than one week before removal.		
			Clear path of access for three-wheeled vehicles, rickshaws and pedestrians maintained along routes of usual travel.		
			Excavated materials sufficiently dry or loaded into sealed dump trucks that will not leak materials onto roadways		
Lack of planning during construction fails to properly sequence activities and minimize disturbance/cost.	S2	T	Plan construction to accommodate traffic flow; perform work on one road before beginning work on the second; complete construction on one segment before progressing to new location.	Contractor	Project Site
Drains are clogged at end of construction period.	S2	P	Close or cover newly installed drains to prevent entry of dirt; contractor to turn over to LGU installed drain free of dirt or foreign material.	Contractor	Drainage works
Schools, mosques, hospitals, temples may be disturbed by noise, dust and impeded access	S2	T	Increase work force to complete construction quickly in affected areas. Practice good housekeeping to minimize dust / avoid obstruction in the paths of travel of pedestrians and vehicles	Contractor	All activities
Potential for benefit from employment for local people	S2	T	Provide preferential employment for locals in labor force as specified in construction contract tender documents	Contractor	Project Site
Trees may be removed along drainage easements	S2	P	Avoid removing trees where possible	Contractor	Project Site
Potential for accident and injury of construction workers and public in zone of construction	S2	T	Implement a safety and health plan for workers and require personal protective gear suitable to the type of work being performed. Train in safe work procedures. Maintain a record of accidents that are reported to the supervising engineer. Bar the public from construction areas and barricade and mark excavations	Contractor	Project Site
OPERATION & MAINTENANCE					
Drainage channels are not maintained, solid waste builds up in drains, drains no longer function properly.	S2	P	Prevent deposit of foreign materials (oil, grease, solid waste, plastics) into drains, inspect, repair and clean drain periodically.	GCC	All drains
Appearance and environment will deteriorate if material from drain cleaning piled on adjacent land	S2	T	Dispose of material from blocked drain in location away from roadway and drain	GCC	All drains

Sig = Significance of Impact (S3 = Not Significant, negligible impacts; S2 = Moderate, reversible impacts which are site specific and simple to contain and mitigate; S1 = Significant, potentially irreversible impacts requiring complex mitigation); Dur = Duration of Impact (T = Temporary; P = Permanent)

70. A program of monitoring will be conducted to ensure that all parties take the specified action to provide the required mitigation, to assess whether the action has adequately protected the environment, and to determine whether any additional measures may be necessary. This will be conducted by the Environmental Officer within the PIU supported by the PMCU Environmental Coordinator and the Environmental Specialists on the MDSC Team. The Environmental Officer will be responsible for monitoring implementation of mitigation measures and reporting to the PMCU, and will recommend remedial action if measures are not being provided or are not protecting the environment effectively. Post-construction monitoring will be conducted by the GCC.

71. Most of the mitigation measures undertaken during construction are meant to minimize disturbance from the construction in urban areas by maintaining access, planning work to avoid sensitive times, reducing dust and noise pollution and dealing effectively with excavated materials. Experienced Contractors should be familiar with the requirements. Monitoring of such measures normally involves making observations in the course of site visits, although some require review of records and surveys of residents.

72. Table 3 shows the proposed Environmental Monitoring Plan for these subprojects, which specifies the various monitoring activities to be conducted during all phases. The table describes: (i) mitigation measures, (ii) location, (iii) measurement method, (iv) frequency of monitoring and (v) responsibility (for both mitigation and monitoring). It does not show specific parameters to be measured because as indicated above, most measures will be checked by simple observation, by checking of records, or by interviews with residents or workers. Costs related to monitoring are included in the costs for loan project implementation.

73. LGED should conduct monitoring during the operational period to confirm the long-term benefits of the scheme. This will involve monitoring condition of drains in relation to breakage and removal of built up sediments, and limits on discharge of oil and grease to drains.

