

## Environmental and Social Impact Assessment (ESIA) Study for 51 MW Gas Fired Power Plant



**February 2015**

Submitted by:



**BETS Consulting Services Ltd.**

House-10, Road-135, Gulshan-1  
Dhaka-1212, Bangladesh

Phone : 9889923-24,

Fax : 880-2-9889967

E-mail : [bets@betsbd.com](mailto:bets@betsbd.com)

Web : [www.betsbd.com](http://www.betsbd.com)

## **Environmental and Social Impact Assessment (ESIA) Study for 51 MW Gas Fired Power Plant**

### **Table of Contents**

LETTER OF TRANSMITTAL .....	v
LIST OF TABLES .....	v
LIST OF FIGURES .....	vi
LIST OF ANNEXES .....	vii
ABBREVIATIONS .....	1
EXECUTIVE SUMMARY .....	3
CHAPTER-1 .....	15
INTRODUCTION .....	15
1.1 BACKGROUND .....	15
1.2 PROJECT OUTLINE .....	15
1.3 PROJECT RATIONALE .....	17
1.4 PURPOSE and SCOPE of the ESIA .....	17
1.5 Scope of the ESIA .....	17
1.6 Approach and Methodology .....	18
1.6.1 Preliminary Discussions with Project Proponent .....	18
1.6.2 Screening and Scoping Exercise .....	18
1.6.3 Baseline Data Collection .....	19
1.6.4 Stakeholder Consultation .....	19
1.6.5 Impact Assessment and Mitigation Measures .....	20
1.6.6 Analysis of Alternatives .....	20
1.6.7 Management Plans and Grievance Redress Mechanism .....	20
1.6.8 Information/Data Sources .....	20
1.7 Content of ESIA Report .....	21
CHAPTER-2 .....	23
POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK .....	23
2.1 INTRODUCTION .....	23
2.2 ENVIRONMENT-RELATED POLICIES IN BANGLADESH .....	23
2.2.1 National Environmental Policy, 1992 .....	23
2.2.2 National Environment Management Action Plan, 1995 .....	24
2.2.3 National Conservation Strategy, 1992 .....	24
2.2.4 Other Policies relevant to Environment .....	24

2.3 ENVIRONMENT AND SOCIAL RELATED LEGISLATIONS IN BANGLADESH .....	26
2.3.1 The Environment Conservation Act, 1995 (subsequent amendments in 2000 and 2002) .....	26
2.3.2 Environment Conservation Rules (ECR), 1997 (subsequent amendments in 2002 and 2003) .....	26
2.3.3 Acquisition and Requisition of Immovable Property Ordinance, 1982 .....	27
2.3.4 Administrative and Regulatory Guidelines and Instructions .....	28
2.3.5 Framework for Leasing of Government (Khas) Agricultural Land.....	28
2.3.6 Other Relevant National Legal Instruments for the Project.....	29
2.4 ADMINISTRATIVE FRAMEWORK RELATED TO ENVIRONMENT IN BANGLADESH .....	33
2.4.2 Department of Environment (DOE) .....	33
2.4.3 Status of Project Approval from DOE.....	37
2.5 INSTITUTIONAL ARRANGEMENTS RELATED TO LAND ACQUISITION IN BANGLADESH .....	37
2.6 PROJECT RELEVANT INTERNATIONAL TREATIES AND CONVENTIONS.....	37
2.7 World Bank REQUIREMENTS .....	38
CHAPTER-3.....	42
DESCRIPTION OF THE PROPOSED PROJECT .....	42
3.1 TYPE OF THE PROJECT .....	42
3.2 LOCATION & APPROACH ROAD OF THE PROJECT .....	42
3.2.1 ELECTRICAL INTERCONNECTION FOR POWER EVACUATION .....	42
3.2.2 FUEL TRANSPORTATION .....	42
3.3 PROJECT INFORMATION IN BRIEF .....	43
3.4 PRESENT STATUS OF THE PROJECT .....	47
3.5 RESOURCES AND UTILITIES.....	47
3.6 POWER GENERATION METHOD .....	47
3.7 PLANT OPERATION.....	48
3.8 PROJECT COST AND FUNDING .....	48
CHAPTER 4: .....	49
ANALYSIS OF ALTERNATIVES .....	49
4.1 GENERAL .....	49
4.2 SITE SELECTION.....	49
4.3 TECHNOLOGY OPTIONS.....	49
4.4 NO PROJECT SCENARIO .....	51
CHAPTER 5: .....	51

ENVIRONMENTAL AND SOCIAL BASELINE DATA .....	51
5.1 INTRODUCTION .....	51
5.1.1 STUDY OVERVIEW .....	51
5.1.2 Site Overview.....	51
5.1.3 Objectives and Methodology.....	51
5.2 PHYSICAL ENVIRONMENT .....	53
5.2.1 CLIMATE .....	53
5.2.2 LAND USE .....	64
5.2.3 GEOLOGY AND SOILS .....	64
5.2.4 NATURAL HAZARDS .....	64
5.2.5 WATER RESOURCES .....	66
5.2.6 AIR QUALITY .....	72
5.2.7 NOISE LEVEL.....	75
5.3 BIOLOGICAL ENVIRONMENT .....	79
5.3.1 OVERVIEW .....	79
5.3.2 BIO-ECOLOGICAL ZONE .....	83
5.3.3 ADOPTED METHODOLOGY .....	84
5.3.4 FLORAL COMPONENT .....	85
5.3.5 FAUNAL COMPONENT .....	86
5.4 SOCIO-ECONOMIC ENVIRONMENT.....	90
5.4.1 APPROACH AND METHODOLOGY .....	90
5.4.2 DEMARCATION OF THE PROJECT AREA FOR SOCIO-ECONOMIC STUDY .....	90
5.4.3 SITE VISIT AND RECONNAISSANCE.....	91
5.4.4 STAKEHOLDER CONSULTATIONS.....	91
5.4.5 DOCUMENTATION COLLECTION AND REVIEW.....	91
5.4.6 SOCIO-ECONOMIC BASELINE PROFILE.....	91
5.4.7 FINDINGS OF SOCIO-ECONOMIC SURVEY .....	99
CHAPTER6: .....	104
ANTICIPATED ENVIRONMENTAL IMPACT AND MITIGATION MEASURES.....	104
6.1 INTRODUCTION .....	104
6.2 CONSTRUCTION PHASE.....	104
6.2.1 ECOLOGICAL IMPACTS.....	104
6.2.2 PHYSICO-CHEMICAL IMPACTS .....	109
6.2.3 SOCIO-ECONOMIC IMPACTS .....	115
6.3 ENVIRONMENTAL IMPACT OPERATIONAL PHASE .....	116



6.3.1 OVERVIEW OF IMPACTS .....	116
6.3.2 NOISE IMPACTS DURING OPERATIONAL PHASE.....	116
6.3.3 WATER QUALITY ASSESSMENT .....	117
6.3.4 AIR QUALITY .....	118
6.3.5 SOCIO-ECONOMIC IMPACTS.....	119
6.3.6 CUMULATIVE IMPACT .....	120
6.4 IMPACT EVALUATION .....	121
6.4.1 CONSTRUCTION PHASE.....	122
6.4.2 OPERATION PHASE .....	123
6.5 MITIGATION MEASURES.....	124
6.5.1 CONSTRUCTION PHASE.....	124
6.5.2 OPERATION PHASE .....	127
CHAPTER-7:.....	130
INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION .....	130
7.1 INTRODUCTION .....	130
7.2 APPROACH AND METHODOLOGY FOR CONSULTATION.....	130
7.3 STAKEHOLDER ASSESSMENT.....	130
7.4 SUMMARY OF CONSULTATION .....	132
7.5 FOCUS GROUP DISCUSSION .....	134
7.6 PUBLIC DISCLOSURE.....	135
CHAPTER 8: .....	136
ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN .....	136
8.1 SCOPE OF ESMP.....	136
8.2 WORK PLANS AND SCHEDULES .....	136
8.2.1 CONSTRUCTION PHASE.....	136
8.2.2 OPERATION PHASE .....	139
8.3 ENVIRONMENTAL MONITORING PLAN .....	140
8.3.1 MONITORING PARAMETERS.....	140
8.3.2 MONITORING SCHEDULE .....	142
8.3.3 RESOURCES AND IMPLEMENTATION .....	143
8.4 OCCUPATIONAL HEALTH AND SAFETY .....	144
8.4.1 GENERAL REQUIREMENTS .....	144
8.4.2 WORKPLACE ENVIRONMENTAL QUALITY .....	144
8.4.3 WORK IN CONFINED SPACES.....	147
8.4.4 HAZARDOUS MATERIAL HANDLING AND STORAGE.....	148

8.4.5 TRAINING .....	149
8.5 ENVIRONMENTAL MANAGEMENT SYSTEMS (EMS).....	150
CHAPTER 9: .....	152
RISK ASSESSMENT AND MANAGEMENT .....	152
9.1 INTRODUCTION .....	152
9.2 POWER PLANT RISKS ASSESSMENT .....	152
9.4 EMERGENCY RESPONSE PLAN .....	154
9.4.1 Emergency Response Cell.....	154
9.4.2 Emergency Preparedness.....	155
9.4.3 Fire Fighting Services .....	155
9.4.4 Emergency Medical Services .....	156
9.4.5 Rescue Services.....	156
9.4.6 Security Services.....	157
9.4.7 Public Relations Services.....	157
9.5 CONCLUDING REMARKS .....	157
CHAPTER 10: .....	159
GRIEVANCE REDRESS MECHANISM.....	159
10.1 INTRODUCTION .....	159
10.2 OBJECTIVES OF GRIEVANCE REDRESS MECHANISM .....	159
10.3 COMPOSITION OF GRC AND ULC.....	159
CHAPTER 11: .....	162
CONCLUSIONS AND RECOMMENDATIONS .....	162
11.1 CONCLUSION .....	162
11.2 RECOMMENDATIONS.....	163
LIST OF REFERENCES .....	165
ANNEX-I to XX.....	166

## **LETTER OF TRANSMITTAL**

### **LIST OF TABLES**

Table 1.6-1: Key Data Sources
Table 2.2-1: Policies Relevant to Environment
Table 2.3-1: National Legal Instruments relevant to the Project
Table 2.6-1: Project Relevant International Treaties and Conventions
Table 3.3-1: Basic data of "Midland Power Co. Ltd."
Table 4.3-1: Summary of alternative site assessment
Table 5.2-1: Total Monthly and Annual Rainfall (mm), Comilla Weather Station
Table 5.2-2: Average Monthly Relative Humidity (%), Comilla Weather Station
Table 5.2-3: Average Monthly Minimum Temperature (°C), Comilla Weather Station
Table 5.2-4: Average Monthly Maximum Temperature (°C), Comilla Weather Station

Table 5.2-5: Monthly & Yearly Maximum Wind Speed in Konts & Direction in Degree at Comilla
Table 5.2-6: Details of Surface and Ground Water Sampling Locations
Table 5.2-7: Methods for Water Analysis
Table 5.2-8: Surface Water Quality Analysis
Table 5.2-9: Ground Water Quality Analysis Result
Table 5.2-10: Methodology for Analysis of Ambient Air Quality
Table 5.2-11: Ambient Air Quality Sampling Location
Table 5.2-12: Ambient Air Quality in the Study Area
Table 5.2-13: Ambient PM <sub>10</sub> , PM <sub>2.5</sub> Concentrations as per NAAQS as determined in recent measurements with the plant in operation
Table 5.2-14: Standards for Noise (EQS)
Table 5.2-15: Details of Ambient Noise Monitoring Locations
Table 5.2-16: Noise level in and around the Proposed Project Site
Table 5.3-1: List of the Important Bird Areas (IBAs) of Bangladesh
Table 5.3-2: Common Fish Species in Meghna River and Surrounding Water Bodies
Table 5.4-1: Demographic Profile of the Project Study Area
Table 5.4-2: Religion Profile of the Project Study Area
Table 5.4-3: Employment Status by field of Activity in the Project Study Area
Table 5.4-4: Production of Key Crops in Char Chartala union of Ashuganj Upazila as per 2012-13 Statistics
Table 5.4-5: Sources of Drinking Water and Electricity Facility of the Project Area
Table 5.4-6: Sanitation Facility of the Project Study Area
Table 5.4-7: Access to Resources in study Area
Table 6.2-1: Categories and definition of consequence levels for ecological impacts
Table 6.2-2: Likelihood of occurrence and rankings natural impacts
Table 6.2-3: Ecological impact significance rankings
Table 6.2-4: Risk assessment matrix
Table 6.2-5: Summary of potential ecological impact assessment
Table 6.3-1: OSHA noise exposure limits for the work environment
Table 6.3-2: List of Factories and Power Plants within 10km radius of MPCL, Charchartola, Ashugonj, B-Baria
Table 6.4-1: Effect of project activities on physico-chemical environmental parameters during construction phase
Table 6.4-2: Effect of project activities on ecological parameters during construction phase
Table 6.4-3: Effect of project activities on socio-economic parameters during construction
Table 6.4-4: Effect of project activities on physico-chemical environmental parameters during operation phase
Table 6.4-5: Effect of project activities on ecological parameters during operation phase
Table 6.4-6: Effect of project activities on socio-economic parameters during operation phase
Table 6.5-1: Tree species recommended for plantation within the MPP
Table 7.3-11: Stakeholder Mapping for the Project
Table 7.4-1: Details of Consultations Held for the Project
Table 8.2-1: Potentially significant environmental impact during construction phase and mitigation measures
Table 8.2-2: Environmental management and monitoring reporting
Table 8.2-3: Potentially significant environmental impact during operation phase and mitigation measures
Table 8.3-1: Monitoring plan during construction phase of the project
Table 8.3-2: Monitoring plan during operational phase of the project
Table 8.3-3: Cost Estimate for Environmental Monitoring during Construction Phase
Table 8.3-4: Cost estimate for environmental monitoring during operational phase
Table 8.3-5: Cost estimate for training during operational phase
Table 8.4-1: General requirements for workers' health and safety
Table 10.3-1: Sample Grievance Reporting Form

## **LIST OF FIGURES**

Figure 1.2-1: Process Flow Diagram of Electricity Generation

Figure 2.4-1: DOE Environmental Clearance Applicability and Procedure  
 Figure 2.4-2: Flowchart of EIA Process Applicable to the Proposed Project  
 Figure 3.2-1: Project Location Map  
 Figure 3.2-2: Project Location in Satellite Image  
 Figure 3.2-3: Layout Plan of the Project Area  
 Figure 5.1-1: 5 km Study Area Map  
 Figure 5.2-2: Climatic Zones of Bangladesh  
 Figure 5.2-2: Average Monthly Rainfall (2004-2013), Comilla Weather Station  
 Figure 5.2-3: Average Monthly Humidity (2004-2013), Comilla Weather Station  
 Figure 5.2-4: Average Minimum and Maximum Temperatures (2004-2013), Comilla Weather Station  
 Figure 5.2-5: Monthly Wind Rose Diagram (2013), Comilla Weather Station  
 Figure 5.2-6: Seasonal and Annual Wind Rose Diagram (2013), Comilla Weather Station  
 Figure 5.2-7: Seismic Zones of Bangladesh (BNBC, 1993)  
 Figure 5.2-8: Surface and Ground Water Sampling Locations  
 Figure 5.2-9: Ambient Air Quality Monitoring Location  
 Figure 5.2-10: Noise Level Monitoring Locations  
 Figure 5.3-1: Forest Areas of Bangladesh  
 Figure 5.3-2: Protected Areas of Bangladesh  
 Figure 5.3-3: Bio-ecological zone of the study area  
 Figure 5.4-1: Average Household Size in the study area  
 Figure 5.4-2: Occupation Profile of the Project Area  
 Figure 5.4-3: Education and Literacy of the Study Area  
 Figure 10.3-1 Flow Chart of Grievance Procedure

## **LIST OF ANNEXES**

ANNEX-I	The World Bank Operational Manual OP 4.01
ANNEX-II	Environmental Clearance Certificate (ECC) of DOE
ANNEX-III	Ambient Air Quality Monitoring Results
ANNEX-IV	Checklist of Flora
ANNEX-V	Checklist of Fauna
ANNEX-VI	Declaration-willing buyer-willing seller and Copy of deeds executed with sellers
ANNEX-VII	Photo of Baseline Monitoring and Consultation
ANNEX-VIII	Focus Group Discussion Meeting Attendance Sheet
ANNEX-IX	List of ESIA Team
ANNEX-X	Chance Find Procedures for Protection of Cultural Property
ANNEX-XI	Gadget of Environment and Forest Ministry on ECA
ANNEX-XII	Assessment of Impact of Air Pollution due to Operation of 51 MW Gas Based Power Plant
ANNEX-XIII	Storm Water Drainage Layout Plan
ANNEX-XIV	Noise Pollution Modeling of Operational Phase of the 51 MW Gas Based Power Plant
ANNEX-XV	Manufacturer's Specification of Engines with Emission Levels
ANNEX-XVI	Emergency Preparedness and Response Plan
ANNEX-XVII	Environmental Compliance Report
ANNEX-XVIII	Technical Comparison with Investment Analysis of Technologies
ANNEX-XIX	PM Measurement by Atomic Energy Dhaka
ANNEX-XX	Normalization of Noise Level Data

## ABBREVIATIONS

ADB	Asian Development Bank
ANSI	American National Standard Institute
BBS	Bangladesh Bureau of Statistics
BCA	Bangladesh Country Almanac
BMD	Bangladesh Meteorological Department
BOD	Biochemical Oxygen Demand
BOO	Build, Own and Operate
BPDB	Bangladesh Power Development Board
BRTC	Bureau of Research Testing and Consultation
BUET	Bangladesh University of Engineering and Technology
BWDB	Bangladesh Water Development Board
COD	Chemical Oxygen Demand
CO	Carbon Monoxide
DCS	Distributed Control System
DESA	Dhaka Electric Supply Authority
DESCO	Dhaka Electric Supply Company
DGPS	Digital Global Positioning System
DLN	Dry Low NO <sub>x</sub>
DMDP	Dhaka Metropolitan Development Plant
DO	Dissolved Oxygen
DoE	Department of Environment
EA	Environmental Assessment
ECR	Environment Conservation Rules
EGCB	Electricity Generation Company of Bangladesh
EIA	Environmental Impact Assessment
EM	Emergency Manager
ESIA	Environment and Social Impact Assessment
ESMP	Environmental and Social Management Plan
EMS	Environmental Management System
EMU	Environmental Management Unit
EPZ	Export Processing Zone
ERC	Emergency Response Cell
ERP	Emergency Response Plan
FGD	Focus Group Discussion
GIS	Geographic Information System
GoB	Government of Bangladesh
GPS	Global Positioning System
GE	Gas Engine
HYV	High Yielding Variety
IEE	Initial Environmental Examination
IPP	Independent Power Producer
kV	Kilo Volt
MPP	Midland Power Plant
MPCL	Midland Power Company Limited

NO <sub>x</sub>	Oxides of Nitrogen
OSHA	Occupational Safety and Health Administration
PCB	Poly Chlorinated Biphenyles
PGCB	Power Grid Company of Bangladesh
PM	Particulate Matter
QA/QC	Quality Assurance / Quality Control
REB	Rural Electrification Board
RMZ	Regulatory Mixing Zone
SIA	Social Impact Assessment
SO <sub>x</sub>	Oxides of Sulfur
SPM	Suspended Particulate Matter
ST	Steam Turbine
TPH	Total Petroleum Hydrocarbon
TSS	Total Suspended Solids
USDOT	United States Department of Transportation
USEPA	United States Environmental Protection Authority
USFHWA	United States Federal Highway Authority
WB	World Bank

## EXECUTIVE SUMMARY

### INTRODUCTION

In order to increase the capacity of electricity production, the Ministry of Power, Energy and Mineral Resources, GOB has given permission to the private entrepreneurs to establish new power plants of different generation capacities on a Rental and Build, Own and Operate (BOO) basis in private sector. Considering the Power shortfall in the country and government plans, authority of Midland Power Company Ltd. has constructed a **51 MW Gas Fired Power Plant** on BOO basis at Ashugonj, Brahmanbaria to narrow the ever-increasing gap between demand and supply of electricity through natural gas based low cost generation.

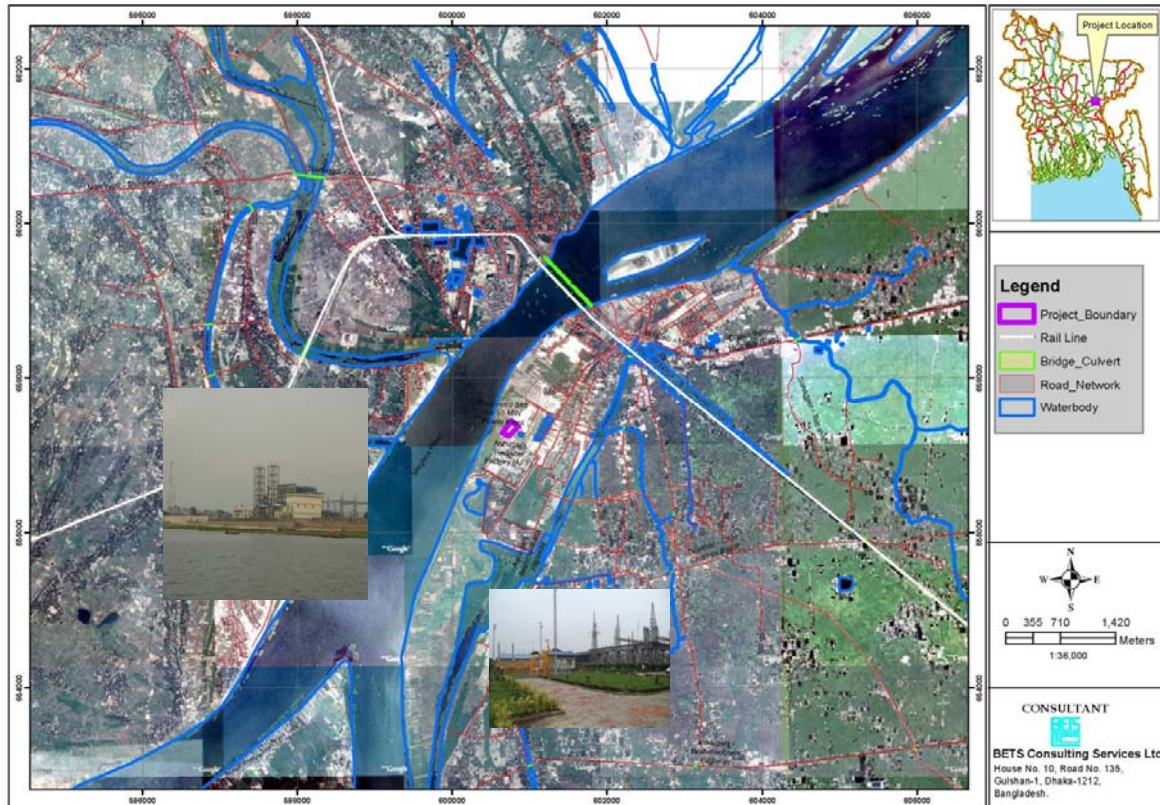
In early 2012, a full-scale Environmental Impact Assessment (EIA) of the plant was carried out by the Midland Power Company Ltd. It was carried out to assess the environmental concerns of the Power Plant. However, a number of issues were not appropriately addressed in that assessment (e.g., air and noise quality modeling) due to time constraints and lack of availability of necessary data. In this context, the World Bank suggested revision of the Environment and Social Impact Assessment (ESIA) document of the Power Plant following World Bank Guidelines. As the construction of the plant has been completed and it is in operation, a monitoring/compliance report of the ESMP measures proposed in this ESIA report has also been prepared. This report also includes the compliance status on the DOE conditions for EIA clearance. The report is submitted as a standalone accompanying document with this ESIA report(Annex-XVII).

Midland Power Co. Ltd. has appointed BETS Consulting Services Ltd. to update the existing Environmental and Social Impact Assessment document by:

- (i) Revising the document to reflect the World Bank environmental and social guidelines;
- (ii) Carrying out a cumulative impact assessment;
- (iii) Including quality assured data on Air Quality and noise parameters;
- (iv) Performing air and noise quality modeling; and
- (v) Prepare a monitoring/compliance report for the construction period and operation until now.

### PROJECT DESCRIPTION

The concerned power plant of the Midland Power Co. Ltd. is located at Ashugonj in the administrative district of Brahmanbaria under Chittagong Division. The selected site for Midland Power Co. Ltd. is about 5-6 km away from Brahmanbaria city centre. The proposed site of the project is on the south side of the Dhaka-Sylhet highway and quite close to the Ashugonj Fertilizer and Chemical Complex Ltd. (AFCCCL). A large grain SILO is located to the Northern side of the project site. To the eastern side of the project the NG distribution hub of the Gas Transmission Company Limited (GTCL)-Petrobangla Company of the GOB is located. Meghna River is just adjacent to the western side of the plant-site. Bhairab Railway Station is about 2 km away to the northwest of the project site. The project site enjoy's the infrastructural facilities such as electricity, water, telecommunication, etc. The access to the project site, project location sketch map with its surroundings is shown in the Satellite Image below. Project site is well connected with the national road linking system.



**Satellite Image Depicting Project Location**

## **ENVIRONMENTAL AND SOCIAL BASELINE DATA**

### **Physical Environment**

#### **Climate Geology and Soil**

Long-term average climatic data collected at the nearby Comilla weather station (2004 to 2013) reflect the monsoonal effects on climate in this region (Bangladesh Meteorological Department, Dhaka 2014): Mean maximum temperature is 35.5°C; Mean daily minimum temperature is 6°C; Mean annual relative humidity is 81% and Mean annual rainfall 2016 mm.

Data about wind speed and direction for the period from 2004 to 2013 as collected from Meteorological Department and the data indicates that the maximum wind speed recorded as 25 knots in the month of October, 2007. The prevailing wind direction is South and South-east in most part of the year.

Geology of Bangladesh is generally dominated by poorly consolidated sediments deposit over the past 10,000 to 15,000 years (Holocene age). The geology of the study area consists of Quaternary deltaic sediments, which have been strongly influenced by tectonic movements on deep-seated faults. The area lies on a tectonic block, which has been uplifted relative to the surrounding areas. The soil profile of the study area consists of about 12m thick clay deposit followed by sand, clay and progressively coarser sand as depth increases.



In terms of crop production, the soils of Bangladesh can be categorized into three main classes; floodplain, terrace and hill soils. Soils are mainly grey loamy on the ridges and gray to dark gray clayey in the basins. Gray sands to loamy sands with compact silty top soils occupy areas of the old Brahmaputra Char floodplain or alluvial soils. In adjoining southern part soil mainly comprises sandy barns and sandy clay barns and tends to be gray to dark gray in poorly-drained basins and brown on higher and better drained land.

### **Air Quality**

The existing ambient air quality of the study area was monitored at three locations (September 2014- October 2014) and at the Plant gate (January 2015 to February 2015) during the monitoring period. The monitoring parameters included Particulate Matter (PM<sub>10</sub> and PM<sub>2.5</sub>), Sulphur Dioxide (SO<sub>2</sub>), Oxides of Nitrogen (NO<sub>x</sub>), and Carbon Monoxide (CO). All the parameters were monitored on 24-hourly basis except Carbon Monoxide (CO) during the duration of the study.

#### **PM<sub>2.5</sub>**

The 24-hourly PM<sub>2.5</sub> concentration in ambient air in the study area was recorded  $146 \pm 36 \mu\text{g}/\text{m}^3$ . The Annual measured concentration was  $54 \pm 32 \mu\text{g}/\text{m}^3$  which is higher than BNAAQS.

#### **PM<sub>10</sub>**

The 24-hourly PM<sub>10</sub> concentration in ambient air in the study area was recorded  $191 \pm 48 \mu\text{g}/\text{m}^3$ . The Annual concentration was found to be  $105 \pm 56 \mu\text{g}/\text{m}^3$  which is higher than BNAAQS.

#### **SO<sub>2</sub>**

The 24-hourly SO<sub>2</sub> concentration was recorded in the range of 8 – 27  $\mu\text{g}/\text{m}^3$ . During the monitoring period, the maximum SO<sub>2</sub> concentration is reported at power plant site as 27  $\mu\text{g}/\text{m}^3$ . SO<sub>2</sub> concentrations at all the monitoring locations were reported well below 365  $\mu\text{g}/\text{m}^3$ , which is a 24-hourly National Ambient Air Quality Standard (NAAQS) for SO<sub>2</sub> in Bangladesh.

#### **NO<sub>x</sub>**

The 24-hourly NO<sub>x</sub> concentration was recorded in the range of 10.3–42.6  $\mu\text{g}/\text{m}^3$ . Average concentration of SO<sub>2</sub> are reported slightly higher due to the industrial setup. During the monitoring period, the maximum NO<sub>x</sub> concentration is reported at power plant site as 42.6  $\mu\text{g}/\text{m}^3$ . There are no stipulated standards for 24-hourly NO<sub>x</sub> concentration in Bangladesh. The annual Bangladesh standard value for NO<sub>x</sub> is 100  $\mu\text{g}/\text{m}^3$  and present average concentrations at all the locations are well below these values.

#### **CO**

The 8-hourly CO concentration was recorded in the range of 40 – 340  $\mu\text{g}/\text{m}^3$ . Average concentrations of CO are reported low at all the monitoring locations compared with the Bangladesh Standards (10 mg/m<sup>3</sup>).

### **Noise**

Excessive noise is a potential issue for both human and biological receivers and can cause a range of negative issues, from mild annoyance and moderately elevated levels of agitation to significant disturbance of behavioral patterns and, in severe cases, temporary or permanent hearing loss. According to the World Health Organization Guidelines for Community Noise (1999), daily sound pressure levels of 50 decibels (dB) or above can create discomfort amongst humans, while ongoing exposure to sound pressure levels over 85 dB is usually considered the critical level for temporary hearing damage.

Noise levels were recorded at nineteen locations in the study area during the monitoring period. Noise levels were recorded in the form of sound pressure levels with the help of a digital sound level meter. Noise level were recorded for two hours at day and night time in the closest settlement area indicated as NL17, NL18 and NL19 monitoring locations and rest of the locations were recorded for 20 minutes both day and night times.

The summarization of the monitoring results revealed that the project area falls into Industrial zone according to Bangladesh Environmental Quality Standard ECR'97 categorization. Noise levels of all locations were within the standard limit of ECR'97 (subsequent amendment in 2006).

### **Water Quality**

Groundwater aquifers in Bangladesh are constantly recharged by major river systems and by infiltration of rainwater. Groundwater is usually available within 5m below ground surface (mbgs). This level fluctuates seasonally but approaches close to the surface in most parts of the country from July to September. At Ashuganj, the groundwater level is about 6 mbgs surface during the dry season, with levels returning to their normal position before the end of the monsoon season. This fall in ground levels is an entirely natural process that arises because of the hydrological link with the river. The ground water quality is within the standard of ECR.

The surface water Quality was compared with the Bangladesh ECR standard for best practice based classification criteria. Some of the water analysis parameters like pH of the Meghna River is within the permissible limits of 6.5 to 8.5. The DO of the sample of Meghna River is 6.7 mg/l and thus meets the surface water classification for different usages. The BOD level is 3.0 mg/l for the Meghna River and thus is well below the permissible limits. Comparison of the data with the surface water quality standards of government of Bangladesh reveal the fact that water of the water bodies are fit for supply after conventional treatment, Water usable by fisheries, Industrial process and cooling industries and Water usable for irrigation.

### **Ecological Environment**

Approximately 12-15 families of the plant species are present in the study area. These are: Gramineae, Leguminosae, Moraceae, Myrtaceae, Cyperaceae, Euphorbiaceae, Rutaceae, Solanaceae, Labiatae, Rubiaceae, Malvaceae, Compositae, etc. The most common roadside plantation trees are Koroi (*Albizia procera*), Sisso (*Dalbergia sissoo*), Mahogany (*Sweitonia mahagoni*), Katanote (*Amaranthus spinosus*), Dhutura (*Datura meteloides*), Apang (*Achyranthus aspera*), Chorekanta (*Chrysopogon aciculatus*), Jagadumur (*Ficus glomoretta*), Swetadrin (*Leucas lavendulifolia*), Tulsi (*Ocimum sanctum*), Titbegun (*Solanum indicum*), Benna (*Vetiveria zizanioides*), Bot (*Ficus benghalensis*) etc. Koroi (*Albizia procera*), Sisso (*Dalbergia sissoo*), Mahogany (*Sweitonia mahagoni*) are the dominant road side plant species in the study area.

A variety of lizards and skinks were observed during the survey. Among the lizards identified was the Common garden lizard (*Calotes versicolor*). Lizards were observed in bushes and the lower canopies of trees in various vegetated areas around the study area. Other common geckos including Brook's House Gecko (*Hemidactylus brookii*), the Common House Gecko (*Hemidactylus frenatus*) were seen within homesteads.

Common skink (*Eutrophis macularia*) was found in several of the terrestrial habitats around the study area. Their niche habitat is low-lying vegetation, leaf litter, grassy areas, bushes, stream banks, under logs and burrows. The burrow-dweller Bengal monitor (*Varanus bengalensis*) was seen basking in the study area.

A large number of aquatic fauna was observed in the study area. Many are totally dependent on wetlands (beels, river, ponds) and species are partially dependent on wetlands. There are little available aquatic habitats for faunal species. Wetlands are intensively exploited and the habitat is highly disturbed. Despite this, some species have adapted to the altered environment, and others have even flourished.

Among the amphibians the skipper frog (*Rana cyanophytis*) is common-being found in most of the wetland habitats and has been the most successful in adapting to the altered environment. The common roof turtle (*Kachuga tecta*) and the flat-shelled spotted turtle (*Lissemys punctata*) are the most common of the reptiles. These freshwater turtle species face problems of migration during summer when water levels are inadequate.

### **Socio-economic Environment**

As per the survey data it can be observed that almost 27% of the respondents are involved in agricultural labour followed by business (20%), Non Agricultural labour (14%) Agricultural activity (9%), Private Service (4%) and Fisherman (2%) in the study area. 24% are of other professions including rickshaw-puller, construction worker, driver etc. It can also be observed that majority of the women respondents are housewives or involved in household activities.

Majority of the respondents have a positive perception about the power plant. They express their opinion that the power plant is a national asset and support to meet our electricity demand. Only who lives in adjacent to the power plant provide their opinion regarding the noise level and odor problem those mostly comes from other industry located near to the settlement and they inform that noise level from the power plant is tolerable. Positive expectations of the surveyed household are primarily with respect to overall development in the area, improved road facilities and employment opportunity for the local people.

The team consulted with a diverse range of stakeholders associated with the project. These included governmental agencies and departments, local administration, NGO, as well as the community. Furthermore, in order to assess the community and household level impacts, a socio-economic survey for a sample household size of 52 within the close settlement of the existing power plant was undertaken. This survey was of much help to establish the baseline conditions of the community living in the vicinity of the project footprint and their opinions, expectations and apprehensions about the existing power plant. The analyses of this data and the inferences drawn have been provided in the following sections.

### **ANTICIPATED ENVIRONMENTAL IMPACT AND MITIGATION MEASURES**

## **Environmental Impact during Construction Phase**

### ***Ecological Impacts***

The proposed Power Plant project site has aquatic habitat which supports few common aquatic floral species and none of them are threatened in Bangladesh. No long-term adverse impacts to the floral and faunal species or their ecosystem are expected.

### **Physico-chemical Impacts**

Impact on Water Quality and General Environmental Waste and wastewater generated during the construction phase of the project include construction debris and wastes, and some other solid wastes (e.g., from labor sheds), human wastes from people working at the project site (e.g., from labor sheds), and some liquid waste from construction processes. These waste/wastewater could lead to pollution of water and general environment, if not properly disposed.

### **Air Quality Impacts**

During the construction phase, the important sources of emissions would include those from the operations of construction equipment and machineries, project vehicles carrying construction materials/ debris to/ from the site. Particulate matter may be generated from stone (aggregate) crushing, earthworks, material storage areas, and unpaved roads.

### **Noise Level**

For assessment of noise level during construction phase, the project activities were divided into two major classes–(i) general site and plant construction and (ii) access road construction. Mitigation measures have been suggested to reduce noise exposure at the nearest residence.

### **Socio-economic Impacts**

#### **Transport and communication:**

During construction phase, some additional traffic will be generated for bringing in construction material and equipment. This traffic will pass through heavily traveled Sylhet-Dhaka road. However, the negative impact of the increased traffic flow would be mostly concentrated mainly within the MPP complex and affecting people in residential areas located close to the project site.