Table 3- Environmental Monitoring Requirements

Mitigation Activities and Method	Location	Responsible for Mitigation	Monitoring Method	Monitoring Frequency	Monitoring Responsibility
PLANNING, LOCATION AND DESIGN					
Analyze, survey and produce a technically and economically feasible design	PMCU office	MDS, LGED	Critical evaluation of design outputs	Continuous	Team Leader & Project Director
Plan the sequence of construction to minimize disruptions	PMCU office	MDS, LGED	Critical evaluation of tender and construction pre-planning	Prior to tender award	Team Leader & Project Director
Incorporate good engineering practice into design	PMCU office	MDS, LGED	Review of design outputs	Before design approval	Team Leader & Project Director
Spoil management plan should be submitted for approval from PIU for the disposal sites of excavated materials, spoils, construction debris and garbage prior to start of construction work.	PMCU office	MDS, LGED	Include environmental clauses; critically evaluate environmental / safety aspect of implementation	Before approval of tender document	Team Leader & Project Director
Environment, Health and safety part of contract documents	PMCU office	MDS, LGED	Include environmental clauses; critically evaluate environmental / safety aspect of implementation	Before approval of tender document	Team Leader & Project Director
CONSTRUCTION					
Inauguration meeting should be held at site headed by local representative	Project site	PIU	CC records	Once before commencement	PIU
Traffic management plan including but not limited to list of roads to be closed, number of flagmen to be designated along length of drainage per work day, type and number of signs/barricades to be used.	Project site	Contractor	Site Visits; CC records	Weekly	MDS, PIU
Application of water to suppress dust where needed. Prompt removal of spoil materials	Construction zone	Contractor	Site Visits; CC records	Weekly	MDS, PIU
Provision of means to bypass construction where necessary using detours, bridging trenches and providing pathways.	Distribution	Contractor	Site visit; resident survey	Weekly	MDS, PIU
Provide flagmen and traffic detours when necessary	Distribution	Contractor	Site visits; CC records	Weekly	MDS, PIU
Plan truck routes to avoid congested areas, narrow roads and peak traffic	All sites	Contractor	Observations off site; CC record	Monthly	MDS, PIU
Dispose of spoil material at a location agreed to by the PIU and the property owner. Use tarpaulins to cover dry materials during transport	Construction zone	Contractor	Site Visits; CC records	Monthly	MDS, PIU

Mitigation Activities and Method	Location	Responsible for Mitigation	Monitoring Method	Monitoring Frequency	Monitoring Responsibility
Materials excavated preceding construction of small drains to be removed from the site quickly.	Construction zone	Contractor	Site visits	Weekly	MDS,PIU
Excavated materials sufficiently dry or loaded into sealed dump trucks that will not leak materials onto roadways	Haul routes	Contractor	Observations on and off site	Weekly	MDS,PIU
Cover or damp down fill material, soil and sand stockpiled on site	Construction zone	Contractor	Site visits	Weekly	MDS,PIU
Only bring construction material to site when needed.	Inhabited areas	Contractor	Site visits; CC records	Weekly	MDS,PIU
Sediments and sludge excavated from drains, khals and rivers allowed to dewater and dry no longer than one week before removal.	Construction zone	Contractor	Site visits; CC records	Weekly	MDS,PIU
Land acquisition / compensation in accord Resettlement Framework*	Where required	GCC	Landowner surveys; LGED record	As needed	MDS,PIU
Clear path of access for three-wheeled vehicles, rickshaws and pedestrians maintained along routes of usual travel.	Construction zone	Contractor	Site visits, CC records	Weekly	MDS,PIU
Increase workforce in front of critical areas such as institutions, place of worship, business establishment, hospitals and schools	Distribution	Contractor	Site visits; CC records	Monthly	MDS,PIU
Consult businesses and institutions regarding operating hours and factoring this in work schedules and ensure there is provision of alternate access to businesses and institutions during construction activities, so that there is no closure of these shops or any loss of clientage	Distribution	GCC	Resident surveys; CC records	Monthly	MDS,PIU
Ensure any damage to properties and utilities will be restored or compensated to pre-work conditions.	Distribution	MDS/GCC	Site visit; design reports	Monthly	MDS,PIU
Plan work with town authorities – work when traffic is light	Distribution	Contractor	Site visits; CC records	Monthly	MDS,PIU
Plan construction to accommodate traffic flow; perform work on one road before beginning work on the second; complete construction on one segment before progressing to new location.	Construction zone	Contractor	Site visits, CC records	Monthly	MDS,PIU
Develop and apply archaeological protocol to protect chance finds	All sites	MDS and CC	MDS and CC records; Site visits	Weekly	MDS,PIU
Provide walkways and metal sheets where required to maintain access across for people and vehicles	Where needed	Contractor	Design reports; resident surveys	Monthly	MDS,PIU

Mitigation Activities and Method	Location	Responsible for Mitigation	Monitoring Method	Monitoring Frequency	Monitoring Responsibility
Minimize need for workers quarters, equipment yard and onsite repair facility in work area; provide potable water supply and latrines for workers, and solid waste disposal	All sites	Contractor	Site visits; CC records	Monthly	MDS,PIU
Exclude public from the site with barricades; provide pedestrian path of travel through work area	All sites	Contractor	Site visits; CC records	Monthly	MDS,PIU
Ensure that workers wear Personal Protective Equipment	All sites	Contractor	Site visits; CC records	Monthly	MDS,PIU
Provide Health and Safety training for all personnel	All sites	Contractor	CC records; worker interviews	Monthly	MDS,PIU
Keep accident reports and records	All sites	Contractor	CC records	Monthly	MDS,PIU
Employ workforce from communities near sites	All sites	Contractor	CC records; worker interviews	Monthly	MDS,PIU
Close or cover newly installed drains to prevent entry of dirt; contractor to turn over to LGU installed drain free of dirt or foreign material.	Construction zone	Contractor	Site visits	Monthly	MDS,PIU
OPERATION AND MAINTENANCE					
Prevent deposit of foreign materials (oil, grease, solid waste, plastics) into drains, inspect, repair and clean drain periodically; dispose of materials removed from drains	GCC's Office	OM contractor	Site observations	Monthly	GCC Office
Dispose of material from blocked drain in location away from roadway and drain	GCC's Office	OM contractor	Site observations	Monthly	GCC Office

VIII. FINDINGS AND RECOMMENDATIONS

A. Findings

74. The Initial Environmental Examination for this subproject has proceeded through description of the proposed infrastructure works, description of the greater environment in which the infrastructure improvements will take place, and analysis of impacts due to location, planning and design; constructions; and operations, with consideration for timing, scale and intensity of impact.

75. Drainage and local water logging are important infrastructure improvements for Gazipur City. Analysis has shown that no significant negative impacts are unlikely to occur due to improvement of their drainage facilities. The main impact is expected to be beneficial: the overall improvement of drainage infrastructure within the City. The relative magnitude of this improvement is best assessed through post-project monitoring and evaluation, either by the Government or by ADB.

76. Recommendations have been made to improve the environmental performance of the subproject. Many are concerned with pre-planning for the proposed drainage improvements, in order to identify actual improvements needed to existing systems. This planning work was conducted under a previous technical assistance, and by the local government, and is found to be accurate and well informed. Environmental criteria for construction are recommended to mitigate construction impacts. Finally, recommendations are made for maintaining the completed components to be carried out by the City.

77. Specific environmental impacts and their associated mitigation measures have been identified in the subproject IEE. Parties responsible for implementation of mitigation measures, and for monitoring implementation, have been identified and the general features of an institutional mechanism have been described. Those features include assignment of tasks and responsibilities for environmental review within the PMCU and PIU, provision of staff to support the environmental function through the MDSC, and a formal capacity building plan to be undertaken during subproject implementation.

78. Public consultation is shown to be an integral feature of project preparation, and indeed the subproject originates among a broad cross-section of stakeholders; hence its acceptability is screened from the outset. In addition, public consultation has been conducted to make clear to the directly affected communities the potential social and environmental impacts as identified by the environmental and social reviews. Informal public consultations were held along the alignments of the proposed improvements to obtain the views of local people. No significant issues were raised during these meetings that have not been addressed in the IEE, nor were there issues that pose a significant constraint on implementation of the proposed subproject. A proposal has been described for continuing the process of public consultation during construction that includes a mechanism for redress of grievances that arise during the construction phase.

B. Recommendations

79. The primary means for environmental management is through mitigation of construction impacts by means of environmental requirements placed on the construction contractor and through maintaining and operating the completed system to guarantee long term performance.

80. Mitigation measures to be undertaken during construction include special means for minimizing interference with access to residences and businesses, means for reducing traffic congestion in the construction areas, provision of alternative means of access to homes and

businesses, and requirements for minimizing worker safety and health risk through use of protective gear and training.

81. Mitigation measures for implementation during operations of the system include repair and cleaning of the drainage system, and limiting the amounts of oil and grease discharged to drains.

IX. CONCLUSIONS

82. The environmental impacts of the proposed improvements in drainage and flood protection infrastructure for Gazipur City have been assessed by the environmental assessment process reported in this document, conducted according to ADB guidelines. Issues related to involuntary resettlement were assessed by a parallel process of resettlement planning and will be compensated by measures set out in detail in the Resettlement Framework for the program.