#### **Navigation:**

Large barges are likely to be used to carry the power plant equipment to the plant site via the Meghna River. So there will be some crowding of in the navigation channel. However, such crowding is expected to be minor in nature and easily manageable.

#### **Public Health:**

The construction activities are likely to have some impact on health and well being due to increased noise pollution and vibration, and local air pollution. Solid wastes generated by the construction activities may create environmental pollution and thus affect public health, if not properly disposed. Proper measures including regular maintenance of equipment and use of protective gear are needed to reduce the risk of accidents during the construction phase.

#### **Employment:**

Some job opportunities will be created for labors as well as skilled manpower (including engineers) for construction of the proposed project. Installation of power plant will require

relatively small number of skilled personnel and laborers; as such installation is highly automated.

### **Environmental Impact during Operation Phase**

The impacts of project activities on most ecological parameters (e.g., floral and faunal habitat and diversity) are mostly insignificant. The effects of project activities a number of physicochemical environmental parameters have been assessed. These parameters include noise level, water quality, and air quality. The impact of the power plant project at its operation phase on socio-economic parameters will be mostly beneficial. Increased power supply will promote wellbeing of the people suffering from lack of power supply or serious load shedding; it is also likely to have positive impact on industrial activities and employment.

### **Noise Impacts**

During the operational phase exceedingly high level of noise is expected to be generated within the confines of the turbine and generator installations. Prolonged exposure to such high level of noise may cause permanent hearing loss. Noise generated by the power plant will not affect the locales on the southern side of the plant. However, future population outside the project site may be affected by the noise during operational phase.

### **Air Quality**

The proposed 51 MW Power Plant is a relatively cleaner technology for electricity production, especially when natural gas with no sulfur content (as is the case here) is used as fuel. It is expected to produce minimal impact on the air quality of the surrounding environment. The effect of stack emissions (NO<sub>x</sub> during operation of only the GT; and NO<sub>x</sub>, CO and PM during operation of the gas fired power Plant) on ambient air quality has been assessed using AERMOD model.

### **Public Consultations**

Discussions were held with the communities who are lives in close to the power plant. Two focus group discussions were held in the Char Chartala village. The overall outputs from the FGD are given below:

1. Main environmental concern is noise pollution that is generated from the power plant. Overall the noise of this power plant is comparatively low rather than other industry.
2. During construction stage all of the affected households got proper compensation
3. During winter season transmission line wire make noise which is often cause panic
4. This plant do not causes any surface water pollution
5. The plant authority should be develop the existing connecting road
6. Few local people have been provided with job in this power plant.
7. Require more job opportunity in the plant specially jobless young people
8. Proper fire fighting system is to be preserved in the plant for safety

### **MITIGATION MEASURES AND ENVIRONMENTAL MANAGEMENT**

Environmental management and monitoring activities for the proposed power plant project could be divided into management and monitoring: (a) during construction phase, and (b) during operation phase. The environmental management program should be carried out as an integrated part of the project planning and execution. For this purpose, it is recommended that

it is recommended that the MPCL for this specific project should take the overall responsibility of environmental management and monitoring.

The MPCL through its team will make sure that the Contractor undertake and implement appropriate measures as stipulated in the contract document, or as directed by the GM, MPCL to ensure proper environmental management of the project activities. It should be emphasized that local communities should be involved in the management of activities that have potential impacts on them (e.g., traffic congestion in the surrounding areas). They should be properly consulted before taking any management decision that may affect them. Environmental management is likely to be most successful if such decisions are taken in consultation with the local community. The environmental management during the construction phase should primarily be focused on addressing the possible negative impacts arising from:

- (a) Generation and disposal of sewage, solid waste and construction waste (b) Increased traffic (c) Generation of dust (particulate matter) (d) Generation of noise and (e) Deterioration of water quality.

**E-1 Potentially significant environmental impact during construction phase and mitigation measures**

Activity/Issues	Potentially Significant Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
Influx of workers	<ul style="list-style-type: none"> <li>• Generation of sewage and solid waste</li> </ul>	<ul style="list-style-type: none"> <li>• Construction of sanitary latrine and septic tank system (one latrine for 20 persons)</li> <li>• Erecting "no litter" sign, provision of waste bins/cans, where appropriate</li> <li>• Waste minimization, recycle and reuse</li> <li>• Proper disposal of solid waste (in designated waste bins)</li> </ul>	Contractor (Monitoring by MPCL)
	<ul style="list-style-type: none"> <li>• Possible spread of disease from workers</li> </ul>	<ul style="list-style-type: none"> <li>• Clean bill of health a condition for employment</li> <li>• Regular medical monitoring of workers</li> </ul>	Contractor (Monitoring by MPCL)
Transportation of equipment, materials and personnel; storage of materials	<ul style="list-style-type: none"> <li>• Increased traffic/navigation</li> <li>• Generation of noise</li> </ul>	<ul style="list-style-type: none"> <li>• Speed reduction to 10 km per hour within the MPCL complex</li> </ul>	Contractor (Monitoring by MPCL)
	<ul style="list-style-type: none"> <li>• Deterioration of air quality from increased vehicular movement, affecting people in the surrounding areas</li> <li>• Wind-blown dust from material (e.g., line aggregate) storage areas</li> </ul>	<ul style="list-style-type: none"> <li>• Keeping vehicles under good condition, with regular checking of vehicle condition to ensure compliance with national standards</li> <li>• Watering unpaved/dusty roads (at least twice a day; cost estimate provided)</li> <li>• Sprinkling and covering stockpiles</li> <li>• Covering top of trucks carrying materials to the site and carrying construction debris away from the site</li> </ul>	Contractor (Monitoring by MPCL)
Construction activities, including operation of construction equipment	<ul style="list-style-type: none"> <li>• Generation of noise from construction activities (general plant and access road construction)</li> </ul>	<ul style="list-style-type: none"> <li>• Use of noise suppressors and mufflers in heavy equipment</li> <li>• Avoiding, as much as possible, construction equipment producing excessive noise during night</li> <li>• Avoiding prolonged exposure to noise (produced by equipment) by workers</li> <li>• Creating a buffer zone around the construction site to reduce disturbance to protect from the health hazard</li> </ul>	Contractor (Monitoring by MPCL)
	<ul style="list-style-type: none"> <li>• Deterioration of air quality from wind-blown dust and</li> </ul>	<ul style="list-style-type: none"> <li>• Not using equipment such as stone crushers</li> </ul>	Contractor (Monitoring by MPCL)

Activity/Issues	Potentially Significant Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
	possible use of equipment, such as stone (aggregate crushers)	at site, which produce significant amount of particulate matter <ul style="list-style-type: none"> <li>• Keeping construction equipment and generators in good operating condition</li> <li>• Using equipment, especially generators with high levels of emission control (e.g., TIER-4).</li> <li>• Immediate use of construction spoils as filling materials</li> <li>• Immediate disposal/sale of excavated materials</li> <li>• Continuous watering of bare areas</li> </ul>	by MPCL)
	<ul style="list-style-type: none"> <li>• Generation of construction waste</li> </ul>	<ul style="list-style-type: none"> <li>• Hauling of construction debris away from the site and their appropriate disposal in asanitary landfill</li> </ul>	Contractor (Monitoring by MPCL)
	<ul style="list-style-type: none"> <li>• Accidents</li> </ul>	<ul style="list-style-type: none"> <li>• Regular inspection and maintenance of equipment</li> <li>• Environmental health and safety briefing</li> <li>• Provision of protective gear</li> </ul>	Contractor (Monitoring by MPCL)
	<ul style="list-style-type: none"> <li>• Spills and leaks leading to soil and water contamination with hydrocarbon and PAHs</li> </ul>	<ul style="list-style-type: none"> <li>• Good house keeping</li> <li>• Proper handling of lubricating oil and fuel</li> <li>• Collection, proper treatment, and disposal of spills</li> </ul>	Contractor (Monitoring by MPCL)
	<ul style="list-style-type: none"> <li>• Employment of work/labor force</li> </ul>	<ul style="list-style-type: none"> <li>• Local people should be employed in the project activities as much as possible.</li> </ul>	Contractor (Monitoring by MPCL)
	<ul style="list-style-type: none"> <li>• If cultural resources are found during construction</li> </ul>	<ul style="list-style-type: none"> <li>• Follow the "Chance Find Procedure" World Bank Operational guidelines OP 4. 11</li> </ul>	Contractor (Monitoring by MPCL)

The environmental management during the operation phase should primarily be focused on addressing the following issues: a. Emission from the power plant b. Generation of noise c. Waste generation at the plant.

Table E-2 summarizes the potentially significant environmental impacts during operation phase, the measures needed to eliminate or offset adverse impacts and enhance positive impacts.

Activity/Issues	Potentially Significant Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
Power Generation	<ul style="list-style-type: none"> <li>• Emission from the power plant</li> </ul>	<ul style="list-style-type: none"> <li>• Using stack as specified in the bid document</li> <li>• Using low nitrogen oxide burners, as specified in the bid document</li> <li>• Installation of stack emission monitoring equipment for major pollutants. An in-house Continuous Air Monitoring Station (CAMS) may be established.</li> <li>• In stack design due consideration should be given to proper insulation</li> <li>• Planting of trees around the project site</li> <li>• Restrictions may also be imposed on installation of industries in the area that emit significant amount of particulate matter.</li> </ul>	MPCL
	<ul style="list-style-type: none"> <li>• Generation of noise</li> </ul>	<ul style="list-style-type: none"> <li>• Provision of silencers for generators and turbines</li> </ul>	MPCL

Activity/Issues	Potentially Significant Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
		<ul style="list-style-type: none"> <li>Planting of trees around the project site (number and cost estimate provided)</li> <li>Regular plant maintenance</li> <li>Regular noise monitoring</li> <li>Use of ear-muffs and ear-plugs by plant personnel working in the generator and turbine facilities of the plant</li> </ul>	
Water Consumption	<ul style="list-style-type: none"> <li>Depletion of groundwater resources</li> </ul>	<ul style="list-style-type: none"> <li>Regular monitoring of groundwater level</li> </ul>	MPCL
Waste generation	<ul style="list-style-type: none"> <li>Inappropriate disposal of sewage causing environmental pollution</li> <li>Generation of solid waste including sludge from demineralizer.</li> <li>Possible water pollution</li> </ul>	<ul style="list-style-type: none"> <li>Good housekeeping</li> <li>Proper construction and maintenance of wastewater disposal system for the plant premises</li> <li>Ensuring proper storage, treatment, and disposal of all solid waste</li> <li>Monitoring of effluent quality from treatment plant (monitoring requirement and cost estimate provided)</li> <li>Monitoring of river water quality (monitoring requirement and cost estimate provided)</li> </ul>	MPCL

**Table E-3&Table E-4 provides the Monitoring plan during construction phase and operational phase of the project.**

**Table E-3 Monitoring plan during construction phase of the project**

Issue	Parameters	Monitoring Frequency
Ambient air quality	CO, NOx, PM10 and PM2.5	Once a month
River water	Water temp., DO, BOD5, COD, Oil and Grease	Once a month
Groundwater	Groundwater level	Once every two months during October to May
Soil Quality	Cr, Cd, Pb and Oil and Grease	Twice during the construction phase
Noise level	Noise at different locations	Every week, particularly during operation of heavy equipment
Process waste	Solid waste	Every week
Occupational health and Safety (worker health, working environment)	Noise, air quality, worker health status check	Once in a month (surveillance of workplace environment)

**Table E-4 Monitoring plan during operational phase of the project**

Issue	Parameters	Monitoring Frequency
Meteorological measurements	Wind direction and speed, temperature, humidity and precipitation.	Continuous monitoring by installing appropriate instrument
Stack emissions	CO, NOx, PM10, PM2.5and temperature	Once a month
Ambient air quality	CO, NOx, PM10, PM2.5, temperature	Once a month
River water	Water temperature and DO	Once a month (March-May, October-December)
Effluent quality	pH, DO, Sulfate, TSS, TDS, BOD, COD, Total N, Total P	Once a week
Groundwater	pH, Color, Turbidity, TDS, Ammonia, Nitrate, Phosphate, As, Fe , Mn and Coliforms; Groundwater level	Twice a year
Noise level	Noise at different locations	Once every three months
River morphology	River cross-section	Once a year during design life of the plant
Vegetation	Number and Condition	Once a year
Occupational health and safety	Health status and safety	Twice a year

## CONCLUSION AND RECOMMENDATION



## **Conclusions**

In this study, the effects of the project activities on physico-chemical, ecological and socioeconomic (i.e., human interest related) parameters during both construction and operation phases have been assessed. The impacts have been identified, predicted and evaluated, and mitigation measures suggested for both construction and operation phases of the proposed power plant. The important physico-chemical environmental parameters that are likely to be affected by the project activities include air quality and noise level.

The study suggests that most of the adverse impacts on the physico-chemical environment are of low to moderate in nature and therefore, could be offset or minimized if the mitigation measures are adequately implemented. Since the project site is located in a developed area that does not appear to be very sensitive ecologically, the impacts of project activities on most ecological parameters (e.g., floral and faunal habitat and diversity) are mostly insignificant.

Noise level has been identified as a significant potential impact of the proposed power plant during both the construction and operation phases. The noise generated from construction activities during the construction phase might become a source of annoyance at the habitat located close to the project site.

Some adverse impact during the operation phase of the plant will come from thermal emission and NO<sub>x</sub> and PM emission from the power plant. However, modeling study suggests that the effect of increased NO<sub>x</sub> and PM in the ambient air due to emission from the power plants will not be very significant.

The power plant has been constructed within a designated area inside the MPCL owned complex. So there was no need for land acquisition. Additionally, there was no settlement in this designated area, and the area was not used for any income generation activities. Therefore, no population has been displaced and no resettlement was required for the construction of the power plant, and no loss of income was associated with the project.

During operation phase, no significant negative impact is anticipated on socio-economic environmental parameters. Significant positive impacts are expected due to improvement in power supply. This will reduce load shedding in Dhaka city and contribute to the national economy. Well-being of the surrounding population, especially Dhaka city, will be significantly improved due to generation of electricity during peak hours. Currently Dhaka city is reeling under unbearable load shedding.

## **Recommendations**

An environmental and social assessment have been carried out for the proposed Midland Power Plant at Ashugonj, which shows low to moderate scale of adverse impacts. These can be reduced to acceptable level through recommended mitigation measures as mentioned in the ESMP. Further, since the project is expected to be financed by the World Bank, it has to comply with the concerned operational policies and guidelines of the Bank in force; so that it is environmentally sound and sustainable. Such compliance will enable the project proponent in improving their environmental performance of the plant during its operational life. It is also recommended that the environmental monitoring plan be effectively implemented in order to identify any changes in the predicted impacts; so that appropriate measures can be taken to off-set any unexpected adverse impacts.



## CHAPTER-1 INTRODUCTION

### 1.1 BACKGROUND

In order to increase the capacity of electricity production, the Ministry of Power, Energy and Mineral Resources, GOB has given permission to the private entrepreneurs to establish new power plants in different generation capacities on a Rental and BOO basis in private sector. Considering the Power shortfall in the country and government plans, authority of Midland Power Company Ltd. has constructed a **51 MW Natural Gas Fired Power Plant** on Build, Own and Operate (BOO) basis at Ashugonj, Brahmanbaria to narrow the ever-increasing gap between demand and supply of electricity through gas-based low cost generation.

In early 2012, a full-scale Environmental Impact Assessment (EIA) of the plant was carried out by the Midland Power Company Ltd. It was carried out to assess the environmental concerns of the Power Plant. However, a number of issues were not addressed in that assessment (e.g., air and noise quality modeling) due to time constraints and lack of availability of necessary data. At present, the World Bank suggested revision of ESIA of the Power Plant to comply with the World Bank Environmental and Social Guidelines to qualify for refinancing under the IPFF project. As the plant is operational now, a ESMP compliance/monitoring report during the construction stage and operational period until now has to be provided as part of this revision.

Midland Power Co. Ltd. has engaged BETS Consulting Services Ltd. to update the existing environmental and social impact assessment by: (i) revising the document to reflect the World Bank environmental and social guidelines including ;(ii) Carrying out a cumulative impact assessment; (iii) performing air and noise quality modeling.

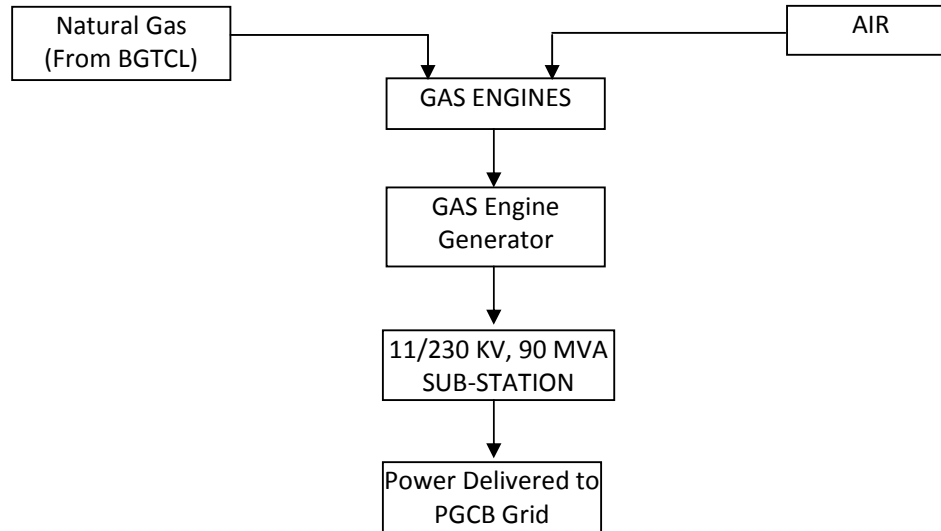
The proposed power plant falls under “red category” and require carrying out EIA in accordance with the Environment Conservation Act 1995 and the Environment Conservation Rules 1997 (ECR, 1997). The EIA of the proposed power plant project presented in this report has been carried out considering the guidelines of the Department of Environment (DoE) of GoB (GoB, 1997) and the relevant safeguard policies and operational guidelines of the World Bank [e.g., Environmental Assessment, OP 4.01; Involuntary Resettlement, OP 4.12; World Bank (1997; 1999a, 1999b; 2003; 2004a; 2004b)].

### 1.2 PROJECT OUTLINE

The major component of the 51 MW Power plant at Ashugonj includes the following:

- Gas Engines are connected directly to generators by a flexible coupling
- Medium voltage current is led to low voltage switchgear station service Station Transformer
- Direct current system is for medium voltage switchgear operations and for instrumentation
- Station delivered with an auxiliary cooling arrangement by dry cooler
- 230KV outdoor substation
- Security fencing and gatehouse

- Generator and Substation control room, administration, amenities, and workshop facilities
- Fire protection tank, water tank and septic tank
- Emergency generator and transformers
- Internal roads



**Figure: 1.2-1 Process Flow Diagram of Electricity Generation**

The development is comprised of six industrial gas engine generators with the electricity generated fed into the 230 kV transmission network via a new switchyard on the project site that is included high voltage transformers and circuit breakers. Attached to the gas engine is an electrical generator that generates electricity when rotated by the engine. The engine generators were assembled off site and delivered to the project site as the six-engine generators sets. There is a back start generator, which is a diesel generator (enclosed in a container-like structure) used to start the plant or power auxiliaries under exceptional conditions when there are outages on the local distribution networks. The gas engine generator set is connected to a switchyard operating at 230 kV. The high voltage switchyard has the step-up transformers (2x45MVA) and switching equipment necessary to connect to the high voltage network. These transformers is located in a switchyard adjacent to the existing 230 kV lines running through the site with appropriate switchgear to ensure safe and reliable connection to the electricity network.

Natural gas is the fuel for the Gas Engines. To facilitate the extreme combustion conditions, air is to be compressed and cooled before entering into the combustion chamber of the gas engine. The gas fuel is supplied to the combustion chamber mixing with the compressed air and gets ignited by the spark plug. Hence power is produced by combustion of the air-fuel mixture in the engine cylinder which transmits to its crankshaft which is connected to the generator. Hence the electricity is produced by generator. The generated electricity is transmitted through the 11kV indoor switchgear and 230kV outdoor substation to the 230kV transmission line connected to the national grid of Bangladesh. The Process flow diagram of electricity generation is shown in **Figure 1.2-1**.

### **1.3 PROJECT RATIONALE**

The supply of electricity has a great impact on the national economy of any country. Presently in Bangladesh, only 48.5% of the total population has access to electricity and per capita generation is only 236 kWh (inclusive of captive) which is very low compared to other developing countries. The GOB has given highest priority to power sector development in the country and has committed to making electricity available to all citizens by 2021. With this in mind, the government has initiated the implementation of reform measures in the power sector, including significant development programs of which this Project constitutes an important part.

The total installed capacity of power plants in Bangladesh, as of July 2012, is 7,551 MW (de-rated capacity). This can be further broken down to 4,304 MW of generation operated by the public sector and 3,247 MW operated by the private sector. In the public sector a number of the generation units have become very old and have been operating at a much-reduced capacity. As a result, their reliability and productivity have also been poor. For the last few years actual demand has not been met due to a shortage of available generation capacity. In addition, due to a shortage of gas supply some power plants are unable to operate at full capability.

To meet this demand with reasonable reliability, the GOB has prepared a Power System Master Plan and also amended its industrial policy to encourage private investment in the power sector. The GOB has committed to attracting private sector investment to install new power generation capacity on a BOO basis.

### **1.4 PURPOSE and SCOPE of the ESIA**

Midland Power Co. has approached the WB for raising investment capital for the Project. As per the WB's environmental and social screening criteria, the proposed project fall under Category "B" and thus requires a comprehensive Environmental and Social Impact Assessment (ESIA) study. Hence, this ESIA study was carried out to meet the environmental and social safeguard requirements of the WB as well as the national applicable laws. The applicable reference framework used for the study is as follows:

- Operational Directive (OD) 4.00: Environmental Assessment, environmental assessment (EA) has become a standard procedure for Bank financed investment projects. The directive was amended as OD 4.01 in 1991 and was converted into Operational Policy (OP) 4.01 in 1999 (World Bank, 1999).
- Applicable Bangladesh national, state and local regulatory requirements

### **1.5 Scope of the ESIA**

The detailed scope of the ESIA study is as outlined below:

- Screening of the Project based on applicable reference framework based on reconnaissance survey and desk based review of Project documents;
- Scoping for the ESIA study;

- Development of an integrated project description of the Project components including its sub-components, which are under the purview of the Project Proponent (PP);
- Development of a regulatory, policy and administrative framework relevant to the Project;
- Monitoring, analysis and reporting of the environmental and social baseline data of the study area including consultation with local communities and other stakeholders;
- Assessment of the environmental impacts of the Project in the study area;
- Assessment of social impacts on the local community as well as project affected people and any other stakeholders, which have been identified during the social consultation process;
- Risk assessment and consequence analysis of the Project;
- Formulation of an Environment and Social Management Plan and associated/specific mitigation plans for identified impacts; and
- Formulation of Stakeholder Consultation and Grievance Redress Mechanism for the Project.

## **1.6 Approach and Methodology**

As the first step, project screening and scoping exercise was undertaken to identify the parameters needed to be considered for the study and to outline the activities for collecting data on each parameter. Data pertaining to all facets of the environment and social viz. physical, ecological and socioeconomic environment were collected from the study area (10 km for overall environmental baseline, 5 km for ecological baseline and 7 km for social baseline) through both primary and secondary sources.

The stepwise activities are detailed in the following subsections:

### **1.6.1 Preliminary Discussions with Project Proponent**

- Discussions held with Midland Power Co., to understand the proposed project, current status of agreements (i.e. implementation, land, water, gas supply, power purchase etc), Project milestones, legal requirements and scope; and
- Collation of relevant project documents such as the project feasibility report, land records, copy of agreements etc.

### **1.6.2 Screening and Scoping Exercise**

- Desk based review of the relevant documents and available imagery of the project site and its surroundings;
- Reconnaissance survey of the site, surrounding areas, gas valve station, approach road and preliminary discussions with locals, stakeholders;
- Meetings and discussions with World Bank and Department of Environment (DOE) of Bangladesh, to understand sensitivities and regulatory requirements associated with the proposed project;
- The outcome of the screening was then used to identify the study area, key data to be collected and the categorization of the project; and

- A preliminary stakeholder mapping exercise was also undertaken to identify key stakeholders from the Government, relevant Governmental Agencies, Non-Governmental Organizations (NGOs) as well as the community at the local, regional and national level. This information was then used for consultation during different stages of the project.

## **Categorization**

Categorization of the Project was completed based on the screening assessment, reconnaissance survey, environmental and social sensitivities, limited consultation and the DOE categorization; WB's categorization criteria based on environmental assessment (EA) checklist for Gas power plant, involuntary resettlement (IR) impact categorization checklist and indigenous peoples (IP) impact screening checklist,

## **Scoping**

The categorization with respect to WB classifications was further used as a basis for defining scope for the impact assessment, planning and implementation of mitigation, monitoring and reporting mechanisms for the project to meet potential lender's requirements as well as those of the GOB.

### **1.6.3 Baseline Data Collection**

- Identification of the monitoring locations for air, water and noise as per sensitive receptors, key locations for water intake and outfall etc;
- The baseline data collection, monitoring and analysis for environmental parameters was completed during the period from end of September to October 2014;
- Socio-economic data collection and consultation was carried during September to October 2014;
- Secondary data was also collected from different government departments, local bodies and through literature surveys etc; and
- All the data was compiled and compared with applicable standards where relevant, and is presented in **Chapter 3** of this report.

### **1.6.4 Stakeholder Consultation**

- Extensive consultation was conducted with key stakeholders' including the local population, government departments/agencies, fishermen, and NGOs;
- Stakeholder consultation was completed with the intent of collecting baseline information on the environmental and social conditions and sensitivities, developing a better understanding of the potential impacts, informing the public of the proposed project and to gain an understanding of the perspectives/concerns of the stakeholders;
- A summary of the stakeholder engagement process and the profile of the groups and their opinions forms a part of the Information Disclosure, Consultation and Participation Chapter of this report (**Chapter 7**); and
- Information gathered was used for formulating mitigation measures and environmental and social management plan/s.

### **1.6.5 Impact Assessment and Mitigation Measures**

- Analysis of the baseline results and the incremental impacts of the project were assessed in accordance with the Bangladesh national guidelines for air, water and noise emissions; standards stipulated in the Environment Conservation Rules (ECR), 1997 and amendments thereof and with reference to the WB Safeguard Policy Statements including both the General Guidelines and those for Power Plants;
- The impact assessment involved the prediction and evaluation of impacts from the project in different phases, including site preparation, construction and operation phase, decommissioning of project and included consideration of mitigation measures towards the same;
- Impact prediction covered residual impacts (impacts remaining after all possible mitigation has been incorporated) and took into account control measures that are part of the project design (e.g. acoustic enclosures for major equipment). Additional measures aimed at further avoiding, minimizing and mitigating predicted impacts were proposed where necessary or appropriate;
- Impact assessment also involved risk assessment covering hazard identification, consequence analysis and risk reduction measures and recommendations; and
- Impacts have been further classified as insignificant, minor, moderate or major based on the criteria for rating of impacts.

### **1.6.6 Analysis of Alternatives**

Analysis of alternative options was considered to minimize impacts of the project while undertaking the ESIA study. The alternative options assessed in the study ranged from technology, transportation methods, project site and operations, including the no project alternative. Alternatives are considered in terms of their potential environmental impacts, the feasibility of mitigating these impacts alternatives for mitigation measures for high residual impact/risk, if any etc.

### **1.6.7 Management Plans and Grievance Redress Mechanism**

- Environmental and Social Management Plan (ESMP) were developed for the mitigation measures suggested and included defined roles and responsibilities for implementation;
- A grievance redress mechanism was developed to address any complaints and concerns from all stakeholders;
- Based on the risk assessment, risk reduction measures and recommendations for a disaster management plan (DMP) were also developed; and
- Institutional review and finalization of the ESMP and grievance

### **1.6.8 Information/Data Sources**

Key relevant information sources have been summarized in Table 1.6-1.



**Table 1.6-1 Key Data Sources**

Parameters	Information sources	Remarks
Project Background, Technical details on project and associated components	<ul style="list-style-type: none"> <li>Midland Power Plant EIA Report</li> <li>Project specification documents from Midland Power Co. Ltd.</li> <li>Project Execution milestones, Plot Plan layout, Organizational Structure</li> </ul>	Midland Power Co. Ltd. (MPCL) provided other information required during the course of the study
Study area features and sensitivities	<ul style="list-style-type: none"> <li>Ground physical Survey</li> <li>Satellite imageries</li> <li>National web portal of Bangladesh: <a href="http://www.bangladesh.gov.bd">www.bangladesh.gov.bd</a></li> </ul>	Details of the satellite data used is included in Baseline Chapter
Legal framework	<ul style="list-style-type: none"> <li>Department of Environment</li> <li>Board of Investment, Bangladesh</li> <li>WB documents</li> </ul>	In discussion with the DOE and local Govt. departments, WB and
Land use /Land cover Details, Meteorology and climatic conditions	<ul style="list-style-type: none"> <li>Ground Physical Survey</li> <li>GIS based land-use analysis</li> <li>Bangladesh Meteorological department</li> <li>Observatory Surface Meteorological Data</li> </ul>	Details of the satellite data used is included in Baseline chapter
Geology, Topography, Hydrology and drainage	<ul style="list-style-type: none"> <li>MPCL EIA report, Location Map</li> <li>Bangladesh water development board</li> <li>Web portal of National Encyclopedia of Bangladesh (Banglapedia)</li> </ul>	In association with field observations
Natural hazards	<ul style="list-style-type: none"> <li>Web portal of National Encyclopedia of Bangladesh (Banglapedia)</li> <li>Bangladesh Meteorological Department</li> </ul>	Included in consultation with locals
Environmental baseline as Air quality, water quality, soil and sediment quality	<ul style="list-style-type: none"> <li>Primary data collection</li> <li>Applicable Standards from DOE, Bangladesh</li> </ul>	Monitoring was completed from September to October 2014
Ecological parameters	<ul style="list-style-type: none"> <li>Primary data collection, observations, surveys and local consultations</li> <li>Websites of birdlife international</li> <li>IUCN Data base</li> </ul>	Survey was carried out in month of September-October 2014, Endangered, critical status was checked from the website <a href="http://www.iucnredlist.org">www.iucnredlist.org</a>
Social-economic parameters	<ul style="list-style-type: none"> <li>Primary data collection surveys, extensive consultations, meetings and discussions held with stakeholders</li> <li>Bangladesh population Census for 2011 for Brahmanbaria District</li> <li>Fisheries Census data</li> <li>Implementation manual of Rural Social, Program, Brahmanbaria,</li> <li>Land Regulation Policy, Bangladesh</li> <li>Land Acquisition and Compensation data for the project site</li> <li>OPD data from local Healthcare Department</li> <li>Website of Department of Social Services</li> <li>Web portal of National Encyclopedia of Bangladesh (Banglapedia)</li> </ul>	Primary Socio-economic Survey was carried out in month of September-October 2014. Details provided in baseline environmental and social conditions chapter.

## 1.7 Content of ESIA Report

The content of the ESIA has been largely structured based on the WB's Operational Policy Statement(Outline of an Environmental Impact Assessment Report). The layout of the Report is as follows:

- Chapter 1 Introduction, Background, Purpose and Scope and Approach and Methodology
- Chapter 2 Policy, Legal and Administrative Framework
- Chapter 3 Project Description
- Chapter 4 Analysis of Alternatives
- Chapter 5 Environmental and Social Baseline Data
- Chapter 6 Anticipated Environmental Impacts and Mitigation Measures
- Chapter 7 Information Disclosure, Consultation and Participation
- Chapter 8 Environment and Social Management Plan
- Chapter 9 Risk Assessment and Management
- Chapter 10 Grievance Redress Mechanism
- Chapter 11 Conclusions and Recommendations

## **CHAPTER-2**

### **POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK**

#### **2.1 INTRODUCTION**

To address the environmental and social risks of any proposed project and its associated components; any protect and conserve the environment from any adverse impacts, the GOB has specified regulations, policy and guidelines. Potential Lenders' also have their own set of requirements (such as the WB's Operational Policies and guidelines) to which any project funded by them must operate.

This Chapter focuses on policy, regulations and the administrative framework under the purview of which the proposed project will fall and this ESIA study will be governed, namely:

- Bangladesh national and local, legal and institutional framework;
- WB Policies and framework; and

#### **2.2 ENVIRONMENT-RELATED POLICIES IN BANGLADESH**

The GOB has developed a policy framework that requires environmental issues to be incorporated into economic development planning. The Key tenets of the various applicable policies are detailed in the following subsections.

##### **2.2.1 National Environmental Policy, 1992**

The Bangladesh National Environmental Policy, approved in May 1992, sets out the basic framework for environmental action together with a set of broad sectoral action guidelines. Key elements of the Policy are:

- Maintaining ecological balance and ensuring sustainable development of the country through protection, conservation and improvement of the environment;
- Protecting the country from natural disasters;
- Identifying and regulating all activities that pollute and destroy the environment;
- Ensuring environment-friendly development in all sectors;
- Ensuring sustainable and environmentally sound management of the natural resources; and
- Promoting active association, as far as possible, with all international initiatives related to environment.

The Environmental Policy of 1992 requires specific actions with respect to the industrial sector which are as follows:

- To phase-in corrective measures in polluting industries;
- To conduct Environmental Impact Assessments (EIAs) for all new public and private industrial developments;
- To ban, or find environmentally sound alternatives for, the production of goods that cause environmental pollution; and
- To minimize waste and ensure sustainable use of resources by industry.

- The policy also states that EIA's should be conducted before projects are undertaken and the DOE is directed to review and approve all Environmental Impact Assessments.

### **2.2.2 National Environment Management Action Plan, 1995**

The National Environmental Management Action Plan (NEMAP) is a wide-ranging and multi-faceted plan, which builds on and extends the statements, set out in the National Environmental Policy. NEMAP was developed to address issues and management requirements related to the environment during the period 1995 to 2005; it also sets out the framework within which the recommendations of the National Conservation Strategy are to be implemented. NEMAP was developed to achieve the following broad objectives:

- Identification of key environmental issues affecting Bangladesh;
- Identification of actions necessary to halt or reduce the rate of environmental degradation;
- Improvement of the natural environment;
- Conservation of habitats and bio-diversity;
- Promotion of sustainable development; and
- Improvement of the quality of life of the people.

To attain the above mentioned objectives, the plan groups all the relevant necessary actions under four headings, namely: institutional, sectoral, location-specific and long-term issues.

The institutional aspects reflect the need of inter- sectoral cooperation to tackle environmental problems which need new and appropriate institutional mechanisms at national and local levels. The sectoral action reflects the way the Ministries and agencies are organized and makes it easier to identify the agency to carry out the recommended actions. The location-specific action focuses particularly on acute environmental problems at local levels that need to be addressed on a priority basis. The long-term actions include environmental degradation to such degree that might become even more serious and threatening, if cognizance is not taken immediately.

### **2.2.3 National Conservation Strategy, 1992**

The National Conservation Strategy, 1992, provides recommendations for sustainable development of the industrial sector. The key aspects of the strategy are as follows:

- All industries shall be subject to an EIA and the adoption of pollution prevention/control technologies shall be enforced;
- Hazardous or toxic materials/wastes shall not be imported as raw materials for industry;
- Import of appropriate and environmentally-sound technology shall be ensured; and
- Dependence on imported technology and machinery should gradually be reduced in favor of sustainable local skills and resources.

### **2.2.4 Other Policies relevant to Environment**

Additional Bangladesh policies, their key features and applicability to the subject Project are detailed in Table 2.2-1.