83. The overall conclusion of both processes is that providing the mitigation, compensation and enhancement measures are implemented in full, there should be no significant negative environmental impact as a result of location, planning, design, construction and operation of the project. There are benefits stemming from recommended mitigation and enhancement measures, and major improvements in quality of life and individual and public health once the project is in operation.

Appendix 1: Environmental Clearance Certificate from Department of Environment

Government of the People's Republic of Bangladesh
Department of Environment
Head Office, Paribesh Bhaban
E-16 Agargaon, Dhaka-1207
www.doe-bd.org

Memo No: DOE/Clearance/5194/2013/180 Date: 21/07/2013

Subject: Environmental Clearance for City Region Development Project.

Ref: Your application on 13/06/2013.

With reference to the above, the Department of Environment (DOE) hereby accords Environmental Clearance to above project excluding the construction of Water Treatment Plant, Water Distribution Pipeline Laying, Sanitary Landfill, Bus and Truck Terminal sub-components.

A copy of the said Environmental Clearance Certificate is attached herewith for your necessary action.

21.07.2013

(Syed Nazmul Ahsan)
Deputy Director (Environmental Clearance)
and
Member Secretary
Environmental Clearance Committee
Phone # 8181778

Mr. Md. Wahidur Rahman
Chief Engineer
Local Government Engineering Department
LGED Bhaban, Agargaon, Dhaka.

Copy Forwarded to :

1) PS to Secretary, Ministry of Environment and Forests, Bangladesh Secretariat, Dhaka.
2) Director, Department of Environment, Dhaka Regional Office, Dhaka.
3) Director, Department of Environment, Khulna Division, Khulna.
4) Assistant Director, Office of the Director General, Department of Environment, Head Office, Dhaka.

Appendix 2: Environmental Specifications for Construction Contractor

General

1. The contractor shall review and comply with the environmental management plan (EMP) prepared for the subproject, and will note and implement any particular requirements therein, in addition to those found in this general specification. At the start of construction, the contractor will provide a Construction Environmental Management Plan for compliance with these specifications, including development of the construction zone, worker camps, equipment yards, haul roads and borrow/quarry areas. The contractor's implementation of mitigation measures will be monitored during the course of the work and reported to the ADB.

2. The contractor will post a public notice regarding the nature, extent and cost of the project at the start of the construction zone; and post notices announcing the grievance redress mechanism in local government offices and in strategic places of the subproject's area of influence. For projects with multiple sites, a single notice may be posted at the pourashava, upazilla or municipal office.

3. The Contractor's Project Manager or other technical staff shall serve as focal person for EMP implementation and for responsibilities under the Grievance Redress Mechanism (GRM). The Contractor's Project Manager or other technical staff is required to obtain construction environmental management training and orientation to be provided by an LGED specialist at the start of construction. Costs for implementing requirements set out herein are considered to be incorporated into the unit bid price for quantities unless indicated as paid for through provisional sums.

Worker Provisions

4. GOB criteria for minimum age, wage and living provisions, benefits, hours of work, overtime arrangements and overtime compensation, and leave for illness, maternity, vacation or holiday should be met for all workers. The Contractor will conform to national law in relation to hiring and employment; and will comply with the principle of equal opportunity, fair treatment, and nondiscrimination with respect to the employment relationship. Hiring of project-affected persons, women, residents of project-affected administrative units and disadvantaged groups is encouraged.

5. The contractor shall implement a safety and accident prevention program involving provision, training and use of safety equipment; minimum skills qualifications for operators and drivers; and record keeping related to accidents.

6. The Contractor will provide Personal Protective Equipment (PPE) to workers that offer adequate protection to the worker without incurring unnecessary inconvenience in its use[1]. Proper maintenance of PPE, including cleaning when dirty and replacement when damaged or worn out; and proper use of PPE should be part of training programs, as appropriate.

7. The contractor will maintain first aid kits onsite along with instructions for use, and personnel trained in basic first aid emergency response measures. In case of injury, the

[1] Depending on the application PPE may include safety glasses with or without side-shields, and protective shades; plastic helmets with top and side impact protection; hearing protectors (ear plugs or ear muffs); safety shoes and boots for protection against moving & falling objects, liquids and chemicals; gloves made of rubber or synthetic materials; facemasks with appropriate filters for dust removal and air purification; single or multi-gas personal monitors; portable or supplied air; on-site rescue equipment, and insulating clothing, body suits and aprons of appropriate materials.

contractor shall arrange treatment of the injured worker(s) and bear the cost of treatment.

8. Laborers and others resident at the site will be provided with lodging in a camp setting, potable water supply, food service facilities and adequate means for maintaining personal hygiene and solid/liquid waste disposal.

9. Safe drinking water will provided at the worksite with sufficient numbers of access points to assure availability for workers. Water will be periodically tested for and assured safe from bacteriological contamination.

10. HIV/AIDS awareness should be incorporated into the contractor's policy and outreach toward workers.

Gender Equity

11. The contractor shall provide equal wage payment for work of equal value for women, as required by the Government of Bangladesh. Separate sanitation and bathing facilities shall be provided for women at work camps and at the construction site.

12. The contractor is encouraged to engage women laborers, project affected women and destitute persons on works suitable for them, and shall follow ILO conventions and relevant protocols. The contractor shall consult with the Women's Ward Councilor and others on the availability of women workers including indigenous women workers in the area to engage them in work suitable to their skills.

Use of Land for Construction Purposes

13. The worksite and ancillary sites shall be surveyed and pegged prior to construction to ensure correct lines and grades for alignments, earth fill, side slopes, flow lines and trees to be removed or preserved in accordance with the design. Final verification of affected persons and assets shall be undertaken prior to the commencement of the works.

14. The contractor will obtain approval from landowners for temporary use of land for ancillary sites such as labor camps and construction yards. Local authorities will be consulted on locations, which will in no case be within 100 m of sensitive receptors such as hospitals, schools, residential communities or identified archaeological, religious or cultural sites. The contractor shall obtain approval and permits from the concerned District Collector for sand mining in rivers. An ancillary site shall be above flood level, at least 10m away from watercourses, and its size kept to a minimum to reduce vegetation clearance and ground disturbance.

15. The contractor will not encroach upon vacant land, or damage forests, wildlife or fisheries in the project area. The Contractor will execute a plan for preventing firewood gathering in the project area and prohibit among workers possession of instruments or poisonous substances for killing or capturing fish or wildlife.

16. Vegetation clearance shall be confined to the minimum area required for construction. Trees within the boundaries of ancillary sites shall be retained wherever possible.

17. Cutting trees is prohibited except inside the construction zone, on upper and lower slopes requiring stabilization, and in quarry areas. Trees to be removed must be specified in the Project plans and specifications. Pits resulting from removal of trees and stumps shall be backfilled and compacted. The contractor shall dispose of removed vegetation at locations approved by the Engineer.

18. No fuel, oil, or parts cleaning fluids shall be spilled, wasted or disposed of at the project site. Secondary containment (earth or concrete berm with bottom and sides sealed with plastic sheeting) at least equal to the capacity of the fuel storage tank shall be provided at fueling stations. Hazardous materials shall be stored above flood level and at least 20m away from any water course.

19. After completion of occupancy, all affected areas within the general project boundary shall be graded to their original elevation or to a continuous sloping grade that allows positive drainage. Machinery, equipment, structures, contaminated earth, plant matter and waste or unused materials shall be removed and disposed of at locations approved by the Engineer.

Sediment Controls and Spoil Materials

20. Areas to be cleared and excavated are limited to areas where construction will take place. The areas will be protected from flowing water including sheet runoff. The contractor will limit sediment loss from exposed surfaces. Existing drainage patterns should be maintained during construction to the extent possible.

21. Discharge of wastewater into water bodies is prohibited as is the discharge of wash water from concrete trucks to waterways. . Land clearing activity will be suspended during rains to limit sediment loss.

22. Topsoil shall be removed from areas of fill or sub-surface excavation and stockpiled at designated locations for reuse in covering embankment slopes, berms, and other disturbed areas.

23. Unsuitable and spoil materials shall be disposed promptly and properly from the site at locations approved by the Engineer.

Community Values

24. Vehicles transporting dirt, sand and construction materials capable of producing dust will be covered when traveling through community areas or along roadways in use by the public. Vehicles will operate within the legal speed limits in populated areas. The operation of moving equipment in locations accessible to the public will be done in a manner so as to prevent the occurrence of incidents and accidents.