**Table 2.2-1 Policies Relevant to Environment**

<b>Policy</b>	<b>Key Features</b>	<b>Applicability</b>
The National Forest Policy, 1994	<ul style="list-style-type: none"> <li>• Afforestation of 20% land</li> <li>• Bio-diversity of the existing degraded forests</li> <li>• Strengthening of the agricultural sector</li> <li>• Control of Global warming, desertification</li> <li>• Control of trade in wild birds and animals</li> <li>• Prevention of illegal occupation of the forested land, tree felling and hunting of wild animals</li> </ul>	Applicable when considering global warming and the protection of forests
National Land Transport Policy, 2004	<ul style="list-style-type: none"> <li>• All new roads and major improvements will be subjected to an EIA</li> <li>• Funding will be provided for mitigation measures</li> <li>• The Government will publish environmental standards for new roads and new design standards addressing environmental issues</li> </ul>	Not directly applicable, however, the standards may apply for the new approach road
The National Water Policy, 1999	<ul style="list-style-type: none"> <li>• Protection, restoration and enhancement of water resources</li> <li>• Protection of water quality, including strengthening regulations concerning agrochemicals and industrial effluent</li> <li>• Sanitation and potable water</li> <li>• Fish and fisheries</li> <li>• Participation of local communities in all water sector development</li> </ul>	Applicable for the preservation of water quality
National Land use Policy, 2001	<ul style="list-style-type: none"> <li>• Deals with several land uses including: agriculture (crop production, fishery and livestock), housing, forestry, industrialization, railways and roads, tea and rubber</li> <li>• Identifies land use constraints in all these sectors</li> </ul>	Applicable as land use change from agricultural to industrial
Draft Wetland Policy, 1998	<ul style="list-style-type: none"> <li>• Establishment of principles for the sustainable use of wetland resources</li> <li>• Maintenance of the existing level of biological diversity</li> <li>• Maintenance of the functions and values of wetlands</li> <li>• Promotion and recognition of the value of wetland functions in resource management and economic development</li> </ul>	Not directly applicable, however may be applicable once the draft policy is finalized
National Fisheries Policy, 1998	<ul style="list-style-type: none"> <li>• Preservation, management and exploitation of fisheries resources in inland open water</li> <li>• Fish cultivation and management in inland closed water.</li> <li>• Prawn and fish cultivation in coastal areas</li> <li>• Preservation, management and exploitation of sea fishery resources</li> </ul>	Not directly applicable
National Agriculture Policy, 1999	<ul style="list-style-type: none"> <li>• The act deals with the programs related to make the nation self-sufficient in food through increasing production of all crops, including cereals, and ensure a dependable food security system for all</li> </ul>	Not applicable

Policy	Key Features	Applicability
The Energy Policy, 1996	<ul style="list-style-type: none"> <li>Provides for utilization of energy for sustainable economic growth, supply to different zones of the country, development of the indigenous energy source and environmentally sound sustainable energy development programs</li> <li>Highlights the importance of EIA's for any new energy development project</li> </ul>	Applicable as subject Project is a Power Plant
The Power Policy, 1995	<ul style="list-style-type: none"> <li>Is an integral part of the Energy Policy and deals with policy statement on demand forecast, long term planning and project implementation, investment terms, fuels and technologies, load management, institutional issues, private sector participation, technology transfer and research program, environmental policy and legal issues</li> </ul>	Applicable as subject Project is a Power Plant
Industrial Policy, 1999	<ul style="list-style-type: none"> <li>Deals with industrial development, direct foreign investments, investment by public and private sector, introduction of new appropriate technology, women's participation, infrastructure development and environmentally sound industrial</li> </ul>	Applicable as the Project is a public and private partnership, industrial development

## 2.3 ENVIRONMENT AND SOCIAL RELATED LEGISLATIONS IN BANGLADESH

The main Acts and Regulations guiding environmental protection and conservation in Bangladesh are outlined in the following subsections and **Table 2.3-1**.

### 2.3.1 The Environment Conservation Act, 1995 (subsequent amendments in 2000 and 2002)

The provisions of the Act authorize the Director General of Department of Environment (DOE) to undertake any activity that is deemed fit and necessary to conserve and enhance the quality of environment and to control, prevent and mitigate pollution. The main highlights of the act are:

- Declaration of Ecologically Critical Areas;
- Obtaining Environmental Clearance Certificate;
- Regulation with respect to vehicles emitting smoke harmful for the environment;
- Regulation of development activities from environmental perspective;
- Promulgation of standards for quality of air, water, noise, and soils for different areas and for different purposes;
- Promulgation of acceptable limits for discharging and emitting waste; and
- Formulation of environmental guidelines relating to control and mitigation of environmental pollution, conservation and improvement of environment.

### 2.3.2 Environment Conservation Rules (ECR), 1997 (subsequent amendments in 2002 and 2003)

The Environment Conservation Rules, 1997 are the first set of rules promulgated under the Environment Conservation Act, 1995. These Rules provide for, inter alia, the following:

- The National Environmental Quality Standards (EQS) for ambient air, surface water, groundwater, drinking water, industrial effluents, emissions, noise and vehicular exhaust;
- Categorization of industries, development projects and other activities on the basis of actual (for existing industries/development projects/activities) and anticipated (for proposed industries/development projects/activities) pollution load;
- Procedure for obtaining environmental clearance;
- Requirements for undertaking IEE and EIA's as well as formulating ESMP's according to categories of industries/development projects/activities; and
- Procedure for damage-claim by persons affected or likely to be affected due to polluting activities or activities causing hindrance to normal civic life.

Depending upon the location, size and severity of pollution loads, projects/activities have been classified in ECR, 1997 into four categories: Green, Orange A, Orange B and Red respectively as nil, minor, medium and severe impacts on important environmental components (IECs).

### **2.3.3 Acquisition and Requisition of Immovable Property Ordinance, 1982**

The basic principles behind compensation of property in Bangladesh are founded in Articles 42 and 47 of the Constitution (1972). The current legislation for governing land acquisition in Bangladesh is the "Acquisition and Requisition of Immovable Property Ordinance (ARIPPO), 1982 and amended in 1983, 1993 and 1994. Key features of the ordinance are as follows:

- This Ordinance provides the Deputy Commissioner (DC) with the power to initiate the acquisition of any property in any locality within his district that is likely to be needed for a public purpose or in the public interest.
- It also defines the process to claim compensation.
- It describes the entire procedure of notice and intimations prior to acquisition of any property and process and timeframes for raising objections.
- It defines the role and authority of Divisional Commissioner in decision making, compensation issues and in case of dispute. Among the matters to be considered in determining compensation are the following:
  - The damage that may be sustained by the person interested, by reason of the taking of standing crops or trees which may be on the property at the time of taking possession thereof by the Deputy Commissioner,
  - The damage that may be sustained by reason of the acquisition injuriously affecting his other properties, movable or immovable, in any other matter, or his earnings; and
  - If in consequence of the acquisition of the property, the person interested is likely to be compelled to change his residence or place of business, the reasonable expenses, if any, incidental to such change; In terms of compensation, the Ordinance explicitly states that the DC, when determining compensation, shall neither consider any disinclination of the person to part with the property, nor any increase in the value of the property to be acquired likely to accrue from the use of it after it has been acquired.
- The Ordinance also covers the case of temporary acquisition of property for a public purpose or in the public interest.

### **Property (Emergency) Acquisition Act, 1989**

The Act was formulated to expedite the emergency acquisition of land to enable the Government 'to control inundation, flood and upsurge caused by natural calamity and to prevent river erosion.' The 1989 Act was not meant to replace the 1982 Ordinance, but to complement it for special circumstances. Normally, acquisition of land for development purposes would not come under the 1989 Act. Use of this Act to acquire land for development would require extremely compelling reasons.

#### **2.3.4 Administrative and Regulatory Guidelines and Instructions**

In addition to the provisions in the law, the land acquisition process is regulated by certain administrative instructions and procedural requirements. The most important of these are summarized here.

- In 1976, the Government constituted land allocation committees at the district, divisional and central levels to control what was regarded as too lavish taking of land for public purposes. The committees were charged with ensuring 'the most rigid measures of economy in the use of land for purposes other than agriculture.'
- The District Land Allocation Committees (DLACs) are chaired by the DC and have seven other members. These members include Executive Engineers of the R&H Department and the Public Works Department, and the Civil Surgeon. They are entrusted with land allocation within the district not exceeding two acres.
- The Divisional LACs are chaired by the Divisional Commissioner and have technical representation at the Superintending Engineer and Deputy Director level. These committees consider land acquisition cases involving between two and five acres of land. All cases of more than five acres go to the Central Land Allocation Committee (CLAC). This committee is chaired by the Minister of Land Administration and has technical representation at the Secretary level. In 1989, the Government ordered that in all cases involving the acquisition of land exceeding 10 bighas, the President would have to give consent.

#### **2.3.5 Framework for Leasing of Government (Khas) Agricultural Land**

The rules for managing and leasing Government-owned (khas) land are framed in two notifications in the Bangladesh Gazette: (1) Notification: Bhumo/Sho-8/Kha-jo-bo/46/84/261, Bangladesh Gazette Extra Edition, May 12, 1997, pp 1527-1536; and (2) Notification: Shuno/Sho-4/Kri-kha-jo--bo-1/98-264, Bangladesh Gazette, September 15, 1998.

Under these regulations, the Government leases cultivable agricultural land in the rural areas to landless farming households. The allotments cannot be more than one acre, except in the southern districts where up to 1.5 acres of char land can be allotted. A landless family is defined as one that works in agriculture and may own a homestead, but has no arable land of its own. Given this basic definition, five groups of landless families are given priority in the allotment of leases:

- families of freedom fighters;
- families who have lost all their land due to erosion;
- widows with an adult son capable of working the land;
- farmers with homesteads but no land;' and
- farmers who have lost all their land due to land acquisition under the eminent domain laws.



The regulation further defines the structure and responsibilities for the management and leasing of Khas Lands at the National, District, and Thana levels.

### **2.3.6 Other Relevant National Legal Instruments for the Project**

Table 2.3-1 presents an outline of other National legal instruments that will have relevance to the proposed Project with respect to the social and environment considerations.

**Table 2.3-1 National Legal Instruments relevant to the Project**

Act/ Rule/ Law/ Ordinance	Enforcement Agency – Ministry/ Authority	Key Features	Applicability to proposed Project
The Environment Conservation Act, 1995 and subsequent amendments in 2000 and 2002	Department of Environment Ministry of Environment and Forests,	<ul style="list-style-type: none"> <li>• Define Applicability of environmental clearance</li> <li>• Regulation of development activities from environmental perspective</li> <li>• Framing applicable limits for emissions and effluents</li> <li>• Framing of standards for air, water and noise quality</li> <li>• Formulation of guidelines relating to control and mitigation of environmental pollution, conservation and improvement of environment</li> <li>• Declaration of Ecologically critical areas</li> </ul>	Applicable
Environmental Conservation Rules, 1997 and subsequent amendments in 2002 and 2003	Department of Environment Ministry of Environment and Forests	<ul style="list-style-type: none"> <li>• Declaration of Ecologically critical areas</li> <li>• Requirement of environmental clearance certificate for various categories of projects</li> <li>• Requirement of IEE/EIA as per category</li> <li>• Renewal of the environmental clearance certificate within 30 days after the expiry</li> <li>• Provides standards for quality of air, water and sound and acceptable limits for emissions/ discharges from vehicles and other sources</li> </ul>	Applicable Projects falls under Red Category and require environmental clearance
Environment Court Act, 2000 and subsequent amendments in 2002	Ministry of Environment and Forests and Judiciary	<ul style="list-style-type: none"> <li>• GOB has given highest priority to environment pollution</li> <li>• Passed 'Environment Court Act, 2000 for completing environment related legal proceedings effectively</li> </ul>	Applicable for completing environmental legal requirements effectively
he Vehicle Act, 1927; The Motor Vehicles Ordinance, 1983; and The Bengal Motor Vehicle Rules, 1940	Bangladesh Road Transport Authority	<ul style="list-style-type: none"> <li>• Exhaust emissions</li> <li>• Vehicular air and noise pollution</li> <li>• Road/traffic safety</li> <li>• Vehicle Licensing and Registration</li> <li>• Fitness of Motor Vehicles</li> <li>• Parking by-laws.</li> </ul>	Applicable for proposed Project in relation to road transport
The Removal of Wrecks and Obstructions in inland Navigable Water Ways Rules 1973	Bangladesh Water Transport Authority	<ul style="list-style-type: none"> <li>• Removal of wrecks and obstructions in inland navigable waterways</li> </ul>	Applicable as canal- inland navigable waterway will be used for transport of equipment for the Project
Water Supply and Sanitation Act, 1996	Ministry of Local Government, Rural Development and Cooperatives	<ul style="list-style-type: none"> <li>• Management and Control of water supply and sanitation in urban areas.</li> </ul>	Not directly applicable, however, indirectly applicable when considering water usage management and sanitation facilities

<b>Act/ Rule/ Law/ Ordinance</b>	<b>Enforcement Agency – Ministry/ Authority</b>	<b>Key Features</b>	<b>Applicability to proposed Project</b>
The Ground Water Management Ordinance, 1985	Upazila Parishad	<ul style="list-style-type: none"> <li>• Management of ground water resources</li> <li>• Installation of tube-wells at any place after license from Upazila Parishad only</li> </ul>	Proposed Project will use surface water source however, should groundwater also be required then licenses will need to be obtained prior to installation of any tube-wells.
The Forest Act, 1927 and subsequent amendments in 1982 and 1989	Ministry of Environment and Forests	<ul style="list-style-type: none"> <li>• Categorization of forests as reserve, protected and village forests • Permission is required for use of forest land for any non-forest purposes</li> </ul>	Not applicable as proposed Project is not on forest land
The Private Forests Ordinance Act, 1959	Regional Forest Officer, Forest Department`	<ul style="list-style-type: none"> <li>• Conservation of private forests and for the afforestation on wastelands</li> </ul>	Not Applicable
Bangladesh Wild Life (Preservation) Act, 1974	Ministry of Environment and Forest; Bangladesh Wild Life Advisory Board	<ul style="list-style-type: none"> <li>• Preservation of Wildlife Sanctuaries, Parks, and Reserves</li> </ul>	Not applicable as the Project study area does not have any wildlife areas
National Biodiversity Strategy and Action Plan (2004)	Ministry of Environment and Forest Bangladesh Wild Life Advisory Board	<ul style="list-style-type: none"> <li>• Conserve, and restore the biodiversity of the country for wellbeing of the present and future generations</li> <li>• Maintain and improve environmental stability for ecosystems</li> <li>• Ensure preservation of the unique biological heritage of the nation for the benefit of the present and future generations</li> <li>• Guarantee the safe passage and conservation of globally endangered migratory species, especially birds and mammals in the country</li> <li>• Stop introduction of invasive alien species, genetically modified organisms and living modified organisms</li> </ul>	Applicable for conservation of bio-diversity
National Water Bodies Protection Act, 2000	Town development authority/Municipalities	<ul style="list-style-type: none"> <li>• The characterization of water bodies as rivers, canals, tanks or flood plains identified in the master plans formulated under the laws establishing municipalities in division and district towns shall not be changed without approval of concerned ministry</li> </ul>	Applicable due to the proximity to and use of surface water bodies
The Protection and Conservation of Fish Act 1950 subsequent amendments in 1982	Ministry of Fisheries and Livestock	<ul style="list-style-type: none"> <li>• Protection and conservation of fish in Government owned water bodies</li> </ul>	Applicable for the conservation of fish as the intake and outfall point will be the canal
The Embankment and Drainage Act 1952	Ministry of Water Resources	<ul style="list-style-type: none"> <li>• An Act to consolidate the laws relating to embankment and drainage and to make better provision for the construction, maintenance, management, removal and control of embankments and water courses for the better drainage of lands and for their protection from floods, erosion and other</li> </ul>	Applicable due to the site location

<b>Act/ Rule/ Law/ Ordinance</b>	<b>Enforcement Agency – Ministry/ Authority</b>	<b>Key Features</b>	<b>Applicability to proposed Project</b>
Antiquities Act, 1968	Ministry of Cultural Affairs	<ul style="list-style-type: none"> <li>damage by water</li> <li>This legislation governs preservation of the national cultural heritage, protects and controls ancient monuments, regulates antiquities as well as the maintenance, conservation and restoration of protected sites and monuments, controls planning, exploration and excavation of archaeological sites</li> </ul>	Not applicable as the study area does not have any likely cultural heritage or ancient monuments of national or international significance. However in case, any such evidence of archaeological findings arise, the Project will act in consonance to the Act
The Acquisition and Requisition of Immovable Property Ordinance 1982 and subsequent amendments in 1994, 1995 and 2004	Ministry of Land	<ul style="list-style-type: none"> <li>Current GOB Act and Guidelines, relating to acquisition and requisition of land</li> </ul>	Applicable
Administrative and Regulatory Guidelines and Instructions for Land Acquisition	Ministry of Land	<ul style="list-style-type: none"> <li>Regulation of land acquisition process by certain administrative instructions and procedural requirements</li> </ul>	Applicable
Framework for Leasing of Government (Khas) Agricultural Land	Ministry of Land	<ul style="list-style-type: none"> <li>The rules for allotting and leasing Government-owned (khas) land to land less families</li> </ul>	Not directly applicable but indirectly if a family becomes landless in the process of acquisition
The Building Construction Act 1952 and subsequent amendments	Ministry of Works	<ul style="list-style-type: none"> <li>This act provide for prevention of haphazard construction of building and excavation of tanks which are likely to interfere with the planning of certain areas in Bangladesh</li> </ul>	Applicable
The Factories Act, 1965 Bangladesh Labour Law, 2006	Ministry of Labour	<ul style="list-style-type: none"> <li>This Act pertains to the occupational rights and safety of factory workers and the provision of a comfortable work environment and reasonable working conditions</li> </ul>	Applicable
Ozone Depleting Substances (Control) Rules, 2004	Ministry of Environment and Forests	<ul style="list-style-type: none"> <li>Ban on the use of Ozone depleting substances</li> </ul>	Applicable
Noise Pollution (Control) Rules 2006	Ministry of Environment and Forests	<ul style="list-style-type: none"> <li>Phasing out of Ozone depleting substances</li> <li>Prevention of Noise pollution</li> <li>Standards for noise levels</li> </ul>	Applicable

**Source: Websites of DOE, Legislative and Parliamentary Affairs Division:: Bangladesh Laws and Bangladesh Board of Investment: Business laws**

## **2.4 ADMINISTRATIVE FRAMEWORK RELATED TO ENVIRONMENT IN BANGLADESH**

The Ministry of Environment & Forests (MoEF) is the nodal agency in the administrative structure of the GOB, for overseeing all environmental matters relating to national environmental policy and regulatory issues in the country. The MoEF oversees the activities of the following technical/implementing agencies:

- Department of Environment (DOE);
- Forest Department (FD);
- Bangladesh Forest Industries Development Corporation (BFIDC);
- Bangladesh Forest Research Institute (BFRI); and
- Bangladesh National Herbarium (BNH).

### **Other Related Organizations**

There are several other organizations under the administrative framework which would govern social and environmental functions related to the proposed Project, namely:

- Forest Department;
- Ministry of Land: Land reform and land acquisition directorate;
- Ministry of water resources: Bangladesh Water Development Board; and
- Local Government Engineering Department (LGED).

### **2.4.2 Department of Environment (DOE)**

The DOE has been placed under the MoEF as its technical wing and is statutorily responsible for the implementation of the Environment Conservation Act, 1995. The Department was created in 1989, to ensure sustainable development and to conserve and manage the environment of Bangladesh.

The principal activities of the DOE are:

- Defining EIA procedures and issuing environmental clearance permits the latter being the legal requirement before the proposed Project can be implemented;
- Providing advice or taking direct action to prevent degradation of the environment;
- Pollution control, including the monitoring of effluent sources and ensuring mitigation of environmental pollution;
- Setting the Quality Standards for environmental parameters;
- Declaring Ecologically Critical Areas (ECAs), where the ecosystem has been degraded to a critical state; and
- Review and evaluation of Initial Environmental Examinations (IEEs) and EIAs prepared for projects in Bangladesh.

### **Environmental Clearance Process**

As mentioned in the Section 2.3.2, ECR has classified projects to be assessed by the DOE in four categories based on the severity of impacts on IECs:

- Green: Nil;
- Orange A: minor;

- Orange B: medium; and
- Red: severe.

The applicability of Environmental clearance and the process in Bangladesh is described in Figure 2.4-1.

The EIA process consists of three stages, screening, IEE, and detailed EIA:

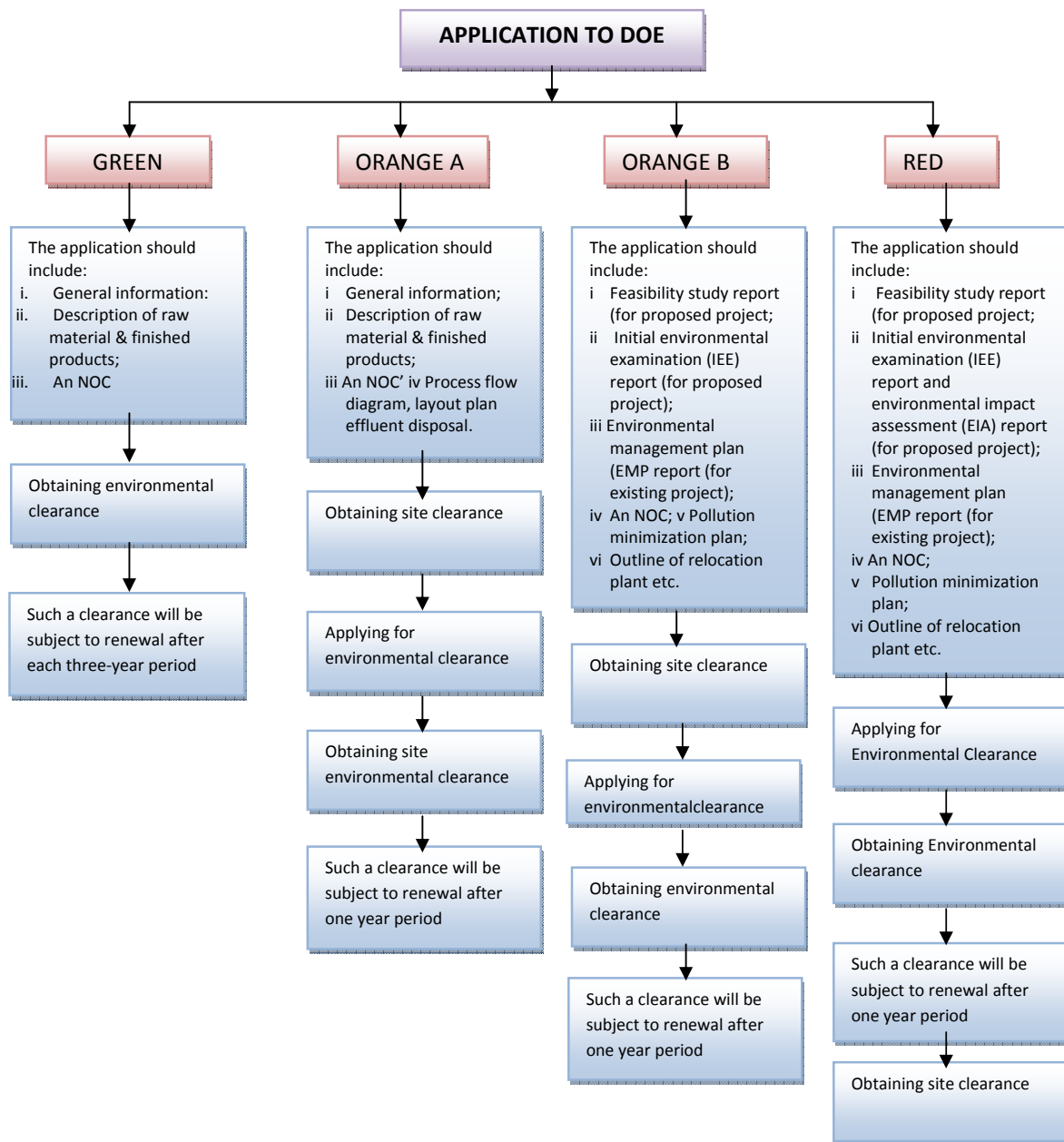
- Projects categorized as Green and Orange-A requires no IEE or EIA for environmental clearance however, the proponent has to submit an application in a prescribed format along with specified documents;
- Projects categorized as Orange-B require an IEE to be submitted to the DOE along with an application in a prescribed format and other specified documents; and
- Red category projects require both IEE and EIA. An IEE is required for the location clearance and an EIA is required for the environmental clearance.

As per the ECR 1997, power plants and the subject project fall under the Red category as they fall within the following:

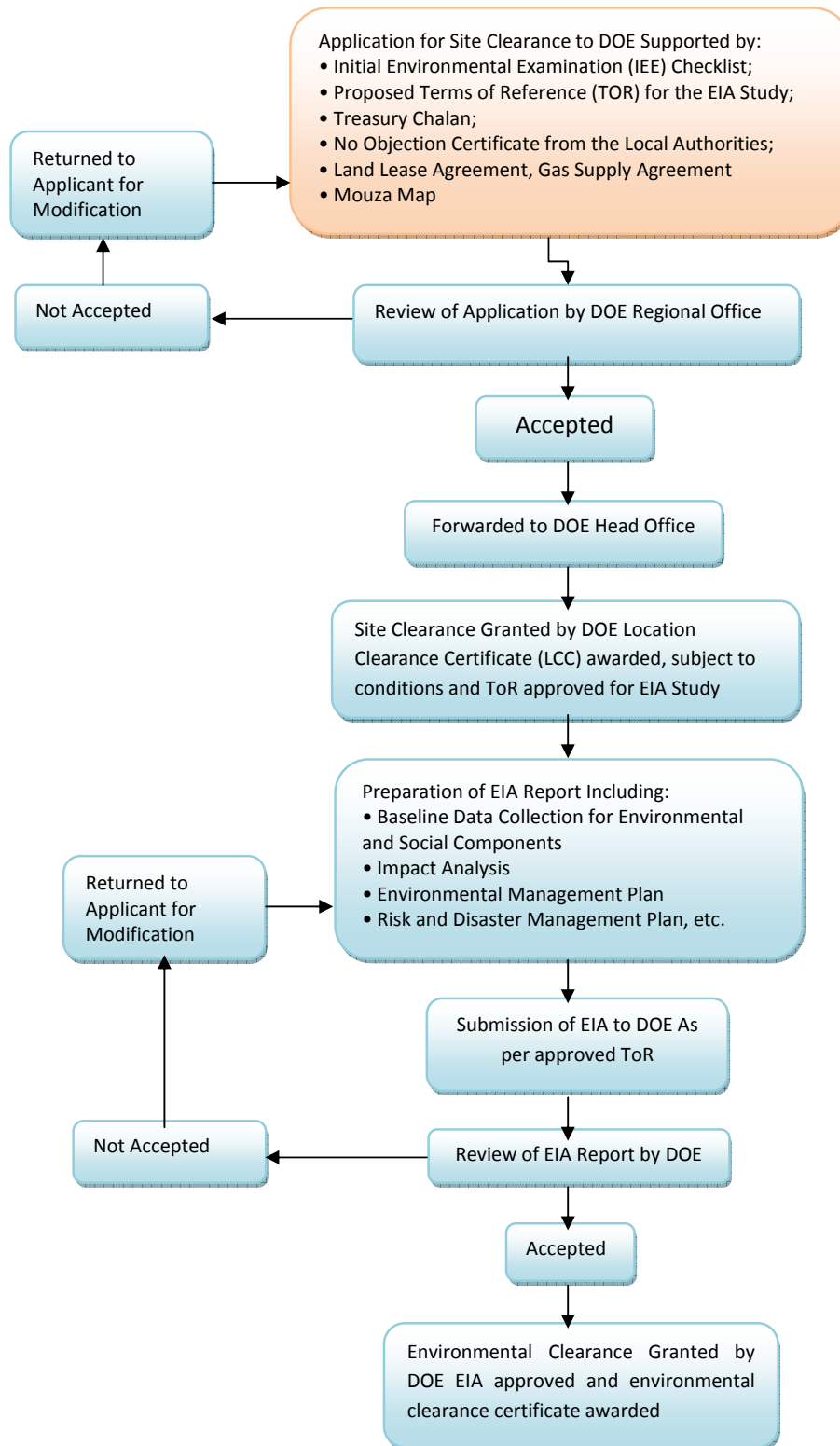
- Item 6: power plants; and
- Item 64: construction/ replacement/ extension of natural gas pipelines.

The process for obtaining an Environmental Clearance Certificate (ECC) for the proposed Project is outlined in Figure 2.4-2.

Figure 2.4-1 DOE Environmental Clearance Applicability and Procedure



**Figure 2.4-2 Flowchart of EIA Process Applicable to the Proposed Project**





### 2.4.3 Status of Project Approval from DOE

The Project has received ECR from the DOE on 31<sup>st</sup> March, 2014 subject to conditions to be fulfilled during the plant operation. The management of the plant MCPL is determined to fulfill the conditions attached to EIA clearance.

This ESIA Report is a revised version of EIA report prepared for re-financing of the project under IPPF project funded by World Bank to fulfill the safeguard requirements of World Bank.

## 2.5 INSTITUTIONAL ARRANGEMENTS RELATED TO LAND ACQUISITION IN BANGLADESH

The administrative set up for land acquisition has two tiers under the Ministry of Land Administration. At the Division level, there is an Additional Commissioner dealing with land administration under the Commissioner. At the district level, there is an Additional Deputy Commissioner in charge of land administration. Under him, there is at least one Land Acquisition Officer and several Assistant Land Acquisition Officers. The number of officers depends on the size of the District. Non-gazette officers in the land administration include Kanungos and surveyors.

## 2.6 PROJECT RELEVANT INTERNATIONAL TREATIES AND CONVENTIONS

Bangladesh is party to a number (30) of international environmental convention, treaties and agreements. The Project relevant international treaties and conventions relevant to the project signed, ratified and in the process of ratification by Bangladesh are detailed in Table 2.6-1.

**Table 2.6-1 Project Relevant International Treaties and Conventions**

Environment related International convention and Treaties	Status
International Plant Protection Convention (Rome, 1951.)	01.09.78 (ratified)
International Convention for the Prevention of Pollution of the Sea by Oil (London, 1954 (as amended on 11 April 1962 and 21 October 1969.)	28.12.81 (entry into force)
Plant Protection Agreement for the South East Asia and Pacific Region (as amended) (Rome, 1956.)	04.12.74 (accessed) (entry into force)
International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties (Brussels, 1969.)	04.02.82 (entry into force)
Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar, 1971) ("Ramsar Convention").	20.04.92 (ratified)
Convention Concerning the Protection of the World Cultural and natural Heritage (Paris, 1972.)	03.08.83 (accepted) 03.11.83 (ratified)
Convention on International Trade in Endangered Species of Wild Fauna and flora (Washington, 1973.) ("CITES Convention")	18.02.82 (ratified)
United Nations Convention on the Law of the Sea (Montego Bay, 1982.)	10.12.82 (ratified)
Vienna Convention for the Protection of the Ozone Layer (Vienna, 1985.)	02.08.90 (accessed) 31.10.90 (entry into force)
Montreal Protocol on Substances that Deplete the Ozone Layer (Montreal 1987.)	02.08.90 31.10.90 (accessed) (entry into force)
London Amendment to the Montreal Protocol on substances that Deplete the Ozone Layer (London, 1990)	18.03.94 (accessed) 16.06.94 (entry into force)
Copenhagen Amendment to the Montreal protocol on Substances that	27.11.2000 (accepted) 26.2.2001 (entry into

<b>Environment related International convention and Treaties</b>	<b>Status</b>
Deplete the Ozone Layer, Copenhagen, 1992	force)
Montreal Amendment of the Montreal Protocol on Substances that Deplete the Ozone Layer, Montreal, 1997	27.7.2001 (Accepted) 26.10.2001 (Entry into force)
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (Basel, 1989.)	01.04.93 (accessed)
International Convention on Oil Pollution Preparedness, Response and Cooperation (London, 1990.)	30.11.90 (signed) In the process of ratification
United Nations Framework Convention on Climate Change, (New York, 1992.)	09.06.92 (signed) 15.04.94 (ratified)
Convention on Biological Diversity, (Rio De Janeiro, 1992.)	05.06.92 (signed) 03.05.94 (ratified)
International Convention to Combat Desertification, (Paris 1994.)	14.10.94 (signed) 26.01.1996 (ratification) 26.12.1996 (entry into force)
Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques, (Geneva, 1976.)	03.10.79 (accessed) (entry into force)
Agreement Relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982 (New York, 1994.)	28.07.96 (signed)
Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on their Destruction (Paris, 1993.)	14.01.93 (signed)
Convention on persistent Organic Pollutants, Stockholm	23.5.2001 (signed) 12.03.2007 (ratified)
Kyoto protocol to the United Nations Framework Convention on Climate Change	21.8.2001 (accessed)

---

**Source:** DOE

## **2.7 World Bank Requirements:**

Any project that would be implemented with financial assistance from the World Bank, the WB requires that the project needs to follow its operational policy. In 1989 the World Bank adopted "Operational Directive (OD) 4.00-Annex A: Environmental Assessment", Environmental Assessment (EA) has become a standard procedure for Bank financed investment projects. The directive was amended as OD 4.01 in 1991 and was converted into Operational Policy (OP) 4.01 (Annex-II) in 1999 (World Bank, 1999).

According to the World Bank policy, the primary responsibility for the Environmental Assessment (EA) process lies with the borrower. The World Bank's role is to advise borrowers throughout the process and ensure that practice and quality are consistent with EA requirements and that the process is integrated effectively into project preparation and implementation.

EA is a process whose breadth, depth, and type of analysis depend on the nature, scale, and potential environmental impact of the proposed project. EA evaluates a project's potential environmental risks and impacts in its area of influence. It also examines project alternatives as well as identifies ways of improving project selection, siting, planning, design, and implementation by preventing, minimizing, mitigating, or compensating for adverse environmental impacts and enhancing positive impacts; and includes the process of mitigating and managing adverse environmental impacts throughout project implementation.

EA considers the natural environment (air, water, and land); human health and safety; social aspects (involuntary resettlement, indigenous peoples, and physical cultural resources);<sup>4</sup> and transboundary and global environmental aspects. EA considers natural and social aspects in an integrated way. It also takes into account the variations in project and country conditions; the findings of country environmental studies; national environmental action plans; the country's overall policy framework, national legislation, and institutional capabilities related to the environment and social aspects; and obligations of the country, pertaining to project activities, under relevant international environmental treaties and agreements. EA should be initiated as early as possible in project processing and is integrated closely with the economic, financial, institutional, social, and technical analyses of a proposed project.

The borrower is responsible for carrying out the EA. For Category A projects the borrower needs to hire independent EA experts not affiliated with the project to carry out the EA. For Category A projects that are highly risky or contentious or that involve serious and multidimensional environmental concerns, the borrower should normally also engage an advisory panel of independent, internationally recognized environmental specialists to advise on all aspects of the project relevant to the EA. The EA report must provide full and detailed justification for the levels and approaches chosen for the particular project or site.

Depending on the project, a range of instruments can be used to satisfy the World Bank's EA requirement: environmental impact assessment (EIA), regional or sectoral EA, strategic environmental and social assessment (SESA), environmental audit, hazard or risk assessment, environmental management plan (EMP) and environmental and social management framework (ESMF). EA applies one or more of these instruments, or elements of them, as appropriate.

OP 4.01 (**Annex-I**) provides the principles and procedures for implementing the EA process. It states that the purpose of EA is to improve decision making and to ensure that the project options under consideration are environmentally sound and sustainable. The OP further notes that the EA is a sufficiently flexible process to allow environmental issues to be addressed in a timely and cost-effective fashion during project preparation and implementation and to help avoid costs and delays due to unanticipated environmental problems.

OP 4.01 is considered to be the umbrella safeguard policy to identify, avoid, and mitigate the potential negative environmental and social impacts associated with Bank lending operations. In World Bank operations, the purpose of Environmental Assessment is to improve decision making, to ensure that project options under consideration are sound and sustainable, and that potentially affected people have been properly consulted. The Bank classifies the proposed project into three major categories, depending on the type, location, sensitivity, and scale of the project and the nature and magnitude of its potential environmental impacts:

Category A: The proposed project is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented. These impacts may affect an area broader than the sites or facilities subject to physical works.

Category B: The proposed project's potential adverse environmental impacts on human population or environmentally important areas-including wetlands, forests, grasslands, or other natural habitats- are less adverse than those of Category A projects. These impacts are site specific; few if any of them are irreversible; and in most cases mitigation measures can be designed more readily than Category A projects.

Category C: The proposed project is likely to have minimal or no adverse environmental impacts.

Category FI: A proposed project is classified as Category FI if it involves investment of Bank funds through a financial intermediary, in subprojects that may result in adverse environmental impacts.

The Environmental, Health, and Safety (EHS) Guidelines of the World Bank Group are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP) (2007). These General EHS Guidelines are designed to be used together with the relevant Industry Sector EHS Guidelines which provide guidance to users on EHS issues in specific industry sectors.

The generally achievable performance levels and measures in new facilities using the existing technologies at a reasonable cost are provided in the EHS Guidelines. Site specific targets with an appropriate time frame are first established in applying the EHS Guidelines. As noted earlier, according to the World Bank (1999a) operational policy OP 4.01, this project has been classified as an Environmental Category-A project. Category-A projects are expected to have significant impacts that may be sensitive, diverse or unprecedented and require full EA.

World Bank's Pollution Prevention and Abatement Handbook (WB, 1999a)) has been consulted extensively particularly on air emission and wastewater discharge standards in assessing air and water quality impacts as well as noise level due to proposed plant construction and operation. Other relevant documents (WB, 2004a, and b) of the World Bank have also been consulted, particularly for assessment of social impacts.

As per the WB's environmental and social screening criteria, the proposed project (Midland Power Company Ltd.) falls under Category "B" and thus requires a comprehensive Environmental and Social Impact Assessment (ESIA) study. Hence, this ESIA study was carried out to meet the environmental and social safeguard requirements of the WB as well as the national applicable laws. The ESIA report describes the project's potential negative and positive environmental impacts and recommends the measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance.

In social aspects, the proposed project site does not encompass areas of physical cultural resources. Hence, the OP 4.11 (Physical Cultural Resources) will not be immediately relevant to this component of the project. The project will not intrude in areas of indigenous people and hence the OP 4.10 will not be relevant to this component of the project. Furthermore the

project will not require any involuntary resettlement. Hence, OP 4.12 will not be triggered for this sub-project.

The IE purchased the required land for the main power station and portion of access road from local land owners through negotiated settlement. The rest of the land for access road is under the Parishad's ambit, and has been developed jointly. The total land is encumbrance free and sand filled. Detail information of the seller, copy of deeds and declaration by the sponsor company that the land has been purchased on a willing buyer-willing seller basis are attached in Annexure-VI.

## **CHAPTER-3**

### **DESCRIPTION OF THE PROPOSED PROJECT**

#### **3.1 TYPE OF THE PROJECT**

Construction of 51 MW Gas Fired Power Plant at Ashugonj, Brahmanbaria is a natural gas based power generation plant. The power plant is designated for continuous base load operation. It can also be used in Stand-by mode. The operation principle is according to electrical demand. The control of electrical production bases on parallel with grid operation.

Auxiliary cooling is arranged with air-cooled radiators and auxiliary cooling system is dimensioned for power without heat production. Electric power will be generated by gas generating set. The engine is capable of running at rated output continuously. For other conditions the power will be adjusted.

#### **3.2 LOCATION & APPROACH ROAD OF THE PROJECT**

The concerned power plant named Midland Power Co. Ltd. is being established at Ashugonj in Brahmanbaria district. The selected site for Midland Power Co. Ltd. is nearly 5-6 km away from Brahmanbaria district city centre. The proposed site of the project is on the south side of Dhaka-Sylhet highway and very close to the Ashugonj Fertilizer and Chemical Complex Ltd. (AFCCCL). Northern side of the project there are Govt. SILO and after that Dhaka-Sylhet highway and Bhairab Meghna Bridge exist. Eastern side of the project there is Govt. establishment (GTCL), approach road to AFCCCL and after that vacant land exists. Meghna River is very adjacent to the western side of the project. Bhairab Railway Station is about 1.5-2 KM away towards northwest from the project site. The project site will enjoy the infrastructural facilities such as electricity, water, telecommunication, etc. The access to the project site, project location sketch map and layout plan of the project with its surroundings has been shown in **Fig-3.2-1&Fig-3.2-3**. Project site is well connected with the national road linking system. A satellite image describing the project location considering the existing scenario inscribed within 5km radius is shown in **Figure 3.2-2**.

##### **3.2.1 ELECTRICAL INTERCONNECTION FOR POWER EVACUATION**

MPCL will establish a substation in their project compound. This substation will be connected from gas engine generator and then the generated electricity will be transmitted from the substation to the PGCB grid through 4.2Km transmission line. MPCL will be responsible to construct this transmission line. Figure-3.2-1 shows the electrical interconnection for power evacuation with green lined diagram. It may be proposed for ESMP and ECR with due approval of TOR from DOE.

##### **3.2.2 FUEL TRANSPORTATION**

The fuel of the power plant (Natural gas) will be collected from nearby Gas Valve station of GTCL which is 1.05 km away from the RMS of the MPCL compound. MPCL will be responsible for the installation of this pipeline. The black line diagram of Figure-3.2-1 shows

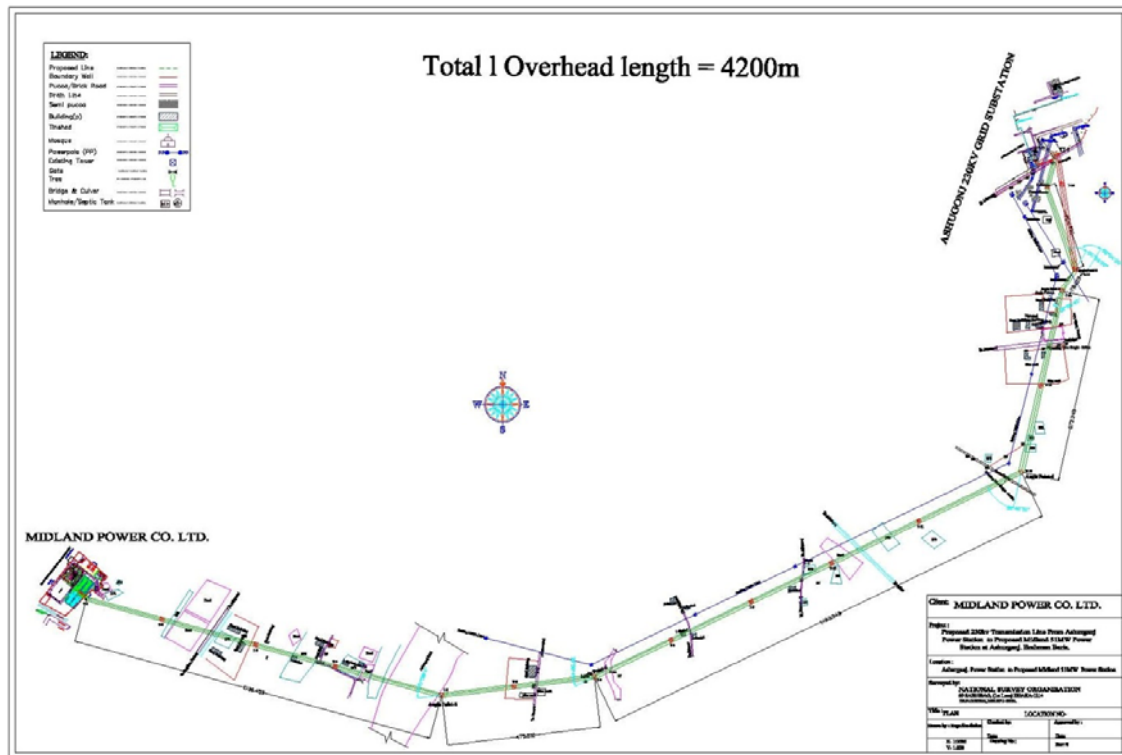
the fuel transportation of the proposed power plant. It may be proposed for ESMP and ECR with due approval of TOR from DOE.

### **3.3 PROJECT INFORMATION IN BRIEF**

The basic data of the project are furnished in Table-3.3-1.

**Table-3.3-1: Basic data of "Midland Power Co. Ltd."**

1.	Name of the Project	: Midland Power Co. Ltd
2.	Type of Industry	: Power Generation Company
3.	Project Proponent	: Mr. Feroz Alam, Managing Director
4.	Contact Address	: YOUTH TOWER, 822/2, Rokeya Sarani, Dhaka-1216.
5.	Project Location	: Ashugoanj, Brahmanbaria.
6.	Total Area of the project	: 3.76 acres
7.	Name of the Raw Materials	: Natural Gas
8.	Quantity required (raw material)	: 12 MMCFD
9.	Final Product	: Electricity
10.	By-product, if any	: None
11.	Plant Capacity	: 51 MWH
12.	Project Cost	: TK. 24533.19 Lac
13.	Engine Manufacturer	: Rolls Royce-Norway
14.	Engines	: Bergen
15.	Fuel Requirement	: 12 MMCFD (Natural Gas)
16.	Fuel Source	: Bakhrabad Gas System pd., Ltd. Feni
17.	Water source	: Deep Tube- Well
18.	Water requirement	: 5000 L/ day
19.	Waste water generation	: 2000 L/ day
20.	Gaseous emission	: 31484 ft <sup>3</sup> / min
21.	Gaseous emission procedure	: Exhaust Manifold (20m high exhaust stack)
22.	Date of Commencement	: January 2012
23.	Date of Completion	: September 2012
24.	Total Manpower	: 70 Persons



**Electrical Interconnection for Power Evacuation**



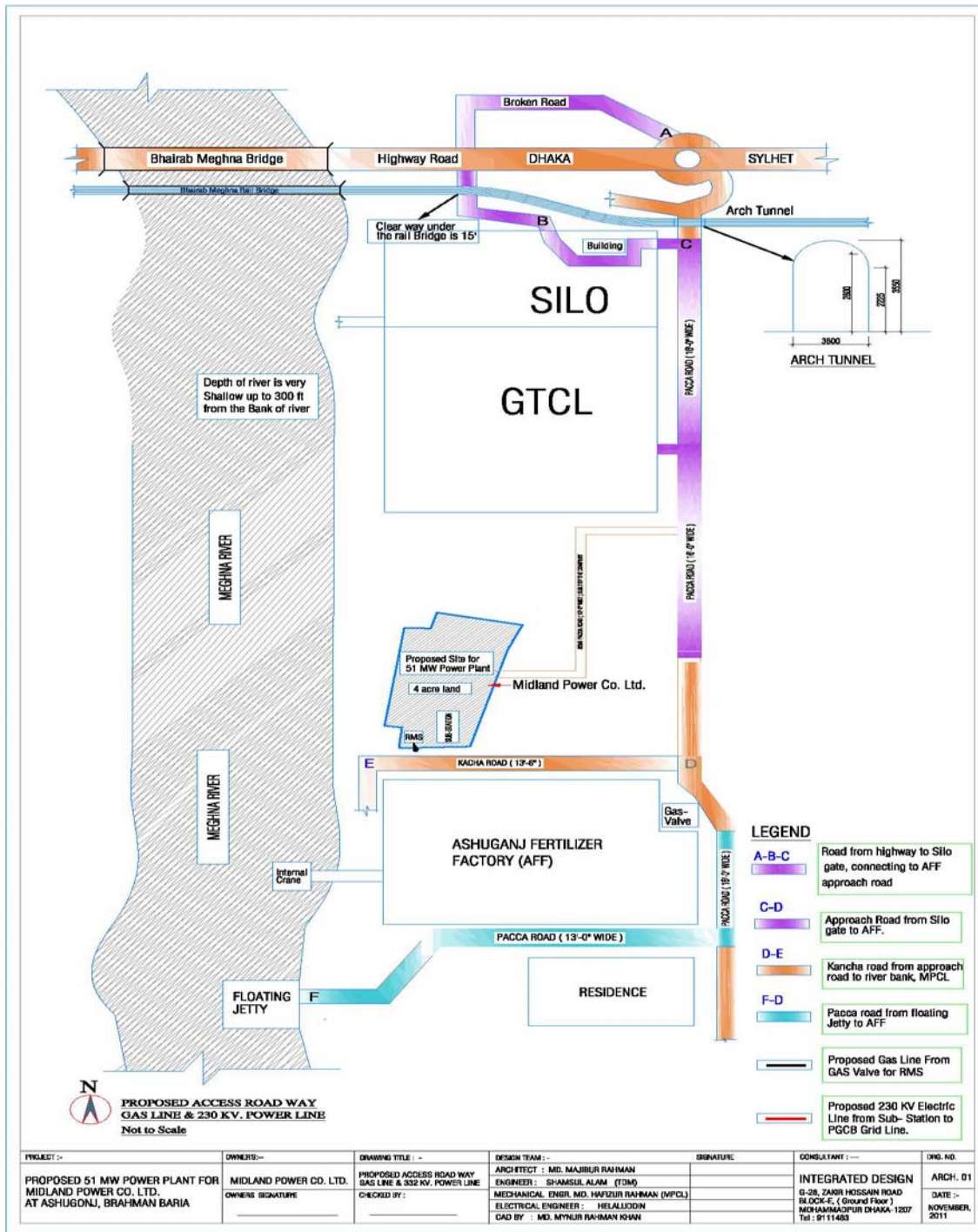


Figure 3.2-1 Project Location Map

[illegible]

---

**46** | P a g e

### **3.4 PRESENT STATUS OF THE PROJECT**

The construction work for developing infrastructure for the project started in January, 2012. The site development work for construction of major items for development during construction phase of factory building, office building, guard house, water pump house, etc and construction of drainage and sewer lines also started as well. The power plant is in operation from 7 December 2013. Environmental Clearance Certificate (ECC) from the Department of Environment (DOE) was issued for this project in 31 March 2014. The issued ECC is annexed in **Annex-II** of this report. This ESIA report is prepared for the World Bank considering the no project scenario and therefore important environmental and social issues of Construction & Operation Phases of the project are carefully taken care of for assessment.

### **3.5 RESOURCES AND UTILITIES**

#### **a) Gas**

The project at full capacity shall require approximately 12 MMCFD for its Gas Generator, etc. The project will have gas connection from Bakhraabad Gas System Ltd. For which necessary arrangements for getting the gas connection has been done. The main gas delivery line and riser point of 'Bakhraabad Gas System Ltd.' exists very near from the project premise.

#### **b) Water**

The plant will not consume water for its operation as the gas engine has a dry low NO<sub>x</sub> control and all cooling operations will be performed by air. Water consumption will only be in the form of domestic water consumption by the plant's personnel. The water will be supplied from Deep Tube well to be drilled on and around the site. It has been estimated that nearly 5,000 liter/day water will be required for domestic purposes. Water will be stored in underground reservoir and lifted to overhead tank by pump and motor.

#### **c) Labour force required**

##### **During Construction Phase**

The major construction works include construction of factory building, office building, water pump house, and construction of, wares house, etc. The construction works of the project is expected its completion within 09 months period. During factory erection and setting up of machinery a good number (about 200) of skilled; semi-skilled and daily wage labors will get job opportunity in the project. In addition to that this project will create employment opportunity to a number of persons indirectly by giving business to them.

##### **During Operation Phase**

This project will create direct job opportunity for about 70 people in various official capacities.

### **3.6 POWER GENERATION METHOD**

Electrical supply and distribution is as follows-

- Gas Engine is connected directly to generator by a flexible coupling
- Generator is cabled to medium voltage switchgear
- Medium voltage current is led to low voltage switchgear station service station
- transformer
- Direct current system is for medium voltage switchgear operations and for instrumentation.

Station will be delivered with an auxiliary cooling arrangement by dry cooler. The start-up and loading time of the engine depends on the preheating level of the engine. When properly preheated, the engine can be loaded to full power within minutes.

If the Gas Engine is in cold condition, it can be started after the pre-lubricating oil pump has reached the required pressure. It shall normally not be loaded faster than what mentioned in the operating manual. Faster loading is possible in case of emergency.

### **3.7 PLANT OPERATION**

The operation of the generating set and the auxiliaries needed is carried out from the turbine control computer in a separate control room. The operation method is automatic with automatic synchronizing. Also the whole plant is controlled and monitored from this screen. The power plant control and supervision system is designed for unattended operation with a daily control and check-up routines.

Control and supervision system is based on PLC and computer units. System allows full control and supervision of all significant parameters in the plant, sends necessary alarm signals and takes care of the plant history recordings. Remote monitoring from the clients other control facility or automation system can be integrated into the system.

Protection of the plant is designed against hazardous faults like loss of lubricating oil pressure. From the alarm central the operators can see the most important temperatures and pressures as well as alarms before shutdowns.

The power station and the control system have been designed to operate parallel with the grid. Plant can also be operated in island mode.

### **3.8 PROJECT COST AND FUNDING**

The total cost for site development, infrastructure development, and machinery procurement and installation costs including trial run cost for the entire industrial project has been estimated to be Tk 24533.19 lac. The yearly environmental monitoring cost of construction and operation phase of the project would be around Tk. 27 lac and around Tk. 43 lac respectively. Cost for the environmental management system and safety & occupational health of the staff during the operation phase would be Tk. 10 lac per annum. The fund for the project is organized by the proponent from equity participation and borrowed from commercial bank i.e. Standard Chartered Bank.

## CHAPTER 4: ANALYSIS OF ALTERNATIVES

### 4.1 GENERAL

The purpose of the analysis of alternatives as part of the ESIA process is to select best among all possible project options. The assessments and recommendations made by the ESIA team are presented below.

### 4.2 SITE SELECTION

The critical and attentive issues for selection of power plant site are taken care of is listed below:

- Avoiding the following twelve (12) Ecologically Critical Areas: Human Settlements, Forest Sanctuaries, National Parks, Game Reserves, Mangroves, Forest Areas, Wetlands, Wildlife Habitats, Archaeological Sites, Ancient Monument Sites, Biodiversity Areas and Similar Other Areas.
- Preference of Non-productive Land: The non-productive land as an alternative just near the proposed agriculture land is preferable for environmental soundness.

The power plant land is a privately owned land and has no dispute with the locality. More on the land is out of the DOE identified twelve ecologically critically areas.

The site is well located considering the following:

- Easy access
- Close proximity to organized industrial zone
- Close proximity to the already existing national electric transmission lines
- Close proximity to the already existing natural gas transmission lines

### 4.3 TECHNOLOGY OPTIONS

Gas Engine power plants are self-contained, light weight and they do not require bulk water. They can be quickly installed at a lower cost than other types of power plants. Gas Engine units are high speed, low vibration quick start machines suitable for peaking power plants. These units require less space, have lower installation and maintenance cost and have simple lubrication and ignition system. Specific fuel consumption does not increase with time in Gas Engine Plants as rapidly as other IC engine based power plants. Also, poor quality of fuel can be readily used in Gas Engines. Their disadvantages are poor part load efficiency, special metal requirements, special cooling methods and short life. Gas Engine power plants are the most suitable plants that can be installed at selected load centers with fewer auxiliaries. Gas Engines can be brought on load quickly and surely.

**Table 4.3-1 Summary of alternative site assessment**

Sl. No.	Issues	Justification for the Selected Site
1	Land Availability	Proposed site is the private land of MPCL
2	Land Acquisition	No land acquisition is required



Sl. No.	Issues	Justification for the Selected Site
3	Land Development	Minor improvements required
4	Logistics Support (Technical and nontechnical)	No logistic support available. New logistic network is required to be developed.
5	Proximity to Load Center	Fairly close the main load center
6	Mode of Communication	<ul style="list-style-type: none"> <li>• Good connectivity by roadway</li> <li>• Excellent water transport connectivity. Situated on the bank of the Meghna River. Waterway connectivity is essential for transporting heavy machineries.</li> <li>• Close to the Bhairab Meghna Rail Bridge.</li> </ul>
7	Transmission Line	<ul style="list-style-type: none"> <li>• Existing transmission lines can be utilized</li> </ul>
8	Gas Line	<ul style="list-style-type: none"> <li>• Closer to the gas Valve Station i.e. 1.05Km only and can be developed with marginal investment</li> </ul>
9	Environmental Impact	<p>Given modern technologies (<b>i.e. use of Dry Low NOx technology in this project is likely to reduce NOx emission significantly</b>) for control of noise, vibration and air pollution, environmental impact is expected to marginally increase. <b>Annex-XV</b> provided the Manufacturer's Specification of Engines with Emission Levels. NOx level indicates in the Specification is 250 mg/Nm<sup>3</sup> which is higher than that of WB requirement of 200 mg/Nm<sup>3</sup>. This level is the max level mentioned in the specification but the monitored level is always around 100 mg/Nm<sup>3</sup> which is automatically monitored and recorded.</p>
10	Time for implementation	New power generation facilities can be established and made operational within a short time

### Summary on Comparative Technology Use:

For gas fired small power plants, the advantage of spark ignition internal combustion engine generators is now well established in Bangladesh. So, the technology choice has been limited to such engine based plants from different sources. As per project requirements, the commercial department collected offers for gen-sets and its associated plant equipment from the following gen-set manufacturer:

1. Rolls-Royce Marine AS, Norway
2. Wartsila Finland OY
3. GE Jenbacher GmbH & Co. OG, Austria
4. MWM GmbH, Germany.

After evaluation it had been perceived that the Rolls Royce engine is the most effective for the project. The average revenue earning/cost savings per kWh found highest among others, that is 0.3113 tk/kWh after adjustment of all expenses.

After negotiation with the Equipment manufactures considering the price, delivery period, reputation, after sales service and world Renowned Brand by the Executive Committee finally selected Rolls-Royce as a Main Equipment Supplier for this project. Technical Comparison with Investment Analysis of MPCL is annexed in **Annexure-XVIII**.

#### **4.4 NO PROJECT SCENARIO**

Bangladesh is facing a major electrical power shortage for the last one decade. The shortfall aggravated during the last 2-3 three years and the total power scenario is very complex one. The supply demand situation in this sector will drastically hamper the development in all sectors of life including those in agricultural, industrial, commercial and domestic sectors. Particularly, the agricultural sector and the industrial sector productivity stoppage may lead to catastrophic disaster in the country in future. There is no alternative than to add more power generating units to the existing power system of Bangladesh within a shortest possible time frame. This is due not only to the increase in demand, but also due to aging of the existing power generating units most of which will near their life cycle very shortly. Both, base load and peaking plants are necessary to be added to the system, so that the whole system can run economically and efficiently. Technically a gas fired power plant is necessary to have more energy efficient power generation systems with higher output. Considering the nature of the peaking demand the proposed gas fired power plant seems to be the most suitable option.

## **CHAPTER 5: ENVIRONMENTAL AND SOCIAL BASELINE DATA**

### **5.1 INTRODUCTION**

#### **5.1.1 STUDY OVERVIEW**

This section discusses the existing conditions within the project study area, covering both the natural and social environments. The analysis was completed through the use of a combination of secondary data sources in addition to extensive on-ground reconnaissance and baseline studies. The assessment is divided into three broad categories:

- Physical Environment;
- Biological Environment; and
- Socio-economic Environment

#### **5.1.2 Site Overview**

The Midland power plant is located on the left bank of Meghna River at Char Chartala union in Ashuganj upazila of Brahmanbaria district and approximately 2.40 km southern side of the Dhaka - Sylhet highway. Ashuganj fertilizer factory is located in the southern side and Gas Transmission Company limited is in the northern side of the power plant. The rural settlement is presented adjacent to the plant boundary. The 5 km study area map is shown in **Figure 5.1-1**.

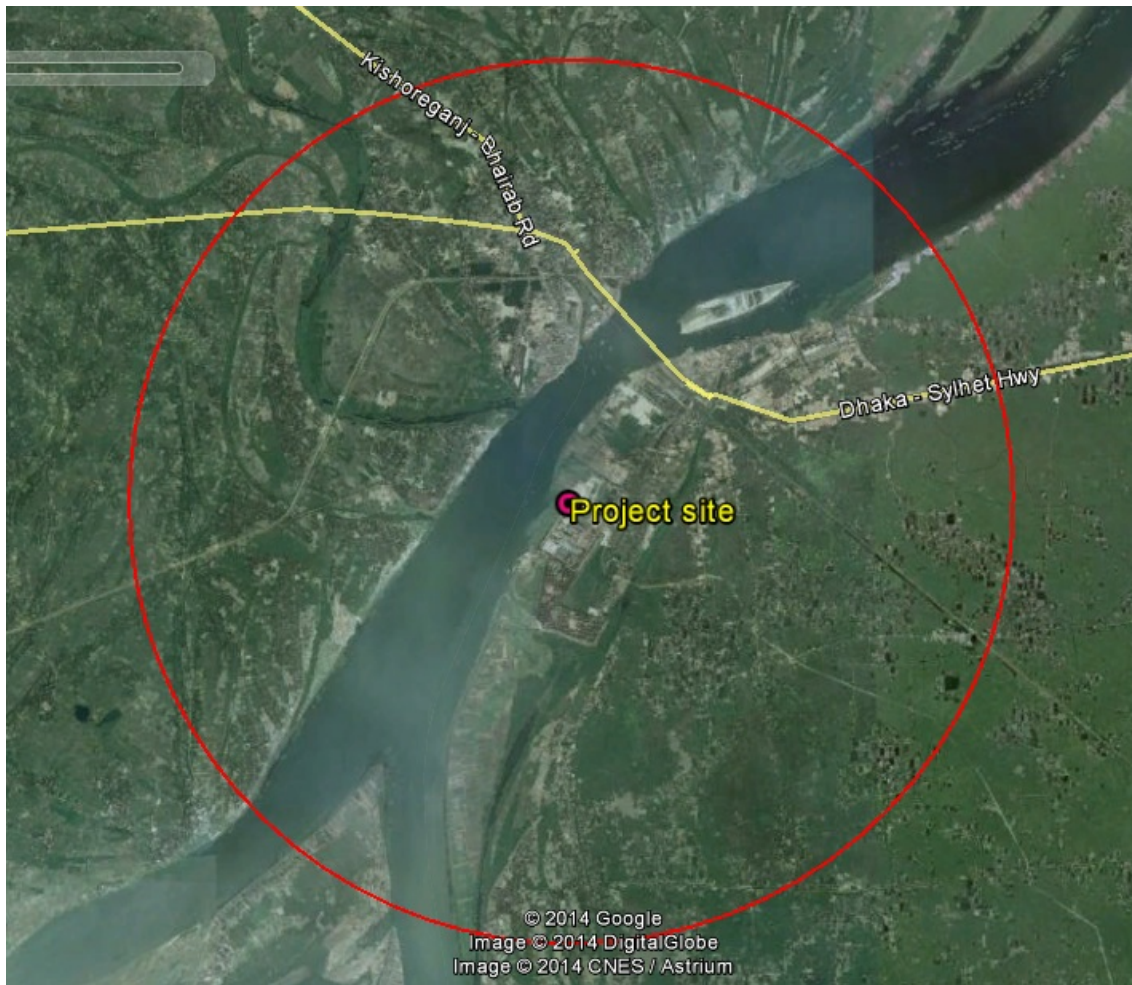
#### **5.1.3 Objectives and Methodology**

The primary objective of the environmental and social baseline condition study is to provide an environmental and social baseline against which potential impacts from the operation of power plant can be compared.

The methodology adopted for collecting the baseline data was as follows:

- Study area of 5 km radial zone from the centre of the power plant location was selected for the baseline studies.
- The environmental and social field monitoring and survey was carried out during the period of September 2014 to October 2014.
- Primary data collection was through environmental monitoring and field survey for water, air, noise and ecology.
- Social baseline of the study area was captured through social surveys involving field consultations, interviews, meeting with stakeholders, discussions with government departments and secondary data review etc.
- Secondary data was collected from government reports, academic institutes, websites, published literature, interactions with government department and stakeholders etc.





**Figure 5.1-1: 5 km Study Area Map**

## **5.2 PHYSICAL ENVIRONMENT**

### **5.2.1 CLIMATE**

#### **5.2.1.1 GENERAL CHARACTERISTICS**

Several climatic zones occur within Bangladesh, with the study area falling within the south central zone as illustrated in **Figure 5.2-1**. The climate of Bangladesh is heavily influenced by the Asiatic monsoon pattern that creates three distinct seasons within the study area:

1. Pre-monsoon hot season (from March to May);
2. Rainy monsoon season (from June to October); and
3. Cool dry winter season (from November to February).

Mean daily maximum temperature rarely exceeds 32°C, and mean daily minimum temperature is approximately 10°C. Average humidity is relatively high, often exceeding 80%, and most rainfall occurs in summer. Fog is very common in winter (Rashid, 1977). High temperatures and thunderstorms characterize the pre-monsoon, hot season. April is

the hottest month in the country, with mean temperatures ranging from 27°C in the east and south, to 31°C in the west-central part of the country. After April, increasing cloud cover reduces the temperature. Wind direction is variable during this pre-monsoon season, especially in the early stages of the season. Rainfall during this period, mostly caused by thunderstorms, can account for 10 to 25% of the annual total (Rashid, 1977).

The summer monsoon season is typified by Southerly or South-westerly winds, very high humidity and heavy rainfall, as well as long periods of consecutive days of rainfall. These conditions are caused by tropical depression weather systems entering the country from the Bay of Bengal. About 80% of the annual precipitation occurs during the five-month monsoon season from May to September (Rashid, 1977).

Low temperatures, cool air blowing from the west or northwest, clear skies and low levels of rainfall characterize the dry season. The average temperature in January varies from 17°C in the northwest and north-eastern parts of the country to 20°C to 21°C in the coastal areas. Minimum temperatures in the extreme northwest in late December and early January reach between 3°C to 4°C.

Long-term average climatic data collected at the nearby Comilla weather station (2004 to 2013) reflect the monsoonal effects on climate in this region (Bangladesh Meteorological Department, Dhaka 2014):

- Mean maximum temperature (35.5°C)
- Mean daily minimum temperature (6°C)
- Mean annual relative humidity 81%
- Mean annual rainfall (2016 mm)

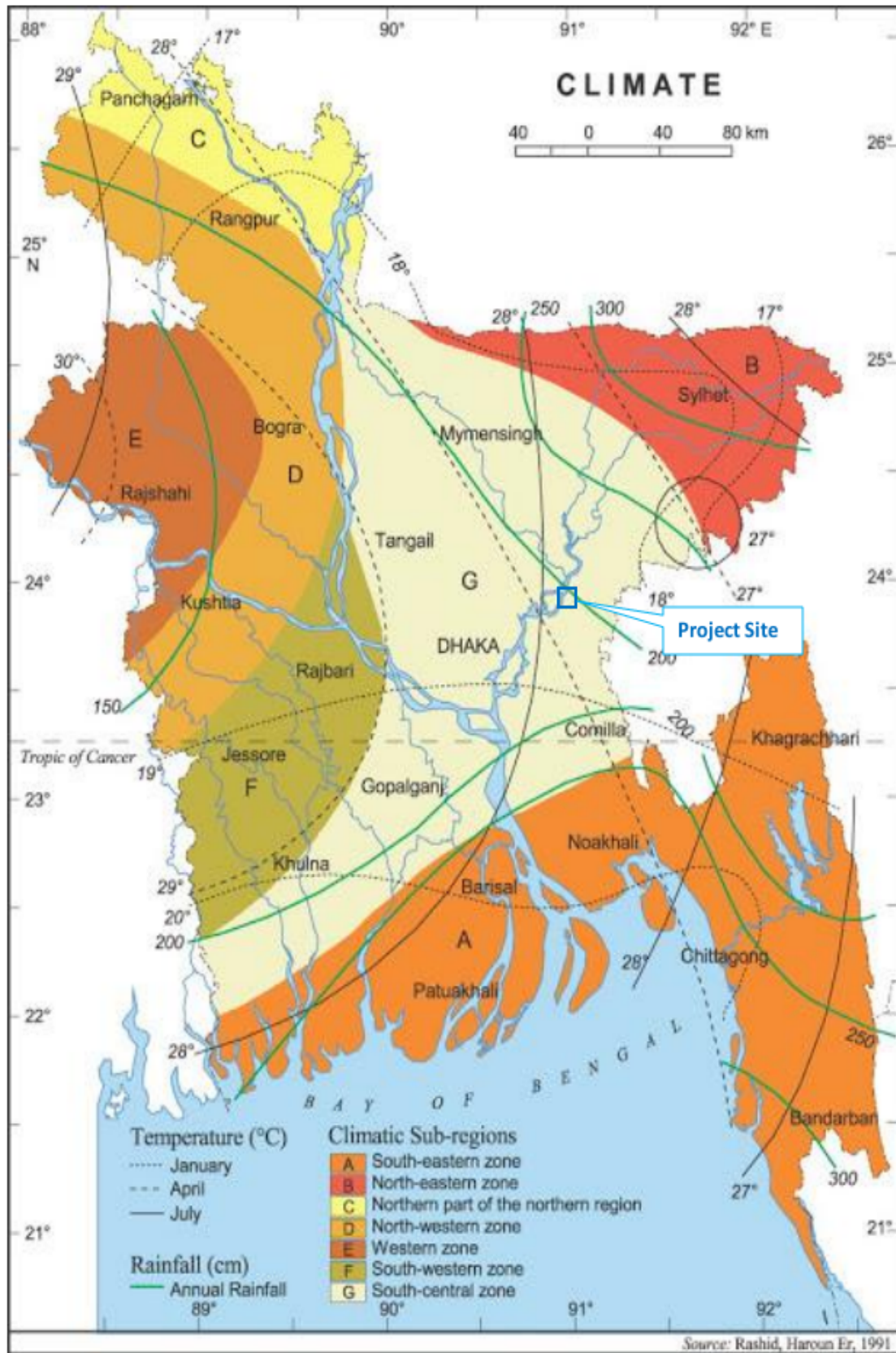


Figure 5.2-2: Climatic Zones of Bangladesh

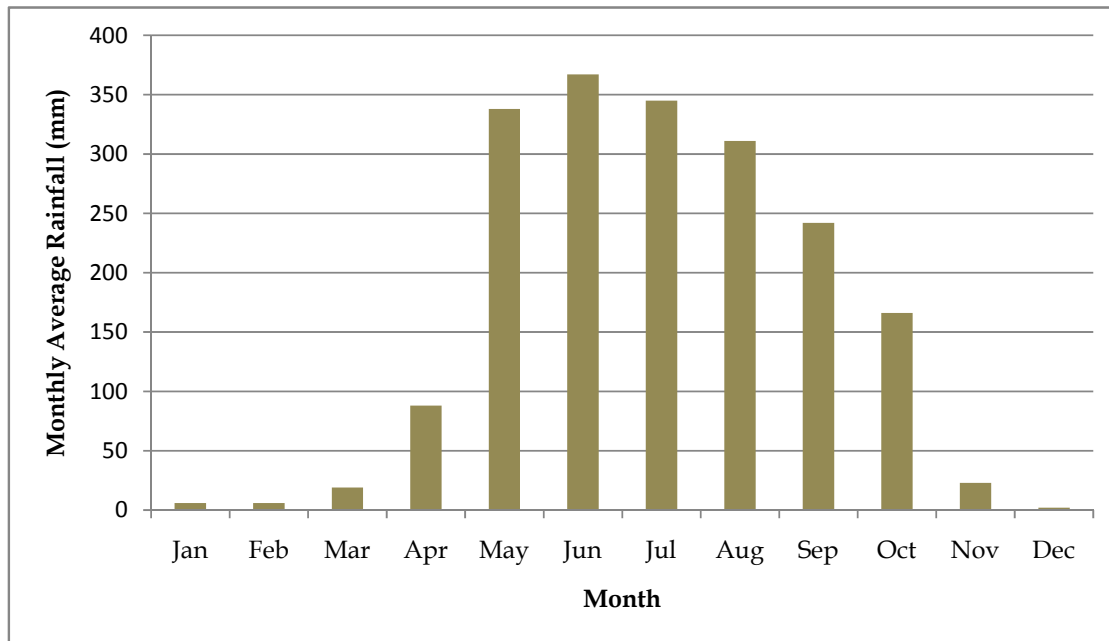
### 5.2.1.2 RAINFALL AND HUMIDITY

The monthly and yearly rainfall recorded at the Comilla weather station is shown in Table 5.2-1. The records show that average monthly rainfall is highest from April through to September. The highest annual rainfall (2,497 mm) recorded within the last 10 years was in the year of 2007, while the lowest annual rainfall (1,578 mm) was recorded in 2010.

**Table 5.2-1: Total Monthly and Annual Rainfall (mm), Comilla Weather Station**

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2004	0	4	6	175	186	654	311	183	686	218	1	0	2424
2005	6	2	249	157	193	259	403	410	395	349	0	1	2424
2006	0	0	0	117	607	402	151	226	300	94	1	0	1898
2007	0	20	21	179	153	548	654	221	339	280	82	0	2497
2008	30	11	26	34	282	330	457	375	247	265	0	0	2057
2009	0	0	3	48	295	235	573	427	145	98	0	0	1824
2010	0	13	30	23	343	417	94	125	241	277	0	15	1578
2011	0	0	28	76	351	346	273	501	233	76	0	0	1884
2012	16	1	13	195	209	442	282	373	178	115	102	3	1929
2013	0	3	30	28	467	214	276	243	255	124	0	3	1643
<b>Average</b>	<b>6</b>	<b>6</b>	<b>19</b>	<b>88</b>	<b>338</b>	<b>367</b>	<b>345</b>	<b>311</b>	<b>242</b>	<b>166</b>	<b>23</b>	<b>2</b>	<b>2016</b>

Source: Bangladesh Meteorological Department, Dhaka.



Source: Bangladesh Meteorological Department, Dhaka.

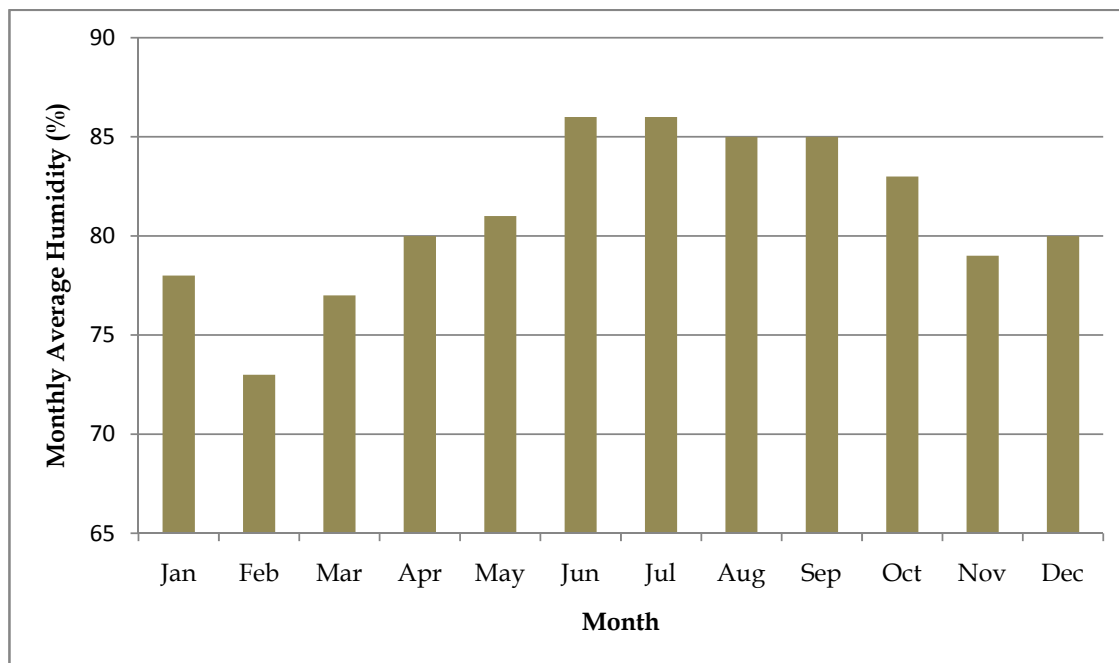
**Figure 5.2-2: Average Monthly Rainfall (2004-2013), Comilla Weather Station**

Relative humidity remains fairly constant from January to December, though on average it is higher in April to October as shown in Error! Not a valid bookmark self-reference. and Figure 3. This observed change in humidity corresponds with the pre-monsoon and dry seasons within the study area.

**Table 5.2-2: Average Monthly Relative Humidity (%), Comilla Weather Station**

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2004	83	74	79	83	78	85	87	84	87	79	78	78
2005	77	76	82	79	80	84	85	87	86	84	80	77
2006	79	79	73	78	80	85	85	83	85	83	81	79
2007	77	77	72	82	82	86	88	85	86	82	82	80
2008	79	73	81	78	79	86	86	86	83	83	78	83
2009	79	74	76	79	80	83	86	86	83	82	77	80
2010	78	71	77	81	81	87	84	84	86	83	79	77
2011	76	69	75	78	83	86	85	86	85	81	77	81
2012	78	71	76	82	80	85	86	84	86	83	79	84
2013	74	69	76	79	86	82	84	86	85	85	79	81
<b>Average</b>	<b>78</b>	<b>73</b>	<b>77</b>	<b>80</b>	<b>81</b>	<b>85</b>	<b>86</b>	<b>85</b>	<b>85</b>	<b>83</b>	<b>79</b>	<b>80</b>

Source: Bangladesh Meteorological Department, Dhaka.



Source: Bangladesh Meteorological Department, Dhaka.

**Figure 5.2-3: Average Monthly Humidity (2004-2013), Comilla Weather Station**

### 5.2.1.3 Temperature

The monthly average minimum and maximum temperatures recorded at the Comilla weather station are presented below in Table 5.2-3 and Table 5.2-4 respectively. The lowest average temperature recorded in the past 10 years was in January 2013 (6.0°C). The highest average temperature reached 35.5°C in June 2012. Throughout the year the highest temperatures are generally in March through October, and the lowest temperatures are from December to February (Source: Bangladesh Meteorological Department, Dhaka.

Figure 5.2-4).

**Table 5.2-3: Average Monthly Minimum Temperature (°C), Comilla Weather Station**

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
------	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----



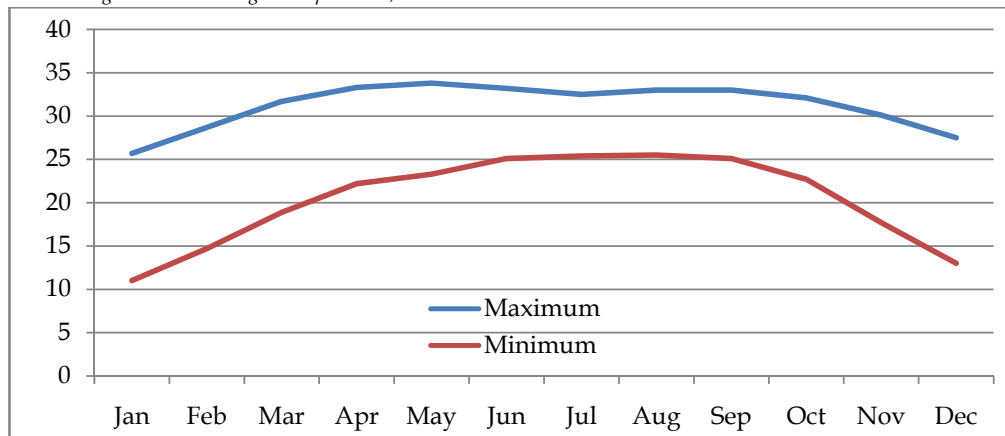
2004	12.9	14.8	20.9	22.4	25.1	25.0	25.5	25.4	25.1	23.1	17.2	14.5
2005	12.4	16.4	21.1	22.7	23.5	26.1	25.5	25.5	25.4	24.2	18.1	14.0
2006	12.2	18.5	20.1	23.0	24.4	25.6	25.8	25.6	25.2	24.2	19.1	13.3
2007	11.1	16.0	18.1	22.7	24.9	25.3	25.4	26.1	25.5	23.3	20.0	14.4
2008	13.2	14.1	20.5	22.9	23.9	25.2	25.6	25.5	25.3	23.2	18.4	15.9
2009	13.6	15.6	20.4	24.2	24.3	25.9	25.5	25.9	25.6	23.0	19.0	13.3
2010	11.0	14.7	22.0	25.2	24.7	26.1	26.3	26.3	25.6	24.7	20.0	13.8
2011	8.4	12.6	14.0	20.0	21.7	23.4	24.2	24.0	24.6	21.3	16.3	10.7
2012	9.4	10.6	16.6	18.8	20.6	23.0	25.0	25.2	24.8	19.6	13.6	9.4
2013	6.0	13.4	15.5	20.0	19.5	25.8	25.2	25.1	24.2	20.0	15.2	10.7
Average	11.0	14.7	18.9	22.2	23.3	25.1	25.4	25.5	25.1	22.7	17.7	13.0

Source: Bangladesh Meteorological Department, Dhaka.

**Table 5.2-4: Average Monthly Maximum Temperature (°C), Comilla Weather Station**

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2004	24.0	27.8	30.8	31.6	34.0	32.0	31.6	32.6	30.9	30.9	29.5	27.3
2005	24.8	28.6	30.5	33.5	33.1	33.4	31.8	31.5	32.5	31.2	29.3	27.6
2006	25.6	30.2	32.0	33.2	33.1	32.6	32.0	32.9	32.0	32.1	29.1	27.0
2007	24.4	26.9	30.2	32.0	33.6	31.9	30.7	32.2	31.7	31.4	29.1	25.9
2008	24.8	25.9	30.6	33.5	33.8	31.6	31.0	31.7	32.7	30.9	29.8	26.5
2009	26.0	28.9	31.7	33.8	34.0	33.4	31.8	32.5	33.2	32.2	30.3	26.1
2010	24.5	28.1	32.0	33.3	33.5	31.9	32.7	33.4	32.8	32.3	30.2	26.4
2011	27.5	29.3	32.5	33.6	34.5	35.0	34.8	35.1	35.0	33.4	31.5	30.5
2012	27.5	30.5	33.2	34.6	35.0	35.5	34.0	33.6	34.6	32.8	31.4	27.0
2013	28.0	30.8	33.4	34.1	33.5	35.0	35.0	34.2	35.0	33.8	30.8	30.2
Average	25.7	28.7	31.7	33.3	33.8	33.2	32.5	33.0	33.0	32.1	30.1	27.5

Source: Bangladesh Meteorological Department, Dhaka.



Source: Bangladesh Meteorological Department, Dhaka.

**Figure 5.2-4: Average Minimum and Maximum Temperatures (2004-2013), Comilla Weather Station**

#### 5.2.1.4 Wind Speed and Direction

Data about wind speed and direction for the period from 2004 to 2013 as collected from Meteorological Department are attached hereto **Table 5.2-14.2-5**.

The data indicates that the maximum wind speed recorded as 25 knots in the month of October, 2007. The prevailing wind direction is South and South-east in most part of the year.

Monthly and seasonal wind roses based on the meteorological data collected from BMD for Comilla observatory are presented in **Figure5.2-5**. Annual wind roses are shown in **Figure5.2-6**.

Table 5.2-1: Monthly & Yearly Maximum Wind Speed in Knts & Direction in Degree at Comilla

Year	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec		
	Sp	Dr	Tm	Sp	Dr	Tm	Sp	Dr	Tm	Sp	Dr	Tm	Sp	Dr	Tm	Sp	Dr	Tm	Sp	Dr	Tm	Sp	Dr	Tm	Sp	Dr	Tm	Sp	Dr	Tm	Sp	Dr	Tm	Sp	Dr	Tm
2004	8	31	6	12	18	6	20	18	6	20	18	12	18	18	6	16	22	12	18	18	6	14	18	12	12	13	12	20	18	18	10	36	6	6	36	6
2005	15	31	9	15	18	9	15	5	9	15	22	18	15	5	9	15	18	3	14	18	9	14	18	12	12	18	15	10	18	12	8	36	9	9	31	9
2006	10	34	9	16	18	6	14	31	9	15	18	6	16	18	18	17	18	21	14	18	9	8	18	9	8	18	6	5	21	12	5	36	12	4	31	6
2007	6	29	9	7	18	6	8	31	6	15	21	15	18	27	15	10	18	9	10	18	15	9	18	12	8	23	6	15	7	18	25	18	0	5	36	6
2008	6	36	15	20	9	12	16	23	18	11	5	12	12	18	9	13	18	9	12	18	9	11	16	9	8	18	12	21	18	3	4	36	9	4	36	6
2009	5	23	9	6	31	9	8	23	15	13	18	6	13	18	9	8	27	6	11	23	18	5	18	15	7	18	6	5	18	9	4	36	9	3	36	9
2010	4	36	3	4	36	9	10	18	6	17	18	9	14	27	15	9	31	21	6	18	12	8	18	9	5	18	6	6	18	12	3	36	3	4	36	9
2011	10	18	9	6	18	9	14	18	9	7	31	15	5	18	9	6	18	9	6	18	12	6	18	9	8	18	9	4	20	18	3	36	6	3	36	9
2012	4	36	6	4	36	6	7	18	6	8	20	9	13	18	6	8	18	12	8	18	9	5	18	18	5	18	18	5	18	6	4	36	12	4	36	15
2013	7	31	9	8	33	9	6	22	15	15	31	18	13	16	9	12	18	6	9	18	9	9	13	9	8	18	6	9	18	6	4	36	9	4	31	9



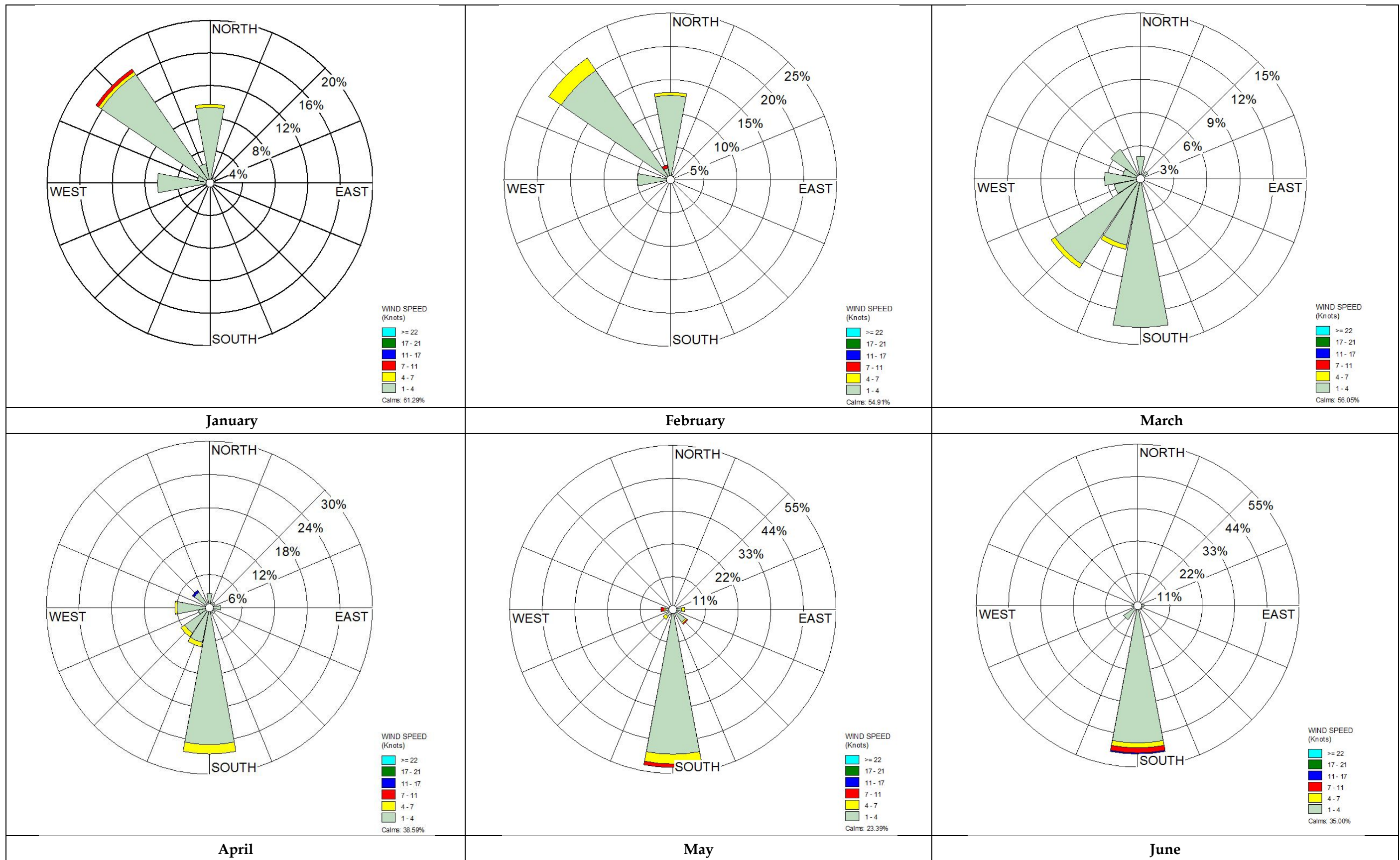


Figure 4.2-5: Monthly Wind Rose Diagram (2013), Comilla Weather Station

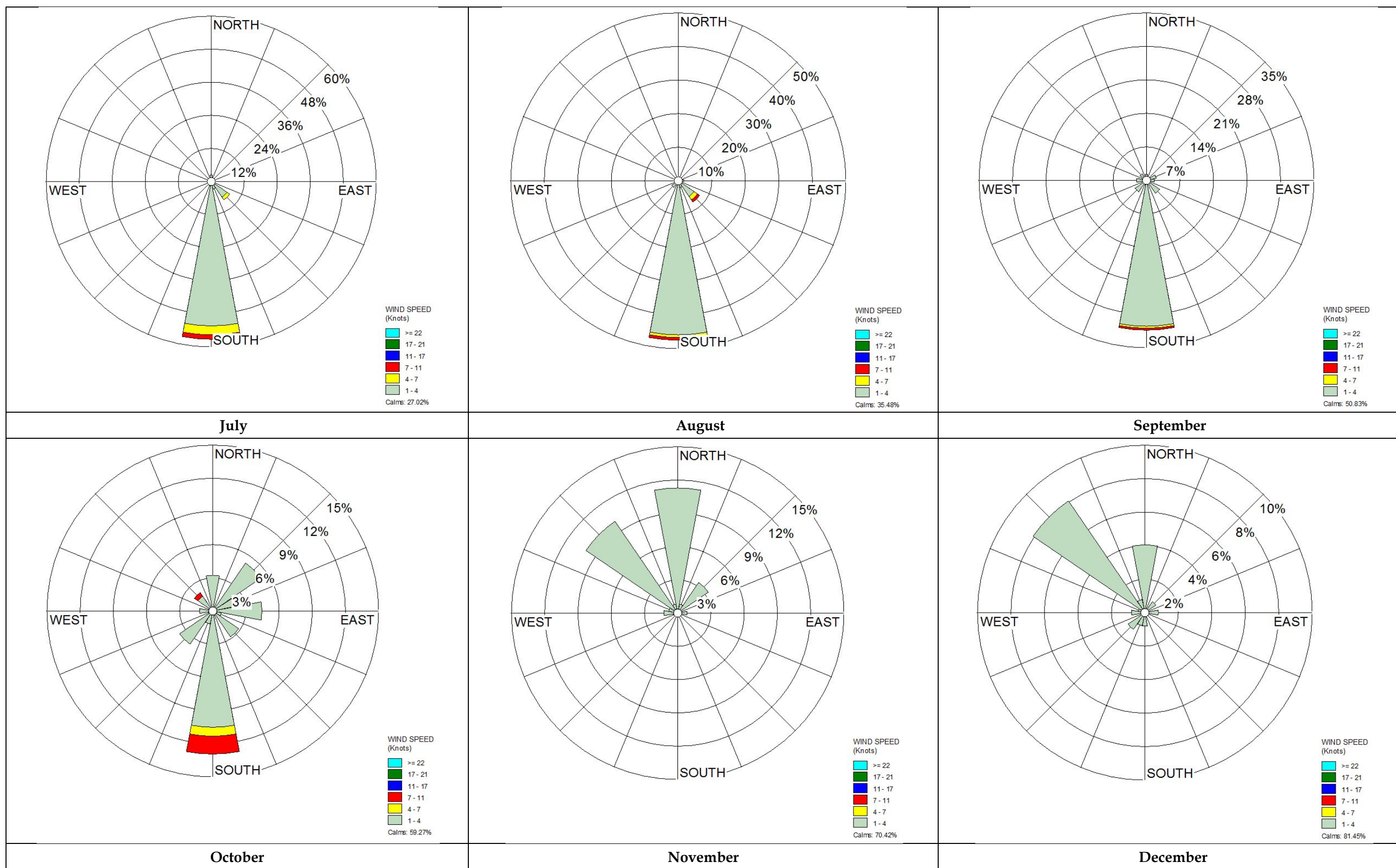


Figure 5.2-5: Monthly Windrose Diagram (2013), Comilla Weather Station (Continued)



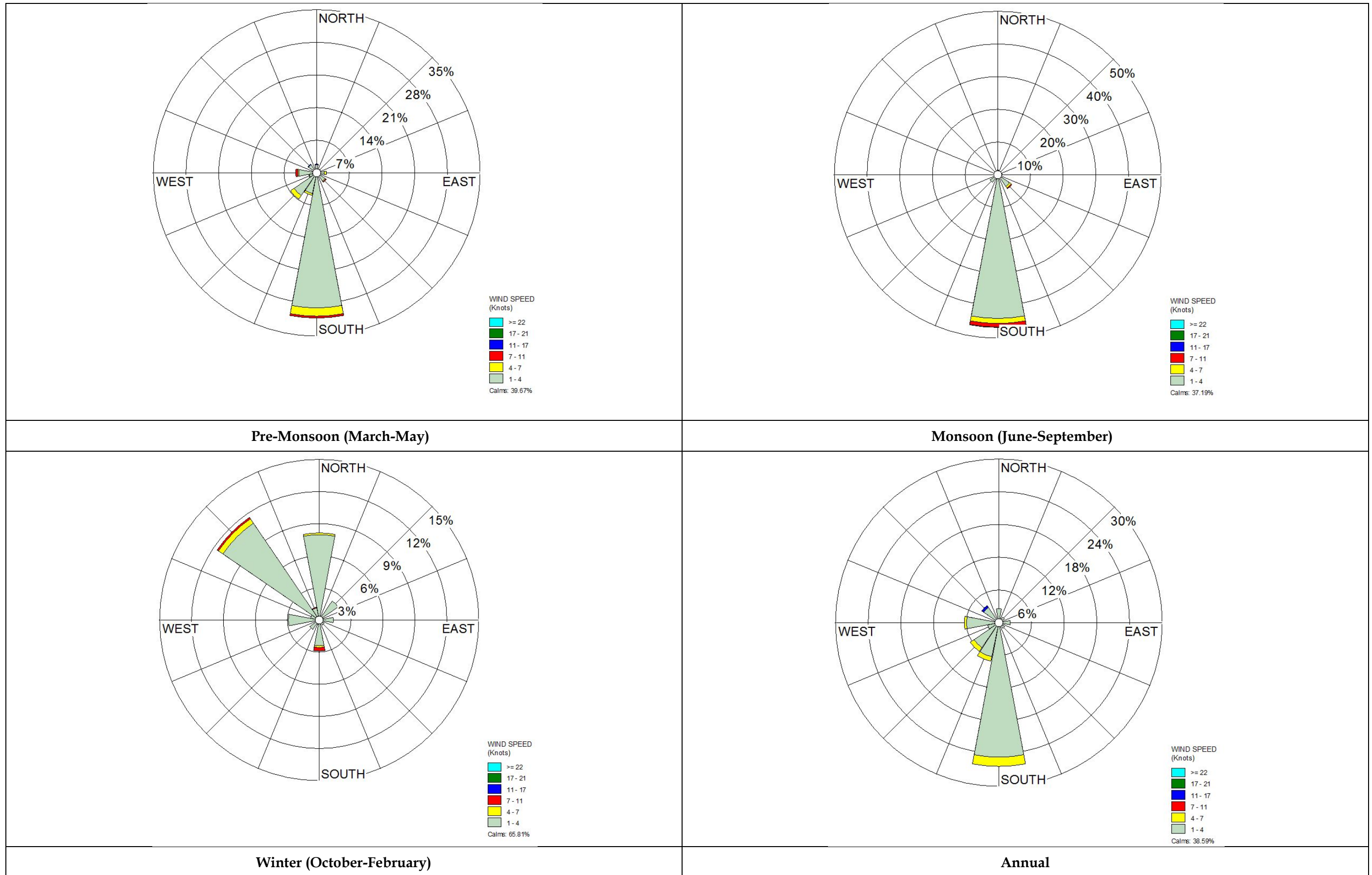


Figure5.2-6: Seasonal and Annual Wind Rose Diagram (2013), Comilla Weather Station

## **5.2.2 LAND USE**

The power plant is located in the industrial belt along the river Meghna. The area on the north-west side of the Midland power plant is mainly used as river landing site for paddy business, stone, sand bricks and breaking yard. In the Southern side is Ashuganj fertilizer factory and staff quarter.

The land use pattern in the area is of mixed type having industrial, commercial and residential uses. Erratic development of housing and industries, imprudent alignment of roads and commercial places and some pockets of good agricultural land are common features of the existing topography surrounding the project area.

## **5.2.3 GEOLOGY AND SOILS**

Geology of Bangladesh is generally dominated by poorly consolidated sediments deposit over the past 10,000 to 15,000 years (Holocene age). The geology of the study area consists of Quaternary deltaic sediments, which have been strongly influenced by tectonic movements on deep-seated faults. The area lies on a tectonic block, which has been uplifted relative to the surrounding areas. The soil profile of the study area consists of about 12m thick clay deposit followed by sand, clay and progressively coarser sand as depth increases.

In terms of crop production, the soils of Bangladesh can be categorized into three main classes; floodplain, terrace and hill soils. Soils are mainly grey loamy on the ridges and gray to dark gray clayey in the basins. Gray sands to loamy sands with compact silty topsoil's occupy areas of the old Brahmaputra Char floodplain or alluvial soils. In adjoining southern part soil mainly comprises sandy barns and sandy clay barns and tends to be gray to dark gray in poorly-drained basins and brown on higher and better drained land.

## **5.2.4 NATURAL HAZARDS**

### **5.2.4.1 INTRODUCTION**

Bangladesh can be regarded as being susceptible to natural calamities. This is due to its unique combination of physiographic, morphological and other natural features, which have lead to direct loss of life and physical property on a massive scale. Natural calamities experienced include floods, cyclones and storm surges, and earthquakes.

### **5.2.4.2 FLOODING**

Every year near about one-fifth of Bangladesh undergoes flood during the monsoon season. A flood season in Bangladesh may start as early as May and can continue until November.

Floods of Bangladesh can be divided into three categories: (i) monsoon flood - seasonal, increases slowly and decreases slowly, inundate vast areas and causes huge loss to the life and property; (ii) flash flood-from sudden torrential flows, following a brief intense rainstorm or the bursting of a natural or manmade dam or levee; and (iii) tidal flood - short duration, height is generally 3-6m, prevents inland flood drainage.

It has been observed that, the existing power plant area has never been inundated by flood water.

#### **5.2.4.3 CYCLONE AND STORM SURGES**

Devastating cyclones hit the coastal areas of Bangladesh almost every year usually accompanied by high-speed winds, sometimes reaching 250 km/hr or more and 3-10 m high waves, causing extensive damage to life, property and livestock. Because of the funnel shaped coast, Bangladesh repeatedly becomes the landing ground of cyclones formed in the Bay of Bengal. The existing power plant site is far from the coastal belt, the likely impact of cyclones is relatively small.

#### **5.2.4.4 SEISMICITY**

Bangladesh is situated in one of the most tectonically active regions in the world. Here three major tectonic plates (the Indian Plate, the Tibet Sub-Plate, and the Burmese Sub- Plate) collide and thrust over each other. Earthquakes occur frequently in the wider region.

Bangladesh can be divided into three Seismic Zones, as described by the ranges of the seismic coefficient. Zone I is the most severe area for earthquake intensity and frequency and Zone III is the least severe (BNBC, 1993). The study area falls in Zone II (0.15) i.e. medium intensity seismic zone. The location of the power plant, relative to the seismic zones is provided in Figure 5.2-7.

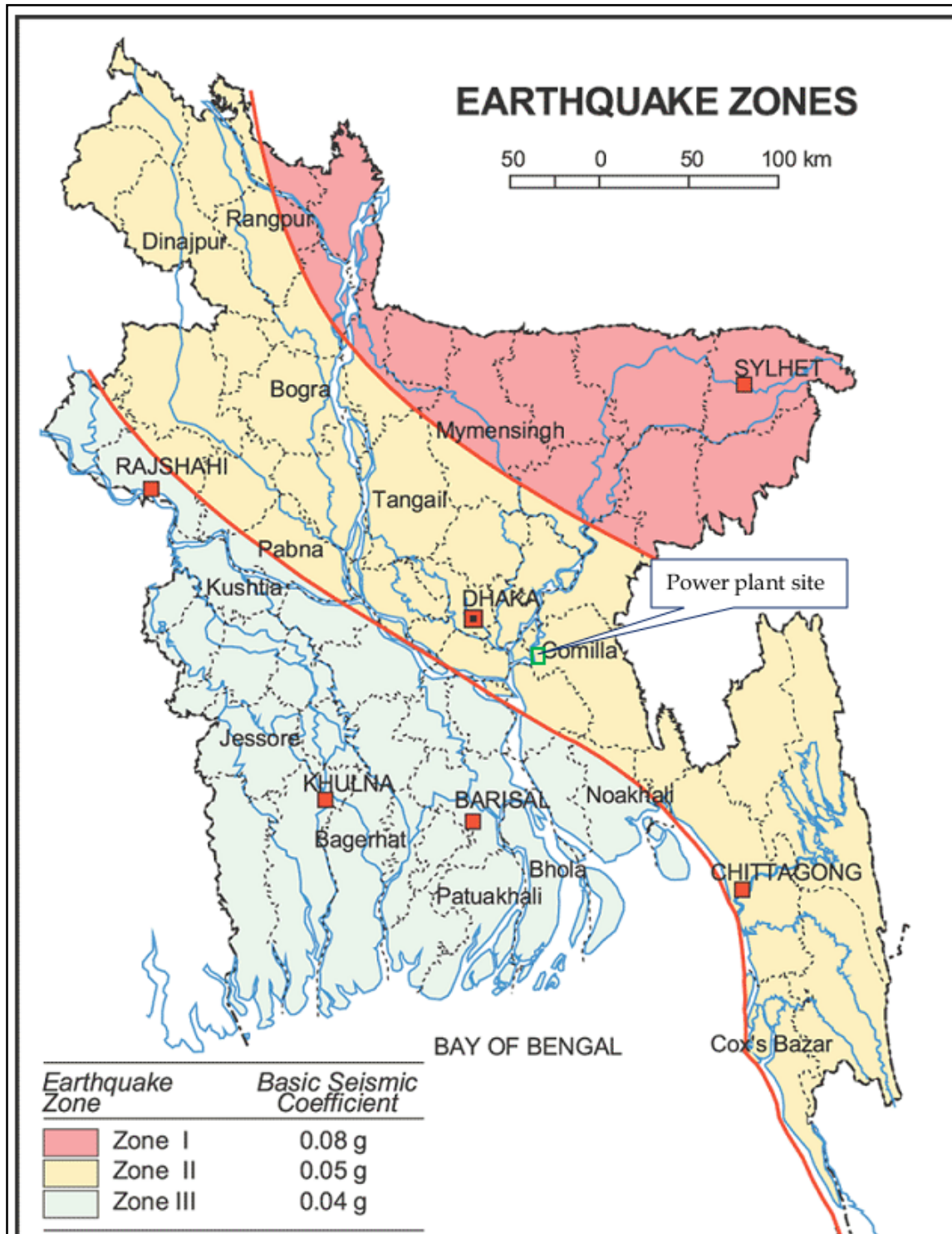


Figure 5.2-7: Seismic Zones of Bangladesh (BNBC, 1993)

### 5.2.5 WATER RESOURCES

Bangladesh and the western portion of the Indian State of Bengal are located within the 'Bengal Basin'. According to Rahman et al (2003), this basin includes the world's largest river delta, which is 140,000 square kilometers (the Ganges-Padma, Jumna-Brahmaputra- Tista and

Meghna rivers and numerous tributary complexes) and the world's largest submarine fan complex (the Bengal Fan). These river systems carry a combined annual sediment load of 1.5 to 2.4 billion metric tons..

Bangladesh has an average annual surface flow of approximately 1,073 million acre feet (MAF), of which about 870 MAF (93%) are received from India as inflow and the remaining 203 MAF (7%) as rainfall. This water is enough to cover the entire country to a depth of 9.14m. About 132 MAF (65% of rainfall and 12% of total) is lost to evaporation each year (114.30 cm), the remainder flows out to the Bay of Bengal.

Water sampling and analysis was undertaken to understand the overall baseline water quality characteristics of the surface and groundwater in the study area. Samples were taken from representative selected water body and groundwater sources representing different parts of the study area.

The surface water sampling was collected from the Meghna River which is adjacent to the power plant. Groundwater sampling locations were selected to obtain a representative water sample from various zones within the study area. The samples were collected from existing ground water sources. A total of 3 samples, One (1) surface water and two (2) ground water samples were collected. Detail of the sampling location is provided in **Table 5.2-6** and depicted in **Figure 5.2-8**.

**Table 5.2-6: Details of Surface and Ground Water Sampling Locations**

Sl.	Sampling location	Sampling Code	Geographic location
1.	Meghna River	SW1	24° 1'46.20"N 90°59'8.11"E
2.	Power Plant Area	GW1	24° 1'41.70"N 90°59'17.56"E
3.	Char Chartala Village	GW2	24° 1'38.66"N 90°59'21.76"E

The samples were analyzed for parameters covering physico-chemical characteristics.

Water samples were collected in a 250 ml sterilized clean PET bottle for complete physio-chemical tests.

The samples were analyzed as per standard procedure/method given in Standard Method for Examination of Water and Wastewater Edition 20, published by APHA. Details of the analysis method and protocol are presented in Table 5.2-7.





Figure 5.2-8: Surface and Ground Water Sampling Locations

Table 5.2-7: Methods for Water Analysis

Sl.	Parameter	Test method (APHA)
1.	Temperature (°C)	Digital thermometer
2.	TDS (mg/l)	Digital TDS meter
3.	EC ( $\mu\text{mhos}/\text{cm}$ )	Digital EC meter
4.	DO (mg/l)	Digital DO meter
5.	pH	Digital pH meter
6.	Salinity (ppt)	Digital Salinity meter
7.	Total Hardness (as $\text{CaCO}_3$ ) (mg/l)	2340.C
8.	Chloride ( $\text{Cl}^-$ ) (mg/l)	4110.B
9.	Iron (Fe) (mg/l)	3113.B
10.	Calcium	3113.B

#### 5.2.5.1 SURFACE WATER RESOURCES

The nearby surface water source in the existing power plant is the Meghna River. Upstream of the site, the Upper Meghna meets the Old Brahmaputra River at Bhairab Bazar and downstream, it joins the Padma River near Chandpur. This is a meandering river with braided characteristics. It flows along the western part of the Brahmanbaria District boundary and has significant influence on the drainage of the Brahmanbaria District. There is a notable change in the flow characteristic of the Meghna River between wet and dry seasons and with lower flow levels in the river. Tidal influence becomes more pronounced in the dry season. During the monsoon, the Meghna River dominates flood extent in the District. It is apparent that Meghna River is the primary source of prolonged monsoon flooding in Brahmanbaria District.



#### **5.2.5.2 SURFACE WATER QUALITY**

The surface water Quality was compared with the Bangladesh ECR standard for best practice based classification criteria. **Table 5.2-8** shows the analysis results. Some of the water analysis parameters are discussed below in detail:

##### ***pH***

pH of the Meghna River is within the permissible limits of 6.5 to 8.5.

##### ***Dissolved Oxygen (DO)***

The DO of the sample of Meghna River is 6.7 mg/l and thus meets the surface water classification for different usages.

##### ***Biological Oxygen Demand (BOD)***

The BOD level is 3.0 mg/l for the Meghna River and thus is well below the permissible limits. Comparison of the data with the surface water quality standards of government of Bangladesh reveal the fact that water of the water bodies are fit for supply after conventional treatment, Water usable by fisheries, Industrial process and cooling industries and Water usable for irrigation.

**Table 5.2-8: Surface Water Quality Analysis**

Characteristics	Unit	Sampling Location	Bangladesh Standard*					
		SW1	Source of drinking water for supply only after disinfecting	Water usable for recreational activity	Source of drinking water for supply after conventional treatment	Water usable by fisheries	Water usable by various process and cooling industries	Water usable for irrigation
<b>BOD<sub>5</sub></b>	mg/l	3.0	2 or less	3 or less	6 or less	6 or less	10 or less	10 or less
<b>Calcium</b>	mg/l	3.8	-	-	-	-	-	-
<b>COD</b>	mg/l	8.0	-	-	-	-	-	-
<b>Chloride</b>	mg/l	3.5						
<b>EC</b>	μmhos/cm	128	-	-	-	-	-	-
<b>DO</b>	mg/l	6.7	6 or above	5 or more	6 or more	5 or more	5 or more	5 or more
<b>Iron</b>	mg/l	0.1	-	-	-	-	-	-
<b>pH</b>	-	6.7	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5
<b>Phosphate</b>		0.7						
<b>Salinity</b>	ppt	Nil	-	-	-	-	-	-
<b>Temperature</b>	°C	28.4	-	-	-	-	-	-
<b>TDS</b>	mg/l	78	-	-	-	-	-	-
<b>Total Hardness</b>	mg/l	19.3	-	-	-	-	-	-
<b>Turbidity</b>	NTU	60	-	-	-	-	-	-

(Source: Laboratory Analysis, Department of Soil, water and Environment, University of Dhaka and EQMS laboratory, Sampling Date: 28/9/14)

\* Bangladesh Environment Conservation Rules, 1997- Schedule 3 (Standards for inland surface water)

### 5.2.5.3 GROUND WATER

Groundwater aquifers in Bangladesh are constantly recharged by major river systems and by infiltration of rainwater. Groundwater is usually available within 5 m below ground surface (mbgs). This level fluctuates seasonally but approaches close to the surface in most parts of the country from July to September. At Ashuganj, the groundwater level is about 6 mbgs surface during the dry season, with levels returning to their normal position before the end of the monsoon season. This fall in ground levels is an entirely natural process that arises because of the hydrological link with the river. The groundwater present in the project area is at three distinct levels:

- An upper silty clay cover of less than 20 m thicknesses, along the borders of the NCR. The maximum thickness ranges from 50 to 100 m.
- A middle composite aquifer of fine to very fine sands, varying in thickness from 30 m to 60 m along the border of the NCR. In the centre of the region, the aquifer is less than 10 m thick. Although it is a good aquifer, its irrigation development potential is poor, because its sands are too fine for slotted well screens and for providing high discharge rate. However, it is used as a source of supply for HTWs and MOSTIS.
- The lowest and main aquifer consists of medium, medium-to-fine or medium-to-coarse sand with layers of clay and silt extending to 30-60m. The coarser-grained structure of this aquifer is suitable for large-scale groundwater development with screened wells. Most tube wells within the main aquifer are less than 150 m deep.

The results of two groundwater samples are shown in **Table 5.2-9**.

**Table 5.2-9: Ground Water Quality Analysis Result**

Sl.	Parameters	Sampling code		Bangladesh Standard
		GW1	GW2	
1.	Arsenic (As) (mg/l)	<0.05	<0.05	0.05 mg/l
2.	Chloride (Cl-) (mg/l)	172.6	160.4	150-600 mg/l
3.	Conductivity ( $\mu\text{mhos/cm}$ )	140	132	-
4.	Fluride (F) (mg/l)	0.20	0.18	1 mg/l
5.	Fecal Coliform (mg/l)	0	0	-
6.	Iron (Fe) (mg/l)	0.40	0.70	0.3-1.0 mg/l
7.	Lead (Pb) (mg/l)	<0.05	<0.05	0.05 mg/l
8.	pH	6.8	7.0	6.5-8.5
9.	Temperature (°C)	26.6°C	26.3 °C	20-30 °C
10.	Total Coliform (mg/l)	0	0	-
11.	Total Dissolved Solids (mg/l)	340	320	1000 mg/l

(Source: Laboratory Analysis, Department of Soil, water and Environment, University of Dhaka and EQMS laboratory)

## 5.2.6 AIR QUALITY

### 5.2.6.1 NATIONAL CONTEXT

Within Bangladesh there are two major sources of air pollution: industrial emissions and vehicular emissions. Industrial sources include power generation, fertilizer factories, mills (sugar, paper, jute and textile), brick kilns, tanneries, chemical and pharmaceutical industries and the burning of solid waste. Emissions from these various sources contribute to the formation of the smog that regularly shrouds the major cities (Rahman *et al*, 2005).

Pollutants emitted from industrial sources include hydrogen sulfide, ammonia, and chlorine; all of which can result in health complaints such as skin irritation, headaches and nausea. Sustained exposure to these pollutants can result in other severe health effects such as severe respiratory health issues and birth defects (Rahman *et al*, 2005). In Bangladesh – where some 89% of the population use solid fuel – air-quality related deaths were estimated to be over 56,000 in 2007 alone (WHO, 2007). With increasing rates of urbanization, it is anticipated that vehicular ownership and usage will also increase, leading to a continued decline in air quality. DoE has identified two-stroke engines as a major polluter, and now discourages their use within Dhaka (Rahman *et al*, 2005).

Within the rural areas of Bangladesh, the main sources of air pollution are brick kilns and domestic heating and cooking – with wood, coal, diesel and bio-fuel (often manure) used as sources of energy (UNEP, 2002). It is therefore likely in rural areas that the principal air contaminants are particulate matter and volatile organic compounds (VOCs). Rural areas often also experience problems, particularly in the dry season, with dust generation due to construction, transport and agricultural activities such as tilling, threshing and plowing.

### 5.2.6.2 METHODOLOGY FOR AIR QUALITY MONITORING

The existing ambient air quality of the study area was monitored at three locations (September 2014- October 2014) and at the plant gate (January 2015-February-2015) during the monitoring period. The monitoring parameters included Particulate Matter (SPM PM<sub>10</sub> and PM<sub>2.5</sub>), Sulphur Dioxide (SO<sub>2</sub>), Oxides of Nitrogen (NO<sub>x</sub>), and Carbon Monoxide (CO). All the parameters were monitored on 24-hourly basis except Carbon Monoxide (CO) during the duration of the study.

The particulate and gaseous samples collected during the monitoring have been analyzed as per the procedures specified in Table 5.2-10. The geographical locations of the ambient air quality monitoring locations has been presented in Table 5.2-11 and depicted in Figure 5.2-9.

**Table 5.2-10: Methodology for Analysis of Ambient Air Quality**

Sl.	Parameter	Analysis procedure
1.	SPM	Gravimetric method
2.	PM <sub>10</sub>	AirMetric MiniVol sampler
3.	PM <sub>2.5</sub>	AirMetric MiniVol sampler
4.	SO <sub>2</sub>	Colorimetric method at 560nm using spectrophotometer (West-Gaeke method)
5.	NO <sub>x</sub>	Colorimetric method at 540 nm using spectrophotometer (Jacob and Hochheiser method)

6.	CO	Digital CO meter	
<b>Table 5.2-11: Ambient Air Quality Sampling Location</b>			
Sl.	Sampling Station	Station Code	Geographic Location
1	Inside the Midland power plant boundary	AQ1	24° 1'41.23"N 90°59'18.11"E
2	Midland Staff Quarter, Char Chartala	AQ2	24° 1'23.35"N 90°59'33.35"E
3	Infront of food Sillo gate, Char Chartala	AQ3	24° 2'15.08"N 91° 0'1.47"E
4	At the Plant Gate	-	24° 1'39.66' N 90° 59'19.5' E

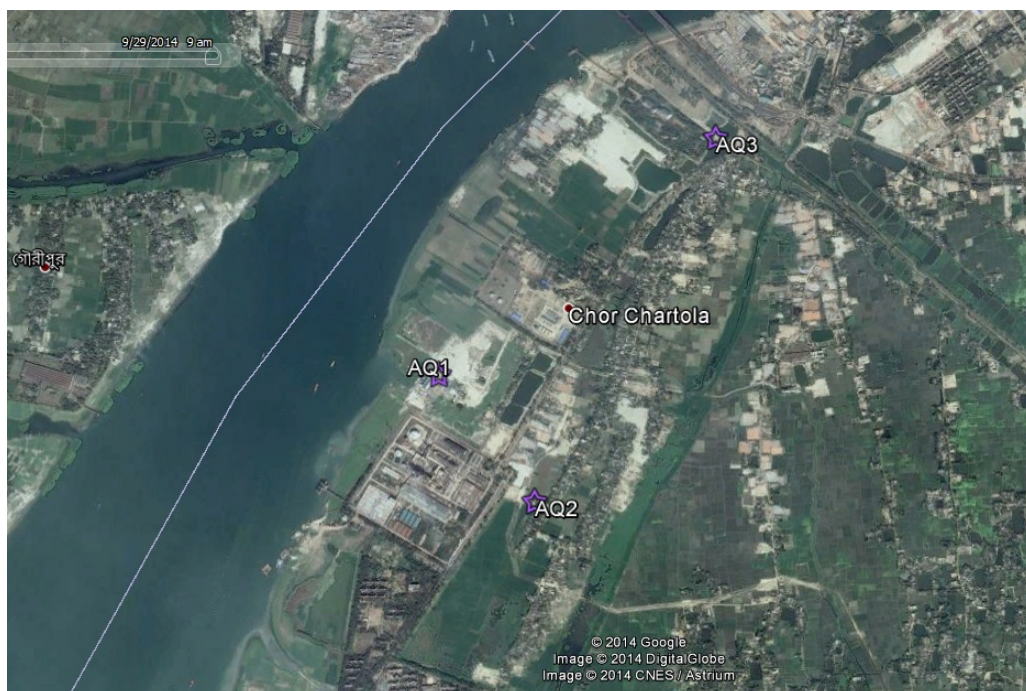


Figure 5.2-9: Ambient Air Quality Monitoring Locations

### 5.2.6.3 AMBIENT AIR QUALITY IN THE STUDY AREA

The monitored ambient air quality is summarized in Table 5.2- and results are annexed in ANNEX III.

Table 5.2-12: Ambient Air Quality in the Study Area

Location	Observed	Ambient Air Pollutants Concentration ( $\mu\text{g}/\text{m}^3$ )		
		SO <sub>2</sub>	NO <sub>x</sub>	CO
AQ1	Maximum	27.5	42.6	340
	Minimum	18.2	26.7	175
	Average	22.2	34.6	255.8
AQ2	Maximum	13.8	25.5	120
	Minimum	9.45	16.3	80
	Average	11.6	20.6	983
AQ3	Maximum	11.3	20.5	90
	Minimum	8.02	10.3	40
	Average	9.67	15.6	65
Bangladesh Standard**	24-Hourly	365	-	-
	8-Hourly	-	-	10,000
	Annual	80	100	-
WHO	24-Hourly	20	-	10,000
	Annual	-	40	-

\*\*The Bangladesh National Ambient Air Quality Standards have been taken from the Environmental Conservation Rules, 1997 which was amended on 19<sup>th</sup> July 2005 vide S.R.O. No. 220-Law/2005.

\*\*\*Who Ambient Air Quality Guideline Values (2005 and 2000), which are also being referred in the World Bank's General Guidelines (2007)

**Table-5.2-13 Ambient PM<sub>10</sub>, PM<sub>2.5</sub> Concentrations as per NAAQS as determined in recent measurements with the plant in operation (Annex- XIX)**

Pollutant	Averaging Time	Who Guidelines	Proposed Bangladesh Standards	Measured Concentration
PM <sub>10</sub>	24 hour	---	150 $\mu\text{g}/\text{m}^3$	191 $\pm$ 48 $\mu\text{g}/\text{m}^3$
	Annual	---	50 $\mu\text{g}/\text{m}^3$	105 $\pm$ 56 $\mu\text{g}/\text{m}^3$
PM <sub>2.5</sub>	24 hour	---	65 $\mu\text{g}/\text{m}^3$	146 $\pm$ 36 $\mu\text{g}/\text{m}^3$
	Annual	---	15 $\mu\text{g}/\text{m}^3$	54 $\pm$ 32 $\mu\text{g}/\text{m}^3$

---

N.B.: It should be noted here that the PM data are sampled and tested by the Reputed Atomic Energy Center, Dhaka (AECD) laboratory. Dr. Bilkis Ara Begum, Chief Scientific Officer, Chemistry Division, Atomic Energy Centre, Dhaka has tested and analyzed the data with due diligence. The analysis of data are annexed in Annexure-XIX.

#### **5.2.6.4 ANALYSIS AND DISCUSSION OF RESULTS**

##### ***PM<sub>2.5</sub> & PM<sub>10</sub>***

Table 5.2-13 represents the ambient PM<sub>10</sub>, PM<sub>2.5</sub>, concentrations as per NAAQS as determined using extrapolation procedure.

- The PM<sub>10</sub> and PM<sub>2.5</sub> concentrations are higher than the yearly average Bangladesh National Ambient Air Quality Standards and also for 24 hour standards except for the wet season.

The contribution of the plant to the cumulative level of air pollutants in the airshed is presumed to be low based on the size and number of other plants in the area.

##### ***SO<sub>2</sub>***

The 24-hourly SO<sub>2</sub> concentration was recorded in the range of 8.02 – 27.45 µg/m<sup>3</sup>. Average concentration of SO<sub>2</sub> are reported slightly higher due to the industrial setup. During the monitoring period, the maximum SO<sub>2</sub> concentration is reported at power plant site as 27.45 µg/m<sup>3</sup>. SO<sub>2</sub> concentrations at all the monitoring locations were reported well below 365 µg/m<sup>3</sup>, which is a 24-hourly National Ambient Air Quality Standard (NAAQS) for SO<sub>2</sub> in Bangladesh. The results were also compared with the WHO guideline values for SO<sub>2</sub> and it is noted that the average SO<sub>2</sub> concentrations at AQ2 and AQ3 are less than the stipulated guideline value (20 µg/m<sup>3</sup>), whereas average concentrations at AQ1 is within the interim target-2 (50 µg/m<sup>3</sup>).

##### ***NO<sub>x</sub>***

The 24-hourly NO<sub>x</sub> concentration was recorded in the range of 10.3 – 42.6 µg/m<sup>3</sup>. Average concentration of SO<sub>2</sub> are reported slightly higher due to the industrial setup. During the monitoring period, the maximum NO<sub>x</sub> concentration is reported at power plant site as 42.61 µg/m<sup>3</sup>. There are no stipulated standards for 24-hourly Nox concentration in Bangladesh and also there is no WHO guideline value for the same. The annual Bangladesh standard and WHO guideline value for NO<sub>x</sub> are 100 µg/m<sup>3</sup> and 40 µg/m<sup>3</sup> and present average concentrations at all the locations are well below these values.

##### ***CO***

The 8-hourly CO concentration was recorded in the range of 40.0 – 340 µg/m<sup>3</sup>. Average concentrations of CO are reported low at all the monitoring locations while comparing with the Bangladesh Standards as well as WHO guideline (10 mg/m<sup>3</sup>).

#### **5.2.7 NOISE LEVEL**

Excessive noise is a potential issue for both human and biological receivers and can cause a range of negative issues, from mild annoyance and moderately elevated levels of agitation to

significant disturbance of behavioral patterns and, in severe cases, temporary or permanent hearing loss. According to the World Health Organization Guidelines for Community Noise (1999), daily sound pressure levels of 50 decibels (dB) or above can create discomfort amongst humans, while ongoing exposure to sound pressure levels over 85 dB is usually considered the critical level for temporary hearing damage. Table 5.2-14 shows the Schedule 4 of the ECR sets the acceptable noise level criteria for various land uses in Bangladesh and World Bank general EHS guideline standard for noise level.

**Table 5.2-14: Standards for Noise (EQS)**

Sl.	Area Category	Bangladesh Guidelines (dBA)		World Bank general EHS Guidelines	
		Day <sup>1</sup>	Night <sup>1</sup>	Day <sup>2</sup>	Night <sup>2</sup>
1.	Silent Zone	50	40	-	-
2.	Residential Zone	55	45	55	45
3.	Mixed Area	60	50	-	-
4.	Commercial Area	70	60	70	70
5.	Industrial Area	75	70	70	70

Source: Sound Pollution (Control) Rules-2006, Bangladesh, EHS Guidelines for General Environmental Guidelines, April 2007, WBG

1. GoB —day is 06:00-21:00; GoB —Night is 21:00-06:00

2. WBG —day is 07:00- 22:00, WBG —Night is 22:00-07:00

#### 5.2.7.1 AMBIENT NOISE LEVEL IN THE PROJECT STUDY AREA

Noise levels were recorded at nineteen locations in the study area during the monitoring period. Noise levels were recorded in the form of sound pressure levels with the help of a digital sound level meter. Noise level were recorded for two hours at day and night time in the closest settlement area indicated as NL17, NL18 and NL19 monitoring locations and rest of the locations were recorded for 20 minutes both day and night times. The details of noise monitoring locations are given in **Table 5.2-15** and depicted in **Figure 5.2-10**. The purpose of ambient noise level measurement was to determine sound intensity at the monitoring locations. The sound level is recorded in form of A-weighted equivalent continuous sound pressure level (Leq) values with the use of A-weighting noise measuring instrument.

**Table 5.2-15: Details of Ambient Noise Monitoring Locations**

Sl.	Code	Location	Geographic Location	Location Setting
1.	NL1	South-west corner of the plant boundary	24° 1'37.79"N 90°59'13.38"E	Industrial
2.	NL2	North-west corner of the plant boundary	24° 1'42.68"N 90°59'17.54"E	Industrial
3.	NL3	North-east corner of the plant boundary	24° 1'40.34"N 90°59'20.57"E	Industrial
4.	NL4	South-east corner of the plant boundary	24° 1'36.35"N 90°59'15.92"E	Industrial



Sl.	Code	Location	Geographic Location	Location Setting
5.	NL5	North side of the plant boundary	24° 1'41.91"N 90°59'18.49"E	Industrial
6.	NL6	North side of the plant boundary	24° 1'41.46"N 90°59'19.09"E	Industrial
7.	NL7	North side of the plant boundary	24° 1'41.00"N 90°59'19.67"E	Industrial
8.	NL8	East side of the plant boundary	24° 1'39.43"N 90°59'19.82"E	Industrial
9.	NL9	East side of the plant boundary	24° 1'38.94"N 90°59'18.86"E	Industrial
10.	NL10	East side of the plant boundary	24° 1'37.37"N 90°59'17.07"E	Industrial
11.	NL11	South side of the plant boundary	24° 1'36.73"N 90°59'15.15"E	Industrial
12.	NL12	South side of the plant boundary	24° 1'37.14"N 90°59'14.25"E	Industrial
13.	NL13	Adjacent to the engine room (Western side)	24° 1'39.96"N 90°59'15.79"E	Industrial
14.	NL14	In front of the engine room (east side)	24° 1'39.62"N 90°59'17.16"E	Industrial
15.	NL15	Infront of the engine room (east side)	24° 1'40.47"N 90°59'17.67"E	Industrial
16.	NL16	Halima Begum's House, Char Chartala	24° 1'35.05"N 90°59'27.42"E	Industrial
17.	NL17	Habibur Rahman House, Char Chartala	24° 1'39.42"N 90°59'21.69"E	Industrial
18.	NL18	Akter Mia's House, Char Chartala	24° 1'37.66"N 90°59'21.03"E	Industrial
19.	NL19	Khorshed Mia's House, Char Chartala	24° 1'36.70"N 90°59'16.84"E	Industrial



Figure 5.2-10: Noise Level Monitoring Locations

Detail noise levels are presented in Table 5.2-16.

**Table 5.2-16: Noise level in and around the Proposed Project Site**

Location	Normalized Noise Data (dB)		Applicable Standard * (dB(A))	
	Day	Night	Day	Night
NL1	63.0±3.0	60.0±2.82	75	70
NL2	69.0±3.2	65.8±3.09	75	70
NL3	51.2±2.4	50.3±2.37	75	70
NL4	61.3±2.9	58.0±2.73	75	70
NL5	63.6±3.0	62.0±2.91	75	70
NL6	61.8±2.9	59.0±2.77	75	70
NL7	53.2±2.5	52.6±2.47	75	70
NL8	55.6±2.6	53.3±2.50	75	70
NL9	64.9±3.1	63.7±2.99	75	70
NL10	59.0±2.8	58.6±2.75	75	70
NL11	60.5±2.8	60.1±2.82	75	70
NL12	60.9±2.9	60.4±2.84	75	70
NL13	66.3±3.1	64.9±3.05	75	70
NL14	67.0±3.1	66.3±3.12	75	70
NL15	65.2±3.1	62.7±2.95	75	70
NL16	56.3±2.6	53.4±2.51	75	70
NL17	59.6±2.8	58.6±2.75	75	70
NL18	57.9±2.7	56.9±2.68	75	70
NL19	62.5±2.9	61.9±2.91	75	70

Source: Field Survey by EQMS (September, 2014)

\*Environmental Conservation Rules, 1997 (Schedule 4) (subsequent amendment in 2006)

Table 5.2-16 summarizes the measured ambient noise levels at each monitoring location. The project area falls into Industrial zone according to Bangladesh Environmental Quality Standard ECR'97 categorization. Noise levels of all locations were within the standard limit of ECR'97 (subsequent amendment in 2006). Normalization of Noise level is annexed in Annexure-XX.

### 5.3 BIOLOGICAL ENVIRONMENT

#### 5.3.1 OVERVIEW

The countries of South and Southeast Asia are considered by the IUCN as regions of high species diversity. A large number of native plants, including 3,000-4,000 species of woody

flora, have been recorded from Bangladesh. The country lies at the meeting point (tectonical region) of several floristic provinces, including the Manipur-Khasia, Bengal and North Burman provinces within the Indo-Malayan realm (IUCN, 2002).

The entire floodplain of Bangladesh was once well forested, but most of the native forests have disappeared in recent decades due to mounting pressure from human populations. The floodplain land has long been subject to cultivation, the most dominant land use within the study area. Thus only scattered patches of native trees, wetlands and associated fauna habitat remain in isolated locations within the terrestrial environment (IUCN, 2002). In many parts of the country, the abundance of plantations and groves of trees around villages creates an aspect of discontinuous forest (Wahab, 2008).

The river systems within the study area are used as local transport routes and are also important for fishing and fish farming. The freshwater watercourses also provide an important nursery ground for native fish. In addition, a number of fish ponds and freshwater wetlands occur within the study area. These areas provide diverse habitats for many freshwater aquatic flora and fauna.

The natural forests of Bangladesh have been subject to rapid depletion in recent years. Forests have been declining at a rate of 2.1% annually from the early 1980s. It was estimated in 1999 that only about 6% of the total area of the country merits the term 'forested' (Salam, et. al. 1999). Traditionally "sal" and mixed evergreen forests used to cover vast areas in the centre and east of Bangladesh. Most of the forests, which are considered of low productivity, have been replaced for tree monoculture plantations using eucalyptus and rubber among other species. Most of this forest land has been denuded, degraded, and occupied by forestry companies or displaced people (IUCN, 2002).

**Figure 5.3-1 and Figure 5.3-2** shows the location of the existing power plant in relation to the country's forest and protected areas. The maps illustrate that no protected habitats or reserve forests occur within 50 km of the plant.

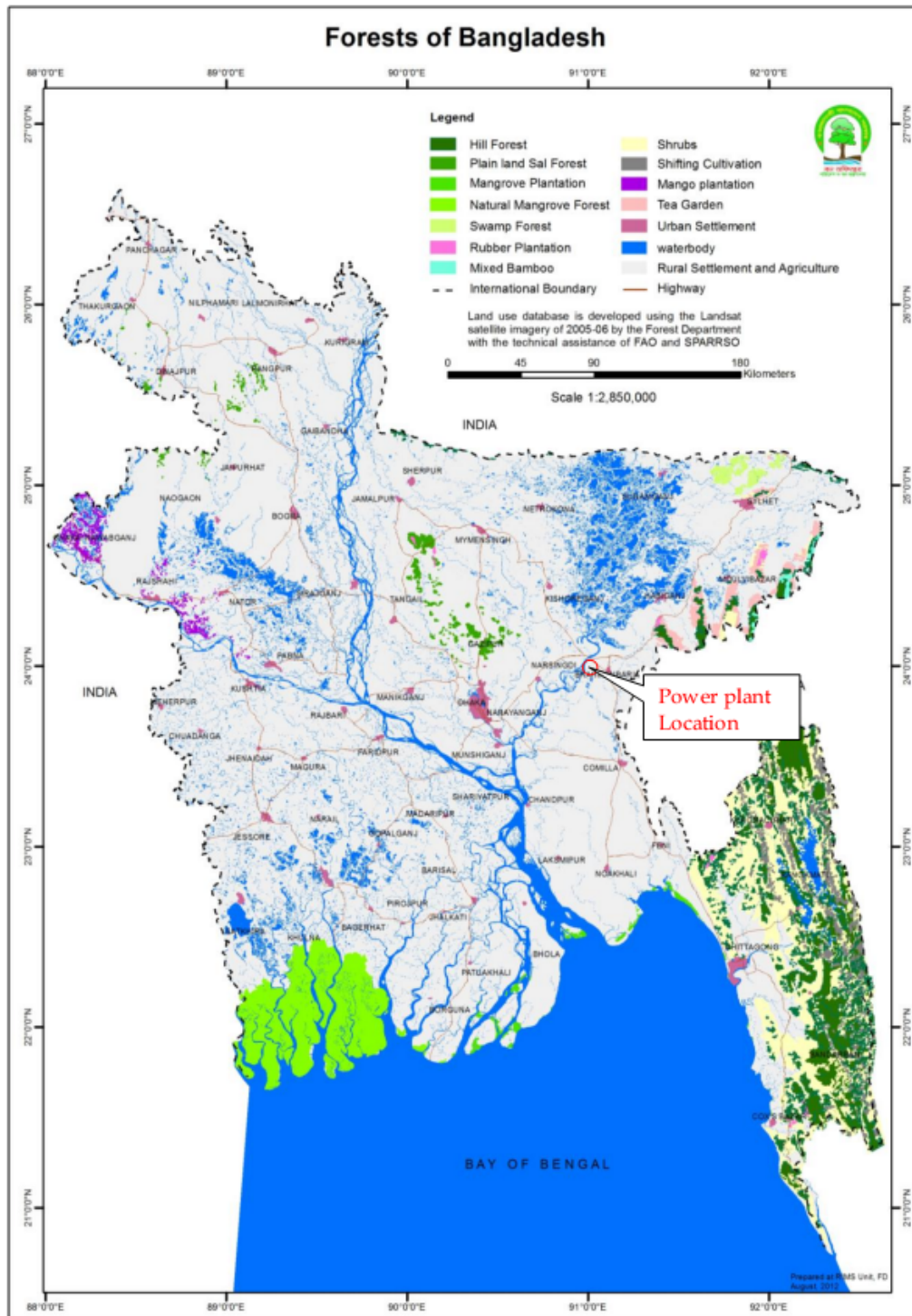


Figure 5.3-1: Forest Areas of Bangladesh



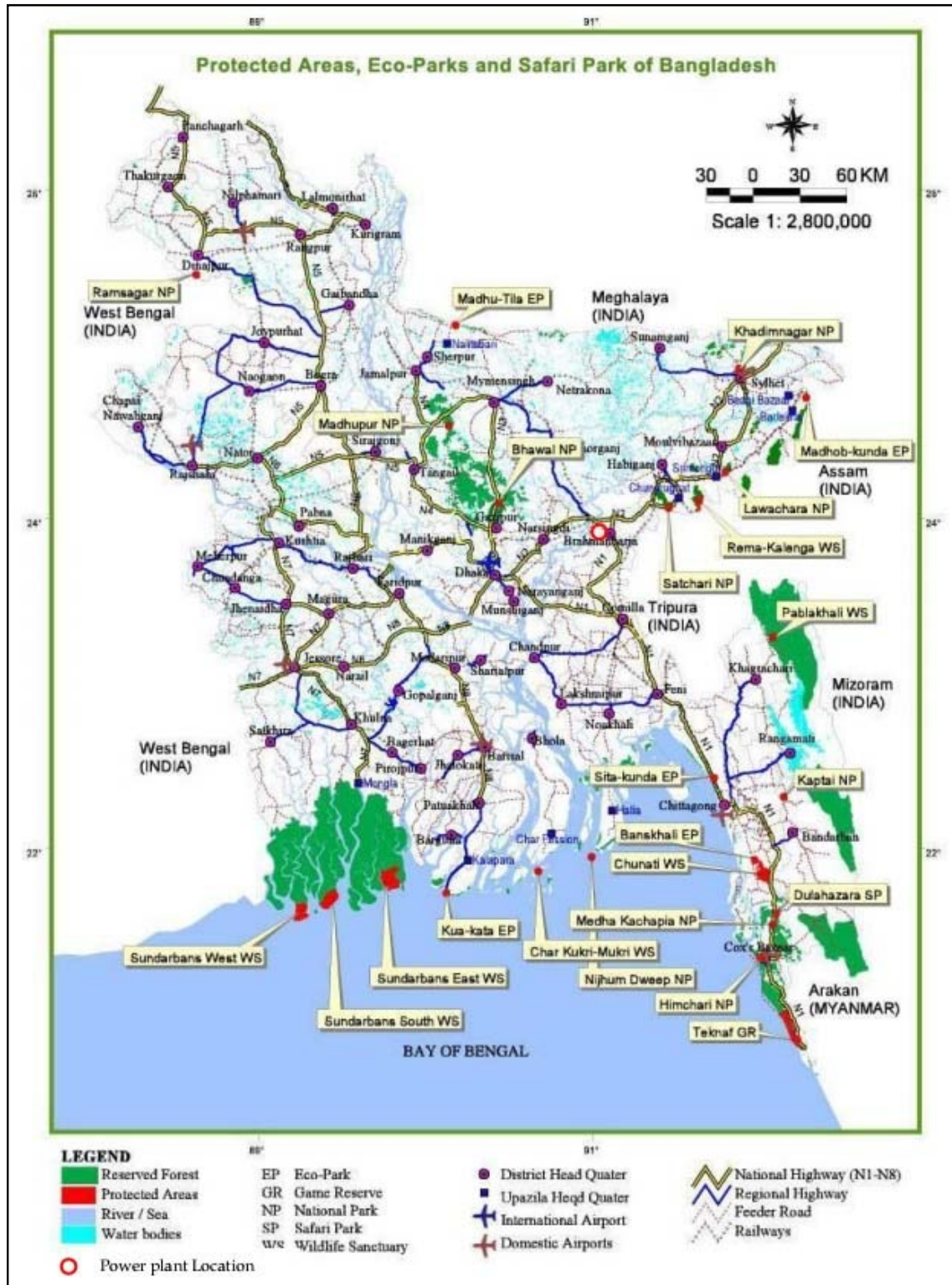


Figure 5.3-2: Protected Areas of Bangladesh

### 5.3.2 BIO-ECOLOGICAL ZONE

Twenty-five bio-ecological zones have been delineated within Bangladesh by the IUCN. Six parameters were used to determine the areas including: physiography, soil, rainfall and temperature, floral distribution, faunal distribution and flood depth (IUCN 2002). The project site occurs in the Meghna Floodplain bio-ecological zone (4e) as shown in **Figure 5.3-3**.

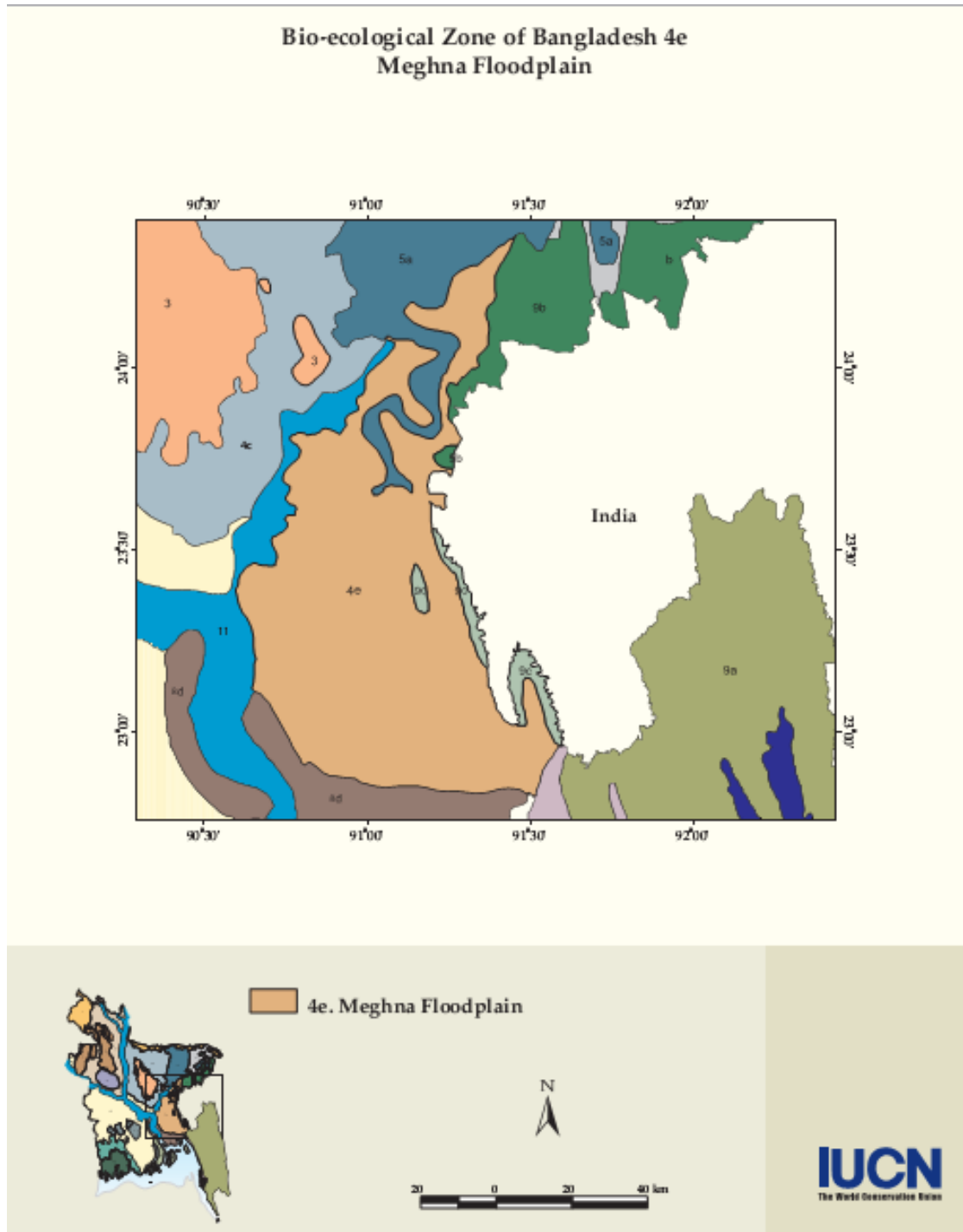


Figure 5.3-3: Bio-ecological zone of the study area

### **Meghna Floodplain Bio-ecological zone**

A major part of the Meghna floodplain was created by the deposition of sediments brought in by the old Brahmaputra river, before it changed its course to the west of the Madhupur sal tract some 200 years ago. The rest of the sediments were laid down principally by the Meghna river itself and by some minor rivers draining down from the Tipperah hills. This floodplain occupies a low-lying landscape of chars and many broad meandering channels. This zone is mostly affected by seasonal flooding while riverbank erosion is considered the major environmental hazard (Brammer, 1996).

The luxuriant growth of palms is the dominant characteristic feature of the vegetation type of this zone. The Betel nut (*Areca catechu*) is increasingly visible as the dominant tree species towards the western section of this zone, and grows almost in the form of forests along the Meghna above Lakshmipur. It is invariably accompanied by the Mandar (*Erythrina indica*), a thorny tree species, that serves to shade the young betel nuts. The Coconut (*Cocos nucifera*) is also very commonly found in the western part of this zone and on the chars. The Toddy palm (*Borassus flabellifer*) and Date palm (*Phoenix sylvestris*) are also to be seen in most parts. The Mahogany (*Swietenia mahagoni*) and Teak (*Tectona grandis*) planted at the roadsides have, on the other hand, matured well. This zone also produces several varieties of cane, a good deal of bamboo and thatching grass (Khan, 1977).

It is evident from old accounts that a few hundred years ago, this zone had, like many other places in Bangladesh, more forest cover than it has today; consequently, faunal diversity was also richer than it is today. Webster (1911) mentioned that the different species of deer, tiger and buffalo, which were well represented in the past, became scarce during the last few decades. Prominent mammalian species, which were found in this zone, are several species of bats, different species of monkeys, pangolins, etc. Moreover, several species of raptorial birds were found in this zone which included: the Red-headed vulture (*Sarcogyps calvus*), White-rumped vulture (*Gyps bengalensis*), Crested serpent eagle (*Spilornis cheela*), Short-toed snake eagle (*Circaetus gallicus*), etc. All these species are now either extinct or threatened (Khan, 1977).

The bio-ecological zone has been separated into two broad ecosystem types that occur within the study area. These are:

- Terrestrial; which represents the flora and fauna that occurs in land based areas that remain relatively unaffected by inundation associated with the monsoon; and
- Aquatic; which includes the flora and fauna associated with water bodies in the study area, including Meghna River, situated adjacent to the Power Plant.

### **5.3.3 ADOPTED METHODOLOGY**

This section deals with the methodology for biodiversity assessment of Flora (tree, shrubs, and herbs) and Fauna (birds, reptiles, amphibians, mammals) as well as the surrounding ecosystems. Most of the field work within the Project study area addressed these groups although each group was dealt with different approaches and requirements. A four person multidisciplinary team was organized to deal with these various aspects. The status of the



flora and fauna of the study area (both terrestrial and aquatic environments) was determined by:

- Reconnaissance survey of project area and surrounding area
- Interviews and discussion with local informants
- Review of IUCN-Bangladesh Red Data Book relevant to the area, and
- Through different secondary sources.

#### **5.3.4 FLORAL COMPONENT**

Reconnaissance field surveys were made to assess the various vegetation types/ecosystems present within the project impact zone. Once established, the target areas were extensively surveyed and a species assessment was made. To facilitate the identification of the maximum number of species, several visits were made. The study area (both directly and indirectly impacted area) occupies both terrestrial as well as aquatic ecosystems.

##### **5.3.4.1 TERRESTRIAL FLORA**

There is no designated forest in the project site and this area is dominated by industrial and commercial establishments. Terrestrial plant species is not so diverse. No endangered or threatened were found in the study area. Only common plant species were found in the study area with herbaceous vegetation.

As a result of past and continued land use within the study area, there are three main terrestrial ecological communities within the study area. They are:

- Agricultural Land;
- Homestead Plantation;
- Road side vegetation

##### ***Agricultural Land***

The study area contain low crop field. The agricultural area provide important hunting and feeding grounds for birds and other wildlife. Species such as the rat (*Mus booduga*) and rat (*Rattus rattus*). Thus, predatory birds such as Black kite (*Milvus migrans*) and House Crow (*Corvus splendens*) are commonly found foraging in the agricultural areas around the study area.

Agricultural vegetation has the lowest diversity of all ecosystem types within the study area. Several weed species occur within this area including *Alternanthera sessilis*, *Amaranthus spinosus*, *Cynodon dactylon*, *Polygonum sp.*, and *Oxalis corniculata*.

Thirteen crop field species were found within the study area these are shown in the ANNEX IV.

##### ***Homestead Plantation***

Homestead vegetation within the study area is generally in moderate condition. Most of the houses around in the study area are surrounded by locally cultivated plants. Common homestead vegetation includes Aam (*Magnifera indica*), Kanthal (*Artocarpus heterophyllus*),

Supari (*Areca catechu*), Mehogani (*Swietenia mahagoni*), Kola (*Musa sp.*) and Jam (*Syzygium cumini*). Among the shrubs Datranga (*Melastoma malabathricum*) and Vat (*Clerodendrum viscosum*) are the most common species. Such vegetation plays an important role in meeting food, fodder, medicine, fuel and other requirements for local people. Homesteads vegetation also provides good shelter for many wildlife species for nesting, roosting and feeding.

Thirty Two homestead species were identified in the study area. Fruit, timber, fuel wood and medicine producing plants were identified. Homestead flora consists of both native and exotic species, a detailed list of these species has been provided in **Annex IV**.

### **Roadside Vegetation**

Approximately 12-15 families of the plant species are present in the study area. These are: Gramineae, Leguminosae, Moraceae, Myrtaceae, Cyperaceae, Euphorbiaceae, Rutaceae, Solanaceae, Labiatae, Rubiaceae, Malvaceae, Compositae, etc. The most common roadside plantation trees are Koroi (*Albizia procera*), Sisso (*Dalbergia sissoo*), Mahogany (*Swietenia mahagoni*), Katanote (*Amaranthus spinosus*), Dhutura (*Datura meteloides*), Apang (*Achyranthus aspera*), Chorekanta (*Chrysopogon aciculatus*), Jagadumur (*Ficus glomoretta*), Swetadrun (*Leacus lavendulifolia*), Tulsi (*Ocimum sanctum*), Titbegun (*Solanum indicum*), Benna (*Veteveria zizanioides*), Bot (*Ficus benghalensis*) etc. Koroi (*Albizia procera*), Sisso (*Dalbergia sissoo*), Mahogany (*Swietenia mahagoni*) are the dominant road side plant species in the study area.

#### **5.3.4.2 Aquatic Flora**

Wetland is a one of the feature in the study area. (Wetlands govern necessary nutrients and other elements for whole ecosystems as it is an important type.

There are two types of wetland in the study area.

- Permanent wetland and
- Seasonal wetlands.

Rivers, canals, perennial water bodies and fishponds are the permanent wetland. Seasonal wetland is mainly floodplains which inundates in the monsoon. Most of the study area supports seasonal wetland. Wetland are abounded by different types aquatic flora such as free floating, rooted floating, submerged, sedges and meadows and marginal plants. Free floating plants are commonly observed throughout the study area. A detail species list of wetlands species provided in **Annex IV**.

#### **5.3.5 FAUNAL COMPONENT**

There is no forest area in the study area only road side and homestead plantation support the avian species for their nesting. Cultivation and plantation areas support a diverse range of common fauna species; however, the quality of such habitat is influenced by a variety of agricultural practices, including cultivation processes and the use of agro-chemicals. Within the study area, cultivated areas, with their associated vegetation types and homestead bushy area, represent the majority of habitat available for terrestrial fauna species.

Village forests or homestead plantations in this area supplies food, fodder, medicine, fuel and timber for local villagers. Village and homestead vegetation is the single most important plant community in terms of diversity. Settlement, embankment and roadside vegetation plays a very important role in providing shelter for many wildlife species.

### 5.3.5.1 Terrestrial Fauna

#### *Birds (Avifauna)*

Habitat Condition of the study Area: The study area is mixed land with barren land, homestead plantation, road side plantation. These vegetation are supporting the bird species for their nesting in the study area. Some common birds were seen during the field visit.

Species Diversity: A total of about 14 bird species were observed within the study area. A detail about the terrestrial bird species checklist is available in ANNEX V.

#### **Important Bird Areas (IBAs) in Bangladesh**

According to the Bird Life International the Important Bird Areas (IBAs) of Bangladesh are listed in Table 5.3-1. The study area is not fall in any important bird area.

**Table 5.3-1: List of the Important Bird Areas (IBAs) of Bangladesh**

Country/ Territory	International name	IBA Code	Criteria
Bangladesh	Aila Beel	BD003	A1, A4i, A4iii
Bangladesh	Ganges-Brahmaputra-Meghna delta	BD011	A1, A4i, A4iii
Bangladesh	Hail Haor	BD006	A1, A4i, A4iii
Bangladesh	Hakaluki Haor	BD004	A1, A4i, A4iii
Bangladesh	Hazarikhil Wildlife Sanctuary	BD013	A3
Bangladesh	Himchari National Park	BD018	A3
Bangladesh	Jamuna-Brahmaputra river	BD009	A1, A4i
Bangladesh	Lawachara / West Bhanugach Reserved Forest	BD005	A1, A3
Bangladesh	Madhupur National Park	BD001	A3
Bangladesh	Muhuri Dam	BD012	A4i
Bangladesh	Pablakhali Wildlife Sanctuary	BD014	A1, A3
Bangladesh	Patenga Beach	BD016	A1, A4i
Bangladesh	Rajkandi Reserved Forest	BD007	A3
Bangladesh	Rampahar-Sitapahar Wildlife Sanctuary	BD015	A3
Bangladesh	Rema-Kalenga Wildlife Sanctuary	BD008	A3
Bangladesh	Sangu Matamuhari	BD017	A3
Bangladesh	Sunderbans (East, South, West Wildlife Sanctuaries)	BD010	A1, A4iii
Bangladesh	Tanguar Haor and Panabeel	BD002	A1, A4i, A4iii
Bangladesh	Teknaf Game Reserve	BD019	A1, A3

(Source- Bird Life international, 2004)

### ***Amphibians & Reptiles***

The geographical location of Bangladesh is such that there is a high possibility of occurrence of animals and plants. It supports a wide range of floral and faunal community throughout the country.

There is no densely protected forest area within in the study area. Due to lack of natural habitat in the study area, the reptiles in this area not diverse but few species are found in the study area including Common Vine snake (*Ahaetulla nasutus*), Smooth water snake (*Enhydryis*) Indian Rat Snake (*Ptyas mucosus*) were found in the study area. Aquatic and semi-terrestrial snakes were found within the water or next to the water bodies around the Project site.

A variety of lizards and skinks were observed during the survey. Among the lizards identified was the Common garden lizard (*Calotes versicolor*). Lizards were observed in bushes and the lower canopies of trees in various vegetated areas around the study area. Other common geckos including Brook's House Gecko (*Hemidactylus brookii*), the Common House Gecko (*Hemidactylus frenatus*) were seen within homesteads.

Common skink (*Eutrophis macularia*) was found in several of the terrestrial habitats around the study area. Their niche habitat is low-lying vegetation, leaf litter, grassy areas, bushes, stream banks, under logs and burrows. The burrow-dweller Bengal monitor (*Varanus bengalensis*) was seen basking in the study area.

### ***Mammals***

No wild mammal species were observed during the site survey. Common mammals that were found within the study area are Mole Rat (*Bandicota bengalensis*), Indian gerbil (*Tatera indica*), Bandicoot Rat (*Bandicota indica*), House Shrew (*Suncus murinus*), Field Mouse (*Mus booduga*), House Mouse (*Mus musculus*), House Rat (*Rattus rattus*), Small Indian Mongoose (*Herpestes autopunctatus*) and Indian fox (*Iepus migrocollis*).

#### **5.3.5.2 Aquatic Fauna**

The main aquatic fauna in this area are different types of fishes. A few ponds that remain almost dry in the summer season in this area are used for natural cultivation of seasonal fresh water fishing. The fresh water fishes are carp (Rui, Katal, Mrigel, Ghania, Kalibaus etc.). The stretch of the river Meghna provides a habitat for a wide variety of fishes and shellfish species, which include carp, catfish (Boal, Pangas, Shilong, Bacha etc.) and live fish (Koi, Singh, Magur etc.). Tortoise, Frogs, Water Snakes etc. are other aquatic found in the Beels around the project area. **Table 5.3.-2** presents available fish species in the Meghna river and in the Beel areas.

A large number of aquatic fauna was observed in the study area. Many are totally dependent on wetlands (beels, river, ponds) and species are partially dependent on wetlands. There are little available aquatic habitats for faunal species. Wetlands are

intensively exploited and the habitat is highly disturbed. Despite this, some species have adapted to the altered environment, and others have even flourished.

Among the amphibians the skipper frog (*Rana cyanophytis*) is common-being found in most of the wetland habitats and has been the most successful in adapting to the altered environment. The common roof turtle (*Kachuga tecta*) and the flat-shelled spotted turtle (*Lissemys punctata*) are the most common of the reptiles. These freshwater turtle species face problems of migration during summer when water levels are inadequate.

The common aquatic snakes include the checkered keelbaek (*Xenochrophis piscator*) and the smooth water snake (*Enhydryn enhydryn*). The common lizards found within the study area comprise the common skink (*Mabuya carinata*) and the garden lizard (*Calotes versicolor*).

Among other species that once were common but now are only occasionally seen are the monitor lizards (*Varanus bengalensis* and *V. flavescens*). These species prefer a habitat with or near water.

Common water birds were seen in the study area including Indian Pond Heron (*Ardeola grayii*), Common kingfisher (*Alcedo atthis*), Little Egret (*Egretta garzetta*), Indian Cormorant (*Phalacrocorax fuscicollis*) etc. Aquatic and water-dependent birds have been severely affected by habitat alteration. Wetland degradation has left virtually no sheltered place for waterfowl to roost or nest. Herons, egrets, bitterns and ducks have been intensely affected by habitat alteration.

The freshwater dolphin (*Platanista gangetica*) are seen rarely in the Meghna during the monsoon season.

**Table 5.3.-2: Common Fish Species in Meghna River and Surrounding Water Bodies**

Sl.	Local name	Common name	Scientific name
1.	Bata	Bata labeo	<i>Labeo bata</i>
2.	Rui	Rohu	<i>Labeo rohita</i>
3.	Mola	Pale carplet	<i>Amblypharyngodon mola</i>
4.	Chital	Humped featherback	<i>Chitala chitala</i>
5.	Bagair	Gangetic goonch	<i>Bagarius bagarius</i>
6.	Koi	Climbing perch	<i>Anabas testudineus</i>
7.	Catla	Catla	<i>Catla catla</i>
8.	Taki	Spotted snakehead	<i>Channa punctata</i>
9.	Shol	Striped snakehead	<i>Channa striata</i>
10.	Gutia	Guntea loach	<i>Lepidocephalus guntea</i>
11.	Mirka	Mrigal	<i>Cirrhinus cirrhosus</i>
12.	Magur	Walking catfish	<i>Clarias batrachus</i>
13.	Ghaura	Garua Bachcha	<i>Clupisoma garua</i>
14.	Kachki	Ganges river sprat	<i>Corica soborna</i>
15.	Tara baim	Striped spinyeel	<i>Macrognathus aculeatus</i>
16.	Sal baim	Tire-track spinyeel	<i>Mastacembleus armatus</i>
17.	Bele	Tank goby	<i>Glossogobius giuris</i>
18.	Chapila	Indian river shad	<i>Gudusia chapra</i>
19.	Golsa-tengra	Menoda catfish	<i>Hemibagrus menoda</i>
20.	Shing	Stinging catfish	<i>Heteropneustes fossilis</i>

21.	Ek Thuita	Congaturi halfbeak	<i>Hyporhamphus limbatus</i>
22.	Tengra	Day's mystus	<i>Mystus bleekeri</i>
23.	Punti	Spot-fin swamp barb	<i>Puntius sophore</i>
24.	Khalla	Corsula mullet	<i>Rhinomugil corsula</i>
25.	Ayre	Long-whiskered catfish	<i>Sperata aor</i>
26.	Ilish	Hilsa	<i>Tenulosa ilisha</i>
27.	Boal	Wallago	<i>Wallago attu</i>

## 5.4 SOCIO-ECONOMIC ENVIRONMENT

The socio-economic baseline environment of the study area was captured to have a picture of the current situation to allow comparison with that of any potential impact associated with the proposed project. The study included an assessment of the baseline condition of the local stakeholders including the local community, governmental organizations, and community development agencies such as NGO/Self Help Groups etc amongst other as well as taking into account their perceptions on the impacts and benefits from this existing power plant.

### 5.4.1 APPROACH AND METHODOLOGY

The approach and methodology adopted for the socio-economic baseline assessment relied on readily available secondary information and primary information collected through consultations with a range of stakeholders for the project as well as sample socio-economic survey of households within the study area of influence. The key activities that were carried out for primary and secondary data collection are summarized as follows:

- **Desk-Based Review** of available project documentation and profile of the project site;
- **Reconnaissance to the Site** to visually observe the social setting in and around 2 km of the area;
- **Secondary Information** is used from the Bureau of Statistic data for 2 km study area.
- **Consultations with the Various Stakeholders** ranging from governmental institutions, local administration (municipality & village administration), local community, land losers, project proponent and NGOs amongst others
- **Socio-Economic Survey** of the key settlements within close proximity of the existing power plant. The survey was conducted for 52 households and data was collected based on a pre-developed questionnaire to ascertain general socio-economic indicators of the area;

### 5.4.2 DEMARCATION OF THE PROJECT AREA FOR SOCIO-ECONOMIC STUDY

From the social perspective, considering that the 2 km radius might entail a very large for primary socio-economic landscape, which may not be entirely relevant from the point of studying the social impact for this power plant, the administrative boundaries of the unions, villages and settlements that lie in the immediate vicinity of the plant site and adjacent rural

settlement have been taken for primary socio-economic survey of the study area. The adjacent settlement is Char Chartala village under Char Chartala union.

#### **5.4.3 SITE VISIT AND RECONNAISSANCE**

The site visit was conducted by a team comprising of two social specialists from EQMS. The entire site visit was conducted in September, 2014. The socio economic survey as well as the stakeholder consultations was concluded during this period.

#### **5.4.4 STAKEHOLDER CONSULTATIONS**

The team consulted with a diverse range of stakeholders associated with the project. These included governmental agencies and departments, local administration, NGO, as well as the community. Furthermore, in order to assess the community and household level impacts, a socio-economic survey for a sample household size of 52 within the close settlement of the existing power plant was undertaken. This survey helped establish the baseline conditions of the community living in the vicinity of the project footprint and their opinions, expectation and apprehensions about the existing power plant. The analyses of this data and the inferences drawn have been provided in the following sections.

#### **5.4.5 DOCUMENTATION COLLECTION AND REVIEW**

During the field assessment and stakeholder meetings, documents of relevance to this study were collected and data from the same was utilized in developing this social baseline. The following is a list of documents that were collected and reviewed during this site assessment.

- Bangladesh population Census for 2011 for Brahmanbaria, kishoganj and Narshigdi District
- Agricultural Census Data 2013, Char Chartala union of Ashuganj Upazila, Brahmanbaria
- Fisheries data of Ashuganj Upazila.

#### **5.4.6 SOCIO-ECONOMIC BASELINE PROFILE**

##### **5.4.6.1 ADMINISTRATIVE PROFILE OF BRAHMABARIA**

Brahmanbaria is a district in east-central of Bangladesh and it is a part of the Chittagong division. Total area of Sylhet District is 1,927.1 km<sup>2</sup> and total population is 2,840,498. Population density of Sylhet district is 1500 per km<sup>2</sup>. The Midland Power plant is located at Char Chartala union of Ashuganj upazila under Brahmanbaria district. The plant is located approximately 23.8 km far from district headquarter and 2.4 km from Dhaka-Sylhet national highway.

##### **5.4.6.2 DEMOGRAPHY OF PROJECT AREA**

In accordance to the Census of Bangladesh (2011), the total population of the project study area is 229739. In Char Chartala (where the project site is located), Ashuganj, Araishidha, Bhairab Paurashava, Musapur the total population is 25789, 35110, 20727, 118992, 29121 respectively and average population density is the project study area is 3084 persons per sq km. In comparison, the density of population of complete Ashuganj upazila is approximately 2673 persons per sq km. Ashuganj Upazila consists of 8 Unions, 30 Mauzas and 41 villages. **Table 5.4-1** provides a snapshot of the key demographic indicators of the key unions within the project study area for 2 km study area.

**Table 5.4-1: Demographic Profile of the Project Study Area**

Upazila	Union	Total Population	Total Household	Average Household Size	Sex Ratio	Literacy (%)
Ashuganj	Char Chartala**	25789	5033	5.1	105	55
	Ashuganj	35110	6816	5.1	99	49.4
	Araisidha	20727	3715	5.5	93	54.2
Bhairab	Bhairab Paurashava	118992	24057	4.9	103	53.6
Roypura	Musapur	29121	5807	5	95	47.9
<b>Project Study Area</b>		<b>229739</b>	<b>45428</b>	<b>5.1</b>	<b>99</b>	<b>52.0</b>
<b>Ashuganj Upazila</b>		<b>180654</b>	<b>33552</b>	<b>5.4</b>	<b>96</b>	<b>51.2</b>
<b>Bhairab Upazila</b>		<b>298309</b>	<b>58940</b>	<b>5</b>	<b>97</b>	<b>42.7</b>
<b>Roypura Upazila</b>		<b>535796</b>	<b>110520</b>	<b>4.8</b>	<b>94</b>	<b>40.5</b>

Source: Population and Housing Census, 2011, Bangladesh Bureau of Statistics (BBS)\*\* Project site is located in this union

#### 5.4.6.3 GENDER RATIO

The average household size in the project study area, Ashuganj, Bhairab and Roypur upazila are 5.1, 5.4, 5.0 and 4.8. The Gender ratio in the project study area is 99 as against 96, 97 and 94 for Ashuganj, Bhairab and Roypur upazila respectively. The lowest gender ratio recorded within the study area is in Char Cahrtala union at 105 whereas the highest is in Araishidha at 113.

#### 5.4.6.4 EDUCATION & LITERACY

According to the Census of Bangladesh (2011), the literacy rate in the project study area is only 52.0%. In comparison, literacy rates in Ashuganj, Bhairab and Roypura Upazilas are also moderate with only 51.2%, 42.7% and 40.5% of the population classified as literate respectively. The literacy rate was found to be lower in the rural areas as compared to the urban settlements where it was observed to be comparatively greater. The low literacy can be attributed to low availability of educational infrastructure in the district, lack of accessibility, as well as use of traditional and archaic means of education practices.



#### **5.4.6.5 SOCIAL CLASSIFICATION**

As per the 2011 census, the population of the project study area primarily consists of Muslims constituting almost 97.8% of the total population. The remaining 2.8% is primarily constituted by Hindus with Christians, Buddhists and others comprising an insignificant percentage. In the project area, the population primarily consists of Muslims with majority of the same from the Sunnisect. The following **Table 5.4-2** indicates the various religious profile of the project study area.

Table 5.4-2: Religion Profile of the Project Study Area

Upazila	Union	Total Population	Muslim		Hindu		Christian		Buddhist		Others	
			Pop.	%	Pop.	%	Pop.	%	Pop.	%	Pop.	%
Ashuganj	Char Chartala	25789	25370	98.4	403	1.6	10	0.039	6	0.023	0	0
	Ashuganj	35110	32415	92.3	2689	7.7	6	0.017	0	0	0	0
	Araisidha	20727	20431	98.6	296	1.4	0	0	0	0	0	0
Bhairab	Bhairab Paurashava	118992	110875	93.2	8082	6.8	30	0.025	4	0.003	1	0.0008
Royapura	Musapur	29121	28494	97.8	627	2.2	0	0	0	0	0	0
<b>Project Study Area</b>		<b>229739</b>	<b>217585</b>	<b>94.7</b>	<b>12097</b>	<b>5.3</b>	<b>46</b>	<b>0.020</b>	<b>10</b>	<b>0.004</b>	<b>1</b>	<b>0.0004</b>
<b>Ashuganj Upazila</b>		<b>180654</b>	<b>172249</b>	<b>95.3</b>	<b>8336</b>	<b>4.6</b>	<b>18</b>	<b>0.010</b>	<b>12</b>	<b>0.007</b>	<b>39</b>	<b>0.0216</b>
<b>Bhairab Upazila</b>		<b>298309</b>	<b>286457</b>	<b>96.0</b>	<b>11815</b>	<b>4.0</b>	<b>32</b>	<b>0.011</b>	<b>4</b>	<b>0.001</b>	<b>1</b>	<b>0.0003</b>
<b>Royapura Upazila</b>		<b>535796</b>	<b>515579</b>	<b>96.2</b>	<b>20199</b>	<b>3.8</b>	<b>10</b>	<b>0.002</b>	<b>2</b>	<b>0.000</b>	<b>6</b>	<b>0.0011</b>

Source: Population and Housing Census, 2011, Bangladesh Bureau of Statistics (BBS)\*\* Project site is located in this union

#### **5.4.6.6 VULNERABILITY CLASSIFICATION**

Vulnerability in the project study area has been defined in the context of socioeconomic status of both individual groups as well as household groups. These include women; old, physically handicapped and destitute people at the individual level and houses headed by women, the physically handicapped, and those below the poverty line. Amongst various categories of vulnerable identified for the project, physically challenged, women and old aged are at the highest risk.

#### **5.4.6.7 Employment Profile**

In accordance to the Census of Bangladesh (2011), service is the dominant source of employment and household income in the study area. The situation is similar at Ashuganj, Bhairab upazila whereas in Roypura upazila of Narsindi district agriculture is the dominant source of income. In the project study area with a few percentage of the population involved in agricultural practices including direct farming, sharecropping, agricultural labourers etc.

With respect to employment profile specifically for the project study area, the following **Table 5.4-3** provides the key occupation practices.

Table 5.4-3: Employment Status by field of Activity in the Project Study Area

District	Upazila	Field of Activity													
		Total Population		Agriculture				Industry				Service			
				Male		Female		Male		Female		Male		Female	
		Male	Female	Pop.	%	Pop.	%	Pop.	%	Pop.	%	Pop.	%	Pop.	%
Ashuganj	Char Chartala**	13192	12597	520	3.94	202	1.60	150	1.14	9	0.07	1346	10.20	299	2.37
	Ashuganj	35110	17435	792	2.26	17	0.10	1166	3.32	455	2.61	1246	3.55	346	1.98
	Araisidha	9987	10740	591	5.92	6	0.06	299	2.99	141	1.31	908	9.09	39	0.36
Bhairab	Bhairab Paurashava	60284	58708	1429	2.37	87	0.15	1859	3.08	315	0.54	6830	11.33	1063	1.81
Raipura	Musapur	14197	14924	967	6.81	37	0.25	327	2.30	107	0.72	1471	10.36	103	0.69
<b>Project Study Area</b>		<b>132770</b>	<b>114404</b>	<b>4299</b>	<b>3.24</b>	<b>349</b>	<b>0.31</b>	<b>3801</b>	<b>2.86</b>	<b>1027</b>	<b>0.90</b>	<b>11801</b>	<b>8.89</b>	<b>1850</b>	<b>1.62</b>
<b>Ashuganj Upazila</b>		<b>88340</b>	<b>92314</b>	<b>5704</b>	<b>6.46</b>	<b>291</b>	<b>0.32</b>	<b>2852</b>	<b>3.23</b>	<b>1163</b>	<b>1.26</b>	<b>7193</b>	<b>8.14</b>	<b>1304</b>	<b>1.41</b>
<b>Bhairab Upazila</b>		<b>146929</b>	<b>151380</b>	<b>11184</b>	<b>7.61</b>	<b>452</b>	<b>0.30</b>	<b>5515</b>	<b>3.75</b>	<b>484</b>	<b>0.32</b>	<b>12860</b>	<b>8.75</b>	<b>1588</b>	<b>1.05</b>
<b>Roypura Upazila</b>		<b>258993</b>	<b>276803</b>	<b>39191</b>	<b>15.13</b>	<b>914</b>	<b>0.33</b>	<b>4456</b>	<b>1.72</b>	<b>461</b>	<b>0.17</b>	<b>17154</b>	<b>6.62</b>	<b>1753</b>	<b>0.63</b>

Source: Population and Housing Census, 2011, Bangladesh Bureau of Statistics (BBS)\*\* Project site is located in this union

#### 5.4.6.8 LOCAL ECONOMY

##### *Agriculture*

Brahmanbaria's economy is primarily agrarian economy as well industrial with significant revenue to its GDP coming from agriculture, industrial and agro based industries. **Table 5.4-4** provides a snapshot of agricultural production of some of the key crops in Char Chartala union of Ashuganj Upazil.

**Table 5.4-4: Production of Key Crops in Char Chartala union of Ashuganj Upazila as per 2012-13 statistics**

Sl.	Crop name	2012-13	
		Cultivated land (Hectare)	Production (Ton/hector)
1.	Boro	200	3.75
2.	Tomato	10	10
3.	Brinjal	8	12
4.	Sweet Potato	80	6
5.	Mustard	40	1.2
6.	Nut	10	2
7.	Chili	5	1.5

Source: Agricultural Department, Ashuganj Upazila

It can be observed from the above table that Rice, and Vegetables contribute to the majority of the total crop output. Rice especially is cultivated both for self-consumption as well as export to other places in Bangladesh.

##### *Local Economy: Fisheries & Aquaculture*

Fishing is a common livelihood practice around the project study area. In Ashuganj upazila remarkable percentage people involve in fisheries activities in the Meghna River. According to the Upazila fisheries officer, there is 1823 registered and approximately 1000 non registered fisherman live in the Ashuganj upazila whereas 586 fisherman in lalpur union.

##### *Livestock & Poultry*

Rearing of livestock and poultry is also an alternative occupation in Ashuganj. It is mostly a sub-practice carried out in conjunction with farming activities and one of the key sectors that includes participation from women and children. The types of livestock reared include Cow, cattle, buffalo, goats, sheep, fowl, and ducks amongst others. The livestock is reared primarily for milk and meat for self-consumption as well as retail and export.

#### 5.4.6.9 ACCESS TO INFRASTRUCTURE

##### *Electricity*

Electricity is a key issue within the project study area and also an overall concern in Brahmanbaria district with about 71.3% of the district electrified whereas the project study

area cover 75.5%. The following **Table 5.4-5** indicates the availability of electricity connection and source of drinking water facility of the project study area.

#### Source of Drinking Water

The primary source of drinking water throughout the district and Ashuganj upazila is deep tube well. As per the 2011 census, in Ashuganj, Bhairab & Roypura upazila respectively 90.5, 94.7 and 97.2 of the populations were dependant on tube well for meeting their water requirements. As per the census, it was estimated that 98.2% of the population in study area have access to safe drinking water while the remaining are exposed to other water sources.

**Table 5.4-5: Sources of Drinking Water and Electricity Facility of the Project Area**

Upazila	Union	Total Households	Source of Drinking Water (%)			Electricity Connection (%)
			Tap	Tube-well	Other	
Ashuganj	Char Chartala**	5033	33.4	64.7	1.8	98.4
	Ashuganj	6816	12.9	85.2	1.9	92.8
	Arisidha	3715	1.1	98.4	0.5	96
Bhairab	Bhairab Paurashava	24075	7.5	91.8	0.7	97
Raipura	Musapur	5807	0.3	98.8	0.9	83.3
<b>Project Study Area</b>		<b>45446</b>	<b>11.0</b>	<b>87.8</b>	<b>1.2</b>	<b>93.5</b>
<b>Ashuganj Upazila</b>		<b>33552</b>	<b>8</b>	<b>90.5</b>	<b>1.5</b>	<b>91.2</b>
<b>Bhairab Upazila</b>		<b>58940</b>	<b>3.2</b>	<b>94.7</b>	<b>2.1</b>	<b>86</b>
<b>Roypura Upazila</b>		<b>110520</b>	<b>0.2</b>	<b>97.2</b>	<b>2.6</b>	<b>56.4</b>

Source: Population and Housing Census, 2011, Bangladesh Bureau of Statistics (BBS)\*\* Project site is located in this union

#### Sanitation

With respect to the sanitation facilities in the project study area, about 37.2% of the total dwellings have sanitary (water sealed) and 46.7% (non water sealed) latrines. Almost 13.0% percent have non sanitary latrines or Kuchcha toilets and remaining 7.4% is dependent on open defecation. The key factors impeding better sanitation practices are primarily poverty, lack of drainage systems and traditional practices used for generations. The following **Table 5.4-6** shows the toilet facility in the project area.

**Table 5.4-6: Sanitation Facility of the Project Study Area**

Upazila	Union	Total Households	Type of Toilet Facility (%)			
			Sanitary (water-sealed)	Sanitary (non water-sealed)	Non-sanitary	None
Ashuganj	Char Chartala**	5033	29.5	64.8	3.9	1.8
	Ashuganj	6816	48.9	40.6	8.5	1.9
	Arisidha	3715	48.2	46.5	4.7	0.6
Bhairab	Bhairab Paurashava	24075	38.7	37.9	19.7	3.8
Raipura	Musapur	5807	20.8	43.8	28	7.4
<b>Project Study Area</b>		<b>45446</b>	<b>37.2</b>	<b>46.7</b>	<b>13.0</b>	<b>3.1</b>
<b>Ashuganj Upazila</b>		<b>33552</b>	<b>35.1</b>	<b>55.2</b>	<b>7.8</b>	<b>1.9</b>
<b>Bhairab Upazila</b>		<b>58940</b>	<b>20.4</b>	<b>34.6</b>	<b>37.4</b>	<b>7.6</b>

Upazila	Union	Total Households	Type of Toilet Facility (%)			
			Sanitary (water-sealed)	Sanitary (non water-sealed)	Non-sanitary	None
Royapura Upazila		110520	20.4	38.2	30.1	11.3

*Source: Population and Housing Census, 2011, Bangladesh Bureau of Statistics (BBS)\*\* Project site is located in this union*

#### 5.4.6.10 CULTURAL HERITAGE

The project study area as such, does not encompass any key cultural heritage or resource of national or regional value. The only cultural resources within the area are local mosques and graveyards.

#### 5.4.7 FINDINGS OF SOCIO-ECONOMIC SURVEY

The baseline assessment also comprised a socio-economic survey which was conducted in the closest rural settlement of the existing Midland power plant and data collected from randomly selected 52 household in order to gain first hand information about the key household level socio-economic indicators.

The socio-economic data was collected on the following main indicators:

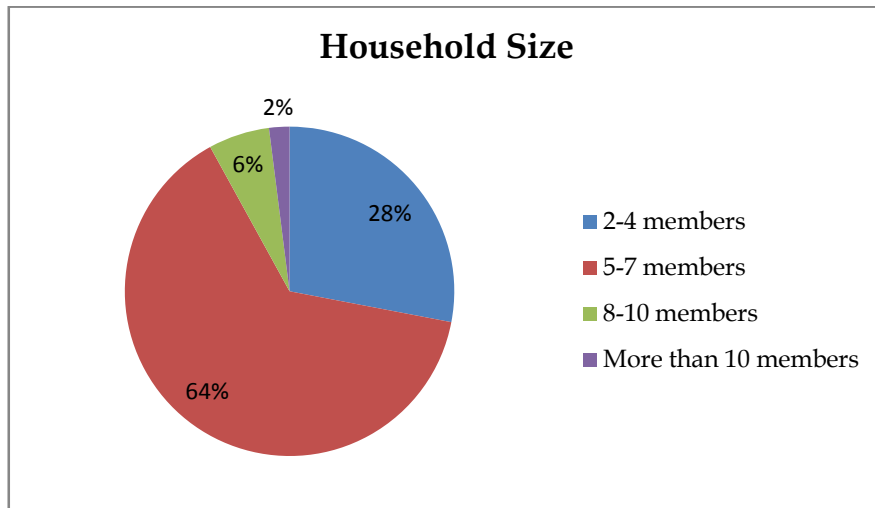
- Demographic Trends
- Access to Public Amenities and Infrastructure
- Access to Utilities and Resources
- Asset ownership
- HH Expenditure & Loan and Debt
- Participation of Women
- Overall awareness and opinion about the project

The following sections provide results from the analysis of the data collected as per the above indicators.

#### 5.4.7.1 DEMOGRAPHIC TRENDS

##### *Household Size*

According to the survey data, the majority of the households in the study area have more than 5 members. A significant percentage (64%) has 5-7 members followed by (28%) households having 2-4 members. Only about 6% of the total sample constituted of households having below 8-10 members and 2% have more than 10 members. **Figure 5.4-1** shows the household size of the study area.



Source: Socio-economic Survey by EQMS (September, 2014)

**Figure 5.4-1: Average Household Size in the study area**

### *Population*

There are 284 peoples living in 52 households in the area giving an average of 5.5 persons per household.

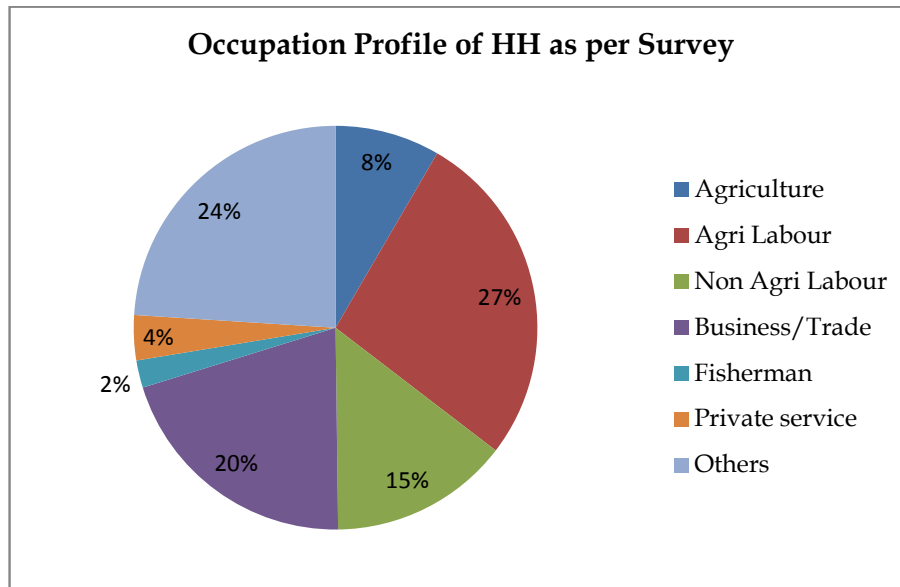
### *Population age and sex distribution*

According to the survey data, the majority of the households in the project area have average population age 25 years. There are 43% women and 57% men.

### **5.4.7.2 OCCUPATIONAL PROFILE**

As per the survey data it can be observed that almost 27% of the respondents are involved in agricultural labour followed by business (20%), Non Agricultural labour (14%) Agricultural activity (9%), Private Service (4%) and Fisherman (2%) in the study area. 24% are doing other activities including rickshaw-puller, construction worker, driver etc. It can also be observed that majority of the women respondents are housewives or involved in household activities. **Figure 5.4-2** showing the occupational profile of the study area.



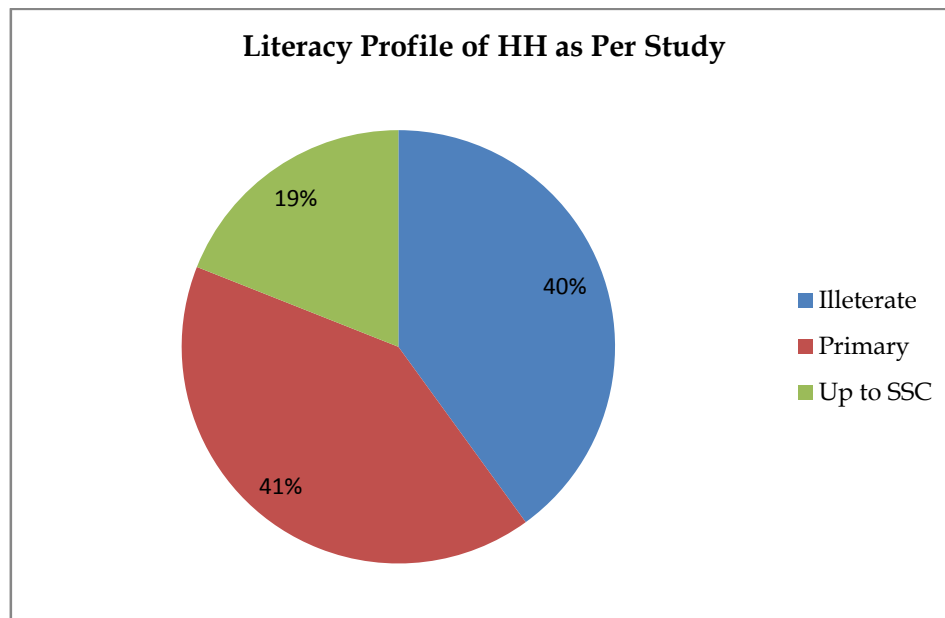


*Source: Socio-economic Survey by EQMS (September, 2014)*

**Figure 5.4-2: Occupation Profile of the Project Area**

#### **5.4.7.3 EDUCATION & LITERACY**

In terms of education and literacy amongst the sample, majority of the respondents were found to be primary level almost 41% and a significant proportion has illiterate almost 40%. Also secondary 19% of the total sample. **Figure 5.4-3** shows the education and literacy of the study area.



*Source: Socio-economic Survey by EQMS (September, 2014)*

**Figure 5.4-3: Education and Literacy of the Study Area**

#### 5.4.7.4 ACCESS TO UTILITIES & RESOURCES

##### *Property of household*

In the Surveyed area, category of land ownership namely Private and Government property are available and recognized. In the present survey, data on household land ownership by category and by type of land were collected to sketch the land ownership scenario for the Villages. The whole land ownership scenario in Surveyed area has been sketched by drawing two different scenarios with Scenario-I land owner, scenario-II is household renter. Conservative estimation considering private Property is 85%, Government Property 15%. Almost these property households have been conveying Ownership about 71% property owners, 8% giving house hold rent, 15% squatter and 6% sharecropper.

##### *Sanitation Facilities*

It can be observed from the below Figure that some of the households or approximately 58% in the project study area pit latrine and 42% sanitation latrine facilities. Moreover, proper sanitation facilities almost 70% mostly observed in the middle and upper middle class sections of the society.

##### *Source of Fuel for Cooking*

Households in the study area use fuel for cooking purposes from different sources including Firewood, crop residue, Kerosene, Cylinder gas, Biogas etc. Almost 32% Source of Fuel has bought from market and 68% collected from nearby sources.

##### *Access to resources*

Among the surveyed HH within the project study area, certain questions were asked with respect to access to key resources such as water sources, grazing land, hospital and markets. All surveyed households reported to have immediate access to resources way within a distance as reported in the following **Table 5.4-7**.

**Table 5.4-7: Access to Resources in Study Area**

Access to Resources	Less than 1 km	1-3 km	>3 km	Total HH
Main Market	-	52	-	52
Medicine/Hospital	-	52	-	52
Masjid/Temple	52	-	-	52
Grazing land	52			52
Surface water sources	52			52

#### **5.4.7.5 ASSET OWNERSHIP**

##### *Land Ownership*

The survey has revealed that about 85% own homestead and 8% own agricultural irrigated land.

##### *House Type*

Majority of the houses in the sample area surveyed are Kuccha and made of locally resourced materials such as mud, straws, Asbestos and burnt bricks. In the study area there are 34% are earthen floor with tin wall and tin roof, 60% are Brick floor with tin wall and tin roof and rest of are built in concrete.

##### *Household Income*

The main sources of income of the surveyed area are agriculture and livestock, agriculture labour, fisheries, non-agriculture labour, industry, business, hawker, transport, construction, service, rent remittance, and others. The income-earner in the HH on average 26% earns below 5000Tk per month. Almost 44% earns 6000-10000 Tk per months. 22% earns 11000-15000 Tk per month. Only 8% households earns 15000Tk above which have been helping their solvency.

##### *Domestic Animals*

The percentage of households possessing domestic animals is observed to be moderate in the study area with more than 75% not owning any form of domestic animals. However within the remaining 25% most of the HH owned or reared cows, goats, hens and ducks.

#### **5.4.7.6 HOUSEHOLD EXPENDITURE**

It can be observed from the survey that the majority of the expenditure is attributed to food and consumable resources with almost half of the monthly income being allocated for the same. Other significant expenditures include clothing, education and healthcare, transportation and Fuel.

#### **5.4.7.7 OVERALL PERCEPTION ABOUT THE EXISTING POWER PLANT**

Majority of the respondents have a positive perception about the power plant. They express their opinion that the power plant is a national asset and support to meet our electricity demand. Only who lives in adjacent to the power plant provide their opinion regarding the noise level and odor problem those mostly comes from other industry located near to the settlement and they inform that noise level from the power plant is tolerable. Positive expectations of the surveyed household are primarily with respect to overall development in the area, improved road facilities and employment opportunity for the local people.

## **CHAPTER6: ANTICIPATED ENVIRONMENTAL IMPACT AND MITIGATION MEASURES**

### **6.1 INTRODUCTION**

This section analyses the potential environmental and social impacts due to the Project. The Project activities will occur in two distinct stages of the Project life cycle:

- (a) Construction of the Plant (Construction Phase) and
- (b) Operation and maintenance of the Plant (Operation Phase).

However, some of the social impacts are linked to the pre-construction phase of the project. The Project does not envisage any major environmental impact in the pre-construction phase. However, there are social impacts associated with the planning and pre construction phase due to land acquisition (with no physical displacement involved). The same have been discussed in **Section 6.1.10** along with other social impacts.

Note: Environmental and social impacts during decommissioning of the Plant have not been considered in the impact assessment, as these will depend on the options available at the time of expiry of the power purchase agreement between MPCL and BPDB. If the Power Purchase Agreement, Land Lease Agreement, Gas Supply Agreement and the other relevant agreements are not extended or renewed and an alternative economical fuel is available, the power plant may be retrofitted to support alternative power generation. This option would be possible, provided that the required retrofits and new emission rates meet the applicable standards and guidelines. If retrofitting is not a feasible option, and the operational life of the Power Plant expires, the power plant will be decommissioned according to the requirements of the authorities at that time.

### **6.2 CONSTRUCTION PHASE**

The major activities during the construction phase of the 51 MW gas fired power plant may be broadly classified into the following: (i) mobilization of equipment, materials and personnel; (ii) site preparation; and (iii) civil construction and electromechanical installation/erection.

Some of these project activities would likely to have some adverse impacts on certain environmental parameters, while some other would have beneficial effects. In this study, the effects of the project activities on physico-chemical, ecological and socio-economic (i.e. human interest related) parameters have been assessed separately.

#### **6.2.1 ECOLOGICAL IMPACTS**

Construction of gas fired power plant would have some potential impacts (direct and indirect) on the existing ecological environment. Activities such as land clearing and alteration, movement of people and vehicle, material placement, excavation, accident, etc.

have direct or indirect impacts on the existing ecological environment. During construction phase, small scale impacts could be identified by studying or monitoring the associated flora and fauna. Large scale impact, if any, could be identified after completion of the proposed project through careful long-term study and monitoring. In this study, at first possible general impacts of project activities on 3F (flora, fauna and fish) have been assessed, which has been followed by more specific evaluation of ecological impacts and risk assessment.

#### **6.2.1.1 IMPACT ON FLORA**

Construction of power plant has potential impacts (direct and indirect) on the existing aquatic and terrestrial flora. Within the project sites, magnitude/intensity of these impacts may vary from place to place, and some could easily be identified, while others require long-term study/monitoring. However, general impacts on project works on flora are briefly described below.

##### **Aquatic Flora**

The proposed Gas Fired Power Plant project site has aquatic habitat which supports few common aquatic floral species and none of them are threatened in Bangladesh. All aquatic floral species are grown in the wild within the proposed project site. Due to proposed project activities, all aquatic flora inside the proposed project would be adversely affected. People, vehicle and material movement over the aquatic floral habitat may cause damage or may uproot from the ground.

##### **Terrestrial Flora**

The proposed project site has terrestrial habitat which supports diversified terrestrial floral species, and none of them are threatened in Bangladesh. During site preparation, some naturally grown floral species (herb and shrub) would have to be cleared; but cutting or clearing of trees would not be required, as there are not “trees” within the project site. These herbs and shrubs within the project site are used by certain adaptive wildlife as habitat for certain time, and therefore, removal of these would have some potential impact. Terrestrial undergrowth has great contribution to the existing ecosystem, and clearing or removal of the undergrowth would also have some adverse impacts.

#### **6.2.1.2 IMPACT ON FAUNA INCLUDING FISH**

Construction of the power plant could have some adverse impacts (direct and indirect) on the existing aquatic and terrestrial fauna due to their highly sensitive and reactive behavior for disturbance that may occur at or near their habitat. Faunal species that are sensitive to direct (human activity and traffic) or indirect disturbance (noise) would be impacted most. Habitat disturbance would reduce habitat availability and effectiveness for a certain period for mammals, reptiles, amphibians, birds and their predators. There are also some possibilities of direct mortality and displacement of amphibians, reptiles, birds and mammals from the use of vehicle or machineries over terrestrial or aquatic faunal habitats. Quantification of these losses is difficult; however, the impact is expected to be low and

short-term in nature. Actions near fish habitats may also have some potential impact on fish fauna e.g., mortality, contamination of water, etc. However, fish habitat (i.e., the river) is not likely to be affected significantly during the construction phase of the project.

### **Amphibians**

Few common amphibian species are available at or near the proposed project site and none of them are nationally threatened. Amphibians are more sensitive to the environmental changes due to their permeable skin and other biological features. Amphibians use both aquatic and terrestrial habitat for their survival and changes of those habitats have a great impacts for their survival. The proposed project activities could have some impacts on existing amphibians such as (i) undergrowth or vegetation may be cleared for construction works, (ii) project vehicle and materials may enter into the shallow / deep freshwater bodies or saturated ground, (iii) increased contamination of water due to various actions related to project, etc. These impacts may cause temporary or permanent disturbance of amphibian habitat. Impacts on amphibian population could be evaluated by monitoring the changes of species composition and richness and their relative abundance.

### **Reptiles**

Few common reptilian species are available at or near the proposed project site and none of them are nationally threatened. One reptile was identified in the study area but not from within the project site. Reptiles are sensitive animal and sometimes used as indicative species for bio-environmental assessment. Burrowing reptiles are bio-sensitive and respond quickly to any man-made or natural activities/calamities. If the project activities are conducted during pre or post breeding season of the burrowing reptiles, the entire community could be affected seriously or their life cycle could be jeopardized.

### **Birds**

Some avian species are available at or near the proposed project site and none of them are nationally threatened. Most birds have adaptive capability by which they can survive in altered environment. Potential impacts are disturbance due to project related actions and excessive human presence during bird's foraging, resting and nesting time that might result in reproductive disturbance/failure. Removal of floral (tree, herb and shrub) species for proposed project would affect some bird habitat from where they collect food (insects), take rest and also build nests. Potential impacts for those bird species are (i) habitat destruction, (ii) temporary displacement due to increased human disturbance and vehicle movement, and (iii) nest abandonment and/or reproductive failure caused by project related disturbance.

### **Mammals**

Few common mammalian species are available at or near the proposed project site and none of them are nationally threatened. One aquatic mammal was identified as threatened from the study area, but not from the proposed project site. Some mammalian species may be

disturbed and displaced from portions of the project sites for some hours, days or months due to the project activities. They are likely to return to their habitat soon after the disturbance has ceased. Project activities, e.g., movement of vehicle and people could displace potential prey species for some mammal within the project area. However, the effects are expected to be temporary, incidental and minimal.

### *Fish*

The stretch of the river Meghna provides a habitat for a wide variety of fishes and shellfish species and none of them are nationally threatened. A few ponds that remain almost dry in the summer season in this area are used for natural cultivation of seasonal fresh water fishing. Therefore, potential impact seems to be restricted only in the river of the proposed project site. These fishes may encounter some potential impacts from the proposed project activities such as mortality, soil /sand deposit to fish habitat, water drawn from shallow fish habitat etc. Monitoring of native fish species composition change and their richness/relative abundance could be an indicative tool to evaluate project impacts.

#### **6.2.1.3 EVALUATION OF ECOLOGICAL IMPACT**

Significant potential impacts would require alternative and/or additional mitigation measures above and beyond those already incorporated in the base design for the project / activity. The significance of an impact is determined by:

- Ecological consequence of the activity
- Likelihood of occurrence of the activity and
- Calculating the product of these two parameters.

Consequence and likelihood of ecological impacts resulting from planned activities are discussed below. Changes in the planned activities for the proposed project would affect both the impact assessment and also the planned mitigation activities.

### *Consequence*

Table 6.2-1 presents the consequence assessment criteria for ecological impact assessment. The level of consequence for each identified impact is determined by examining a number of factors relating to the activity. Each category has a number of parameters as follows:

- Ecological perception of the activity
- Ability of natural environment (ecological fabric and structure) to absorb the impact (i.e. adapt to change) based on its natural dynamics and resiliencies and/or
- Whether or not the activity results in a breach of legislation, regulation or standards to which the project must comply and/or a breach in operator policy.

It should be noted that in assessing an impact, the assigned level of consequence might be different for different consequence criteria. Where this has been found to be the case for this project's proposed activities, a rule has been established that the highest ranking criteria establish the overall consequence ranking for the impact in question.

**Table 6.2-1 Categories and definition of consequence levels for ecological impacts**

Category	Ranking	Definition
Critical	5	<ul style="list-style-type: none"> <li>• Very serious environmental effects with impairment of ecosystem function.</li> <li>• Long-term, widespread effects on significant environment (e.g. unique habitat, national park)</li> <li>• Habitat restitution time &gt;100 years and requiring extreme substantial intervention.</li> </ul>
Major	4	<ul style="list-style-type: none"> <li>• Serious environmental effects with some impairment of ecosystem function (e.g. displacement of species).</li> <li>• Relative widespread medium-long term impacts.</li> <li>• Habitat restitution time &gt;10 years and requiring substantial intervention.</li> <li>• Potential for continuous non-compliance with environmental regulations and/or company policy.</li> </ul>
Moderate	3	<ul style="list-style-type: none"> <li>• Moderate effects on biological environment but not affecting ecosystem function.</li> <li>• Moderate short-medium term widespread impacts</li> <li>• Habitat restitution time 1-5 years (possible limited and local areas up to 10years) with potential for full recovery and limited or no intervention required.</li> <li>• Potential for short to medium term noncompliance with environmental regulations and/or company policy.</li> </ul>
Minor	2	<ul style="list-style-type: none"> <li>• Minor effects on biological environment.</li> <li>• Minor short-medium term damage to small area of limited significant</li> <li>• Full recovery in &lt; 1 year without intervention required.</li> <li>• Any potential non-compliance with environmental regulations and/or company policy would be minor and short-term.</li> </ul>
Low	1	<ul style="list-style-type: none"> <li>• No lasting effect.</li> <li>• Low-level impacts on biological environment.</li> <li>• Limited damage to minimal area of low significant.</li> <li>• Compliance with environmental regulations and/or company policy at all times.</li> <li>• Possible beneficial effect or ecosystem improvement.</li> </ul>
None	0	<ul style="list-style-type: none"> <li>• No impact on ecosystem damage.</li> <li>• No compliance required for environmental regulations and/or company policy at all times.</li> <li>• Possible beneficial effect or ecosystem improvement.</li> </ul>
Limited Positive	+	<ul style="list-style-type: none"> <li>• Some beneficial improvement to ecosystem.</li> <li>• Benefits to specific flora and / or fauna.</li> </ul>
Modest Positive	++	<ul style="list-style-type: none"> <li>• Moderate beneficial improvement to ecosystem.</li> <li>• Medium benefits to specific flora and / or fauna.</li> </ul>
Significant Positive	+++	<ul style="list-style-type: none"> <li>• Major beneficial improvement to ecosystem.</li> <li>• Large scale benefits to specific flora and / fauna.</li> </ul>

### **Likelihood**

The following Table 6.2-2 presents criteria for level of likelihood of the occurrence of an activity. The level of likelihood for each identified impact is determined by estimating the probability of the activity occurring.

**Table 6.2-2 Likelihood of occurrence and rankings natural impacts**

Impact Likelihood	Ranking	Definition Impact	Frequency
Almost Certain (80-100%)	5	The activity will occur under normal operating conditions.	Very Frequent (High frequency of occurrence-occur morethan one per month)
Very Likely (60 - 80%)	4	The activity is very likely to occur under normal operational conditions.	Frequent (Regular frequency. Event likely to occur at least once per year)
Likely	3	The activity is likely to occur at	Occasional



Impact Likelihood	Ranking	Definition Impact	Frequency
(40 - 60%)		some time under normal operating conditions.	(Occurs once every 1 – 10 years)
Unlikely (20 - 40%)	2	The activity is unlikely to but may occur at some time under normal operating conditions.	Few (Unlikely to occur during life of operations – occurs once every 10-100 years)
Very Unlikely (0 - 20%)	1	The activity is very unlikely to occur under normal operating conditions but may occur in exceptional circumstances.	Rare (Highly unlikely to occur during life of the operation. Occurs less than once every 100 years).

### Impact Significance

The significance of ecological impact is determined by calculating the consequence and likelihood of occurrence of the activity, expressed as follows:

$$\text{Significance} = \text{Consequence} \times \text{Likelihood}$$

The above two tables illustrate all possible consequence and likelihood for the different consequences and likelihood categories. The possible significance rankings are presented in the following Table 6.2-3.

**Table 6.2-3** Ecological impact significance rankings

Ranking (Consequence × Likelihood)	Significance
>16	Critical
9-16	High
6-8	Medium
2-5	Low
<2	Negligible

Table 6.2-4 illustrates the risk assessment matrix for the power plant project. Based on the above risk assessment matrix, Table 6.2-5 shows the ecological impact of the proposed power plant project. Table 6.2-5 indicates that most ecological impacts are rated as low. No long-term adverse impacts to the floral and faunal species or their ecosystem are expected.

**Table 6.2-4** Risk assessment matrix

Likelihood/ Frequency	Consequence Severity				
	Low	Minor	Moderate	Major	Critical
Almost certain	High	High	Extreme	Extreme	Extreme
Very Likely	Moderate	High	High	Extreme	Extreme
Likely	Low	Moderate	High	Extreme	Extreme
Unlikely	Low	Low	Moderate	High	Extreme
Very Unlikely	Low	Low	Moderate	High	High

### 6.2.2 PHYSICO-CHEMICAL IMPACTS

The important physico-chemical environmental parameters that are likely to be affected by the project activities during construction phase include water and soil quality, air quality, and noise level. The potential impacts of the project activities on these physico-chemical environmental parameters are described in this Section.

### **6.2.2.1 IMPACT ON WATER QUALITY AND GENERAL ENVIRONMENT**

Waste and wastewater generated during the construction phase of the project include construction debris and wastes, and some other solid wastes (e.g., from labor sheds), human wastes from people working at the project site (e.g., from labor sheds), and some liquid waste from construction processes. These waste/ wastewater could lead to pollution of water and general environment, if not properly disposed.

#### ***Wastewater***

Wastewater, in the form of human wastes, will be generated mainly in the temporary labor sheds. This could be a major source of pollution (including water pollution) if not properly disposed. Use of un-sanitary latrines and improper disposal of human waste would create environmental pollution and adversely affect health and wellbeing of the people at the construction site by increasing the risk of disease transmission. Proper disposal of waste water should therefore be ensured as suggested in Section 6.5. There is also risk of disease transmission from workers from outside who would come to work within the MPP complex.

#### ***Solid waste***

Construction debris and wastes to be generated during the construction phase would includes scrap iron, steel, wooden frames, piping, and other solid wastes. Most of it will be generated toward the end of the construction phase during carrying out of the finishing works, while the site will be cleared of waste materials. The volume of such construction wastes is likely to be significant. Indiscriminate storage and disposal of these construction debris and wastes could create local water logging and ponding by blocking drainage lines and would be aesthetically displeasing. Proper disposal of these wastes, as described in Section 6.5, is therefore necessary.

**Table 6.2-5 Summary of potential ecological impact assessment**

Potential Impacts Source / Project Activities	Impact	Ecological Receptor Type	Description	Likelihood	Consequence	Risk Rating
Site Preparation /clearing for base camp and MPP and associated activities	Floral destruction	Flora	<ul style="list-style-type: none"> <li>• Direct, Negative</li> <li>• Long term, Local</li> <li>• Irreversible</li> </ul>	Likely	Minor	Moderate
	Loss / alteration of faunal habitat	Fauna	<ul style="list-style-type: none"> <li>• Direct, Negative</li> <li>• Short term, Local</li> <li>• Reversible</li> </ul>	Unlikely	Minor	Low
	Increased access for exposed faunal harassment or killing (e.g. snake, rat)	Fauna	<ul style="list-style-type: none"> <li>• Direct, Negative</li> <li>• Short term, Local</li> <li>• Reversible</li> </ul>	Unlikely	Minor	Low
Construction of base camp	Disturbance of soil dwelling fauna (e.g. bee eater, rat)	Fauna	<ul style="list-style-type: none"> <li>• Direct, Negative</li> <li>• Short term, Local</li> <li>• Reversible</li> </ul>	Likely	Minor	Low
MPP construction	Generation of high intensity welding flash and noise	Fauna	<ul style="list-style-type: none"> <li>• Direct, Negative</li> <li>• Short term, Local</li> <li>• Reversible</li> </ul>	Unlikely	Minor	Low
	Contamination of surface soil with used lubricant, if any	Flora and Fauna	<ul style="list-style-type: none"> <li>• Direct, Negative</li> <li>• Short term, Local</li> <li>• Reversible</li> </ul>	Unlikely	Minor	Low
Fencing	Movement disturbance of terrestrial fauna (amphibian, reptile & mammal)	Fauna	<ul style="list-style-type: none"> <li>• Direct, Negative</li> <li>• Short term, Local</li> <li>• Reversible</li> </ul>	Likely	Minor	Low
Material storage or placement	Habitat destruction of terrestrial flora (herb, shrub) and borrowing faunal habitat and Movement disturbance of terrestrial fauna (amphibian, reptile & mammal)	Flora and Fauna	<ul style="list-style-type: none"> <li>• Direct, Negative</li> <li>• Short term, Local</li> <li>• Reversible</li> </ul>	Unlikely	Minor	Low
Vehicle movement	Impairment of terrestrial flora (herb & shrub), terrestrial fauna (amphibian, reptile & mammal)	Flora and Fauna	<ul style="list-style-type: none"> <li>• Direct, Negative</li> <li>• Short term, Local</li> <li>• Reversible</li> </ul>	Likely	Minor	Low
Equipment installation	Habitat destruction of terrestrial flora (herb, shrub) and movement disturbance of terrestrial fauna (amphibian, reptile & mammal)	Flora and Fauna	<ul style="list-style-type: none"> <li>• Direct, Negative</li> <li>• Short term, Local</li> <li>• Reversible</li> </ul>	Unlikely	Minor	Low
Soil excavation	Habitat destruction of terrestrial / aquatic flora (herb, shrub) and Movement disturbance /habitat destruction of terrestrial (burrow) fauna	Flora and Fauna	<ul style="list-style-type: none"> <li>• Direct, Negative</li> <li>• Short term, Local</li> <li>• Reversible</li> </ul>	Unlikely	Minor	Low

Potential Impacts Source / Project Activities	Impact	Ecological Receptor Type	Description	Likelihood	Consequence	Risk Rating
	(amphibian, reptile, bird & mammal)					
Noise disturbance	Disturbance of terrestrial faunal livelihood [movement, foraging, breeding] (amphibian, reptile, bird & mammal)	Fauna	<ul style="list-style-type: none"> <li>• Direct, Negative</li> <li>• Short term, Local</li> <li>• Reversible</li> </ul>	Unlikely	Minor	Low
Water quality	Water contamination due to project related activities (e.g. waste discharge)	Fauna and Fish	<ul style="list-style-type: none"> <li>• Direct, Negative</li> <li>• Short term, Local</li> <li>• Reversible</li> </ul>	Unlikely	Minor	Low
Exhaust from generators	Movement disturbance of terrestrial fauna (e.g. aves)	Fauna	<ul style="list-style-type: none"> <li>• Direct, Negative</li> <li>• Short term, Local</li> <li>• Reversible</li> </ul>	Unlikely	Minor	Low
Spills (oil / Chemical) on land or water	Habitat destruction of flora and fauna	Flora and Fauna	<ul style="list-style-type: none"> <li>• Direct, Negative</li> <li>• Short term, Local</li> <li>• Reversible</li> </ul>	Very Unlikely	Minor	Low
Waste generation: (Solids/liquid/gaseous) (e.g. cement bags, exhaust from cranes/ heavy equipment, domestic waste)	Impairment of the health of terrestrial flora and fauna	Flora and Fauna	<ul style="list-style-type: none"> <li>• Direct, Negative</li> <li>• Short term, Local</li> <li>• Reversible</li> </ul>	Unlikely	Minor	Low
	Nuisance noise, dust, emissions, lighting etc	Flora and Fauna	<ul style="list-style-type: none"> <li>• Direct, Negative</li> <li>• Short term, Local</li> <li>• Reversible</li> </ul>	Unlikely	Minor	Low
	Increased level of disease vectors (mosquitoes, rats, flies, etc)	Flora and Fauna	<ul style="list-style-type: none"> <li>• Direct, Negative</li> <li>• Short term, Local</li> <li>• Reversible</li> </ul>	Unlikely	Minor	Low
	Water and soil contamination due to sewage discharge ( e.g. increase in water borne diseases)	Fauna and Fish	<ul style="list-style-type: none"> <li>• Direct, Negative</li> <li>• Short term, Local</li> <li>• Reversible</li> </ul>	Unlikely	Minor	Low
Decommissioning <ul style="list-style-type: none"> <li>• Repair of damaged roads</li> <li>• Removal of structures</li> <li>• Restoration of site etc</li> </ul>	Nuisance (e.g. noise, emission, vibration etc) from heavy machinery.	Fauna	<ul style="list-style-type: none"> <li>• Direct, Negative</li> <li>• Short term, Local</li> <li>• Reversible</li> </ul>	Likely	Minor	Low

Solid waste of domestic nature that would be generated in the temporary labor sheds at the construction site is not likely to be significant in volume. But indiscriminate disposal of such solid waste would create environmental pollution and unhealthy situation at the project site. These solid wastes should also be disposed of properly as outlined in **Section 6.5**.

### **Drainage**

Since the construction phase involves significant earthwork, there are chances of stagnation and ponding of storm water if care is not taken for proper drainage of storm water.

### **Impacts Related to Construction of Gas Pipeline**

It should be noted that a gas pipeline of 1.05km will be constructed along the available existing road from the Gas Valve Station of GTCL to the RMS of MPCL compound for supply of gas to the proposed power plant. It has very minimal adverse impact in the project considering the disturbance of the movement of the normal vehicles, sound generation for pipeline connection, and dust generation for the trenching of the road.

#### **6.2.2.2 AIR QUALITY IMPACTS**

During the construction phase of the proposed power plant project, the important sources of emissions would include those from the operations of construction equipment and machineries, vehicles carrying construction materials to the site and taking construction debris out of the site. If construction equipment, such as stone (aggregate) crushers is used at the site, this may result in significant emission of particulate matter during its operation. Since construction of the proposed power plant project would most likely involve significant earthworks, increase in particulate matter in the air from wind-blown dust is also a concern to the project site. Mitigation measures as outlined in **Section 6.5** should be adopted to minimize the possible adverse impacts of project activities on air quality.

#### **6.2.2.3 IMPACT ON NOISE LEVEL**

During construction stage major source of noise is expected to stem from transport vehicles which include barges and trucks. Also noise is expected to be produced from plant construction activities. The construction phase may be broadly classified into two different groups:

- i. General Site and Plant Construction,
- ii. Water and Effluent Treatment Plant construction, and
- iii. Access Road Construction.

To assess the noise generated by different activities it is essential to identify the equipment to be used at various stages of the construction work. Therefore, an inventory of the probable equipment to be used and their reference noise generation data are of utmost importance.

### **General Site and Plant Construction**

Construction of the 51 MW gas fired power plant will involve numerous activities. The major construction activities are:

1. General plant construction on the north-western part of the complex;
2. Loading and unloading of construction materials and equipment along with the power generation equipment;
3. Pile driving at the site;
4. Construction of the access road to the north of the processing facility; and
5. Earthwork trucks transporting cuttings along the access road for power plant construction.

### **Inventory of equipment to be used in general site and plant construction**

Some major works such as pile driving, transportation of the equipment and machineries from the dock to the site, installation of the plant, civil works, etc. may induce noise related problems. Construction equipment at the facility is expected to include;

1. Conventional earth-moving equipment, such as excavators, heavy trucks, off-road trucks, roller-trucks,
2. Concrete mixers and cranes.

This equipment will be used to grade and prepare the ground for construction of power plant. Pile drivers are also expected to be used intermittently during the construction operation. Vibration caused by the pile driver may also be a problem during the construction phase.

### **Access Road Construction:**

At present, access to the proposed site is through a paved road which ends about 75m short of the proposed site boundary. Therefore, an access road needs to be constructed to ensure easy and safe access to the proposed plant. Major activities expected to take place for the construction of the access road include, excavation, earth filling, compaction and pavement casting.

### **Inventory of equipment to be used during access road construction**

To accomplish the construction works mentioned above following equipment are expected to be used; i) Heavy truck; ii) Off-route truck; iii) Excavator; iv) Roller; v) Grader; and v) Concrete mixer.

The heavy trucks will be employed in carrying construction materials. The off-route trucks will be used to carry away earth cuttings using excavator. The roller will be used for ground preparation and the concrete mixer will be for preparation of concrete mix.

### **Noise Impact – Construction Phase**

As mentioned earlier, noise may cause mild to severe impact on human nervous system if exposed to sustained high level noise exposure. The physical and psychological impacts

depending on level of exposure may be annoyance, speech interference, sleep deprivation, performance degradation and hearing loss. Accordingly, the Bangladesh Standard for noise level is 75 dBA at daytime and 70 dBA at night (DoE, 1997).

### **6.2.3 SOCIO-ECONOMIC IMPACTS**

In many development projects, the most significant loss of income results from loss of land (due to land acquisition) and income. However, for the proposed power plant project, no land would have to be acquired as the land owner himself is planning to construct the power plant and hence there will be no loss of private land or property. There will be no displacement of population and no resettlement will be required. Also, the proposed project site is not used for any income generating activity, and therefore, there will be no direct loss of income associated with proposed project.

However, a number of project activities will have some adverse impacts on certain socioeconomic parameters (e.g., traffic and communication, public health), while other will have beneficial impacts (e.g., employment). The impacts of the project activities during construction phase on important socio-economic parameters are summarized below.

#### **6.2.3.1 TRANSPORT**

During construction phase, some additional traffic will be generated for bringing in construction material and equipment. This traffic will pass through heavily traveled Dhaka-Ashugonj road. Road traffic flow to and from the project site is likely to increase during the construction phase due to increased movement of vehicles carrying construction materials, equipment and machinery, and personnel. However, possible adverse impact of increased traffic flow is likely to be limited, especially if mitigation measures, as outlined in Section 6.5, are adopted. The negative impact of the increased traffic flow would be mostly concentrated mainly within the Midland Power Plant Complex and affecting people in residential areas located close to the project site.

#### **6.2.3.2 NAVIGATION**

Large barges are likely to be used to carry the power plant equipment to the plant site via the Meghna River. It is a busy navigation route. So there will be some crowding of in the navigation channel. However, such crowding is expected to be minor in nature and easily manageable.

#### **6.2.3.3 PUBLIC HEALTH**

The construction activities of the power plant are likely to have some impact on human health and well being due to increased noise pollution and vibration, and local air pollution within and around the project site. Construction activities will generate dust (see Section 6.2.2). Noise pollution and vibration will be generated from additional traffic and operation of construction equipment. The residential building located close to the project site will be affected by such noise pollution and vibration. A detailed assessment of noise pollution and its impact is presented in Section 6.2.2. Solid wastes generated by the construction activities

and labors may create environmental pollution and thus affect public health, if not properly disposed (see Section 6.2.1).

Accident during construction phase is also an important issue. Proper measures including regular maintenance of equipment and use of protective gear are needed to reduce the risk of such accidents during the construction phase.

#### **6.2.3.4 EMPLOYMENT**

Some job opportunities will be created for labors as well as skilled manpower (including engineers) for construction of the proposed project. Installation of power plant will require relatively small number of skilled personnel and laborers; as such installation is highly automated.

### **6.3 ENVIRONMENTAL IMPACT OPERATIONAL PHASE**

#### **6.3.1 OVERVIEW OF IMPACTS**

During operation of the 51 MW gas fired power plant, certain environmental parameters will experience some adverse impacts while some others will enjoy beneficial effects. In this study, the effects of the project activities on ecological, physico-chemical, and socio-economic parameters have been assessed. As noted earlier, since the project site is located in a developed industrial area that does not appear to be very sensitive, ecologically. The impact of project activities on most ecological parameters (e.g., wetlands, homestead vegetation, forest cover, bushes and trees, wild life, species diversity) are mostly insignificant. Since there will be no thermal discharge (or other forms of discharge from the power plant) in the Meghna river, the operation of the power plant will not affect the water quality or the aquatic ecosystem of the river. However, thermal emission from the power plant may have some adverse impact on homestead vegetation in the surrounding areas.

The effects of project activities a number of physico-chemical environmental parameters have been assessed. These parameters include noise level, water quality, and air quality. The potential impacts of the project activities on these physico-chemical environmental parameters are described in this Section.

The impact of the power plant project at its operation phase on socio-economic parameters will be mostly beneficial. Increased power supply will promote well-being of the people suffering from lack of power supply or serious load shedding; it is also likely to have positive impact on industrial activities and employment. The impacts of project activities on socioeconomic parameters are also described in this Section.

#### **6.3.2 NOISE IMPACTS DURING OPERATIONAL PHASE**

As mentioned in **Chapter 5** prolonged exposure to high level of noise may cause significant damage to human hearing organ and may cause neurological damage. OSHA noise exposure limits for the work environment provides a guideline for the time of noise



exposure at the work environment which may be adopted to prepare an environmental management plan (Table 6.3-1).

**Table 6.3-1** OSHA noise exposure limits for the work environment

Noise (dBA)	Permissible Exposure (Hours and minutes)
85	16 hrs
87	12hrs 6 min
90	8 hrs
93	5 hrs 18 min
96	3 hrs 30 min
99	2 hrs 18 min
102	1 hr 30 min
105	1 hr
108	40 min
111	26 min
114	17 min
115	15 min
118	10 min
121	6.6 min
124	4 min
127	3 min
130	1 min

Note: Exposure above or below the 90dB limit have been "time weighted" to give what OSHA believes are equivalent risks to a 90 dB eight-hour exposure. Source: Marsh, 1991, p. 322.

Therefore, noise assessment during the operational phase of different units of a power plant is essential to adopt adequate management and mitigation measures. With the engine noise specification a noise modeling is prepared for this project. The noise model and engine specification are annexed in **Annex-XIV** and **Annex-XV** respectively. Add paragraph on the data

### **Impact during General Site and Plant Operation**

The project area falls into Industrial zone according to Bangladesh Environmental Quality Standard ECR'97 categorization. Noise levels