25. The Contractor should use available means to prevent accidents by emphasizing safety aspects among drivers; assuring sufficient driving skills and requiring licensing of drivers; adopting limits for trip duration and arranging driver rosters to avoid overtiredness; specifying and obtaining approval from the PIU in advance, and adhering to, haul routes between borrow areas and the project site; avoiding dangerous routes and times of day to reduce the risk of accidents; use of speed control devices (governors) on trucks, and remote monitoring of driver actions.

26. The contractor is responsible for regular spraying of roadway surfaces in use as haul routes and of sites under construction as well as temporary detours where these locations are accessed by the public. The contractor will remove excess debris during construction and after completion of the item of work.

27. The contractor will locate aggregate crushing and batch mix plants at sufficient distance (at least one km) from populated areas, houses, schools and hospitals so as to reduce air pollution and noise. The contractor shall protect, conserve and maintain access to social and cultural properties in the project area including schools, mosques, hospitals,

temples, shrines, graveyards, tourism sites and other public places. The contractor may increase the workforce to minimize the duration of construction in such areas.

28. The Contractor will post flagmen at intersections of transit paths for construction vehicles and local traffic, and along traffic lanes where work is in progress. Traffic detours will be clearly marked.

29. The contractor will provide a path for transit of pedestrians and vehicular traffic through or around the construction area; and barricade open excavations to prevent injury to the public.

30. The contractor shall ensure that working hours do not extend beyond 7.00 a.m. to 7.00 p.m. to avoid undue disturbance of the local people.

31. The contractor shall avoid trenching near to buildings, walls and existing buried pipelines. If unavoidable, the contractor shall provide adequate protective measures to prevent damage.

32. The contractor will avoid blocking access to land, homes and businesses; where unavoidable, the contractor will provide temporary access to affected properties and reinstate permanent access on completion of work; minimize the area under construction at any one time and the duration of works at any one location; and minimize impacts on infrastructure, access and services. Backfill and sealing of construction trenches shall be done promptly.

33. The contractor will install signs and lighting, where there is nighttime traffic, in the vicinity of works on public roads, and restrict access to the construction site by the public.

34. All construction machinery and vehicles to be used in works shall be of proven efficiency and shall conform to GOB standards for emissions and noise levels. The contractor shall regularly maintain the construction machinery and vehicles so that emissions, vibrations and noise levels conform to GOB's relevant standards. The Contractor shall prohibit the use of air horns in settlement areas.

35. The contractor shall promptly reinstate any services and reinstall any physical facilities that are cut, disconnected or damaged during construction activities, and shall maintain or provide temporary services that are interrupted by construction. The Engineer shall inspect and certify the adequacy of all reinstated services and facilities.

<u>Site Conditions, Quarries and Haul Routes</u>

36. At the start of construction, the contractor will provide a Site Environmental Management Plan for development of the construction zone, worker camps, equipment yards, haul roads and quarry areas.

37. Haul routes will minimize interference with ongoing activity in the area. Routes shall be approved by the PIU. Haul roads and transport/equipment routes shall be kept within the construction zone, unless authorized by the PIU.

38. Selection of borrow pits, quarry sites and haul routes shall minimize noise and air pollution in the site vicinity, visual impacts in inhabited areas, impacts on land use, air and noise emissions along haul routes, and congestion in populated areas.

39. Quarry and borrow pit locations will be permitted for use by the local authority, and shall be pre-existing sites, e.g. already in use prior to the start of the construction. Newly opened quarry locations require approval of the PIU.

40. The contractor shall select borrow pits that are free from organic materials. The use of dredged materials from rivers is permitted if the materials are sandy and free from organic matter. Topsoil from farmland should not be used as fill.

41. The contractor shall stockpile construction materials in such a way as to prevent any loss of materials to watercourses. Stockpiling of backfill shall be done outside the right of way and not on the side slopes of roads.

42. Borrow pits shall be restricted to areas within the construction zone as defined by right-of-ways for roads, embankments and irrigation canals. Borrow pits along linear alignments will be interconnected; smoothly excavated; of uniform depth, width and slope; and graded to drain after use.

Archeological and Cultural Relics

43. The Contractor will stop construction on discovery of objects of archeological origin; and notify the PIU, who will contact the Department of Archaeology, Ministry of Cultural Affairs to investigate and, if desirable, undertake recovery. Work must remain halted at the specific location until investigation is complete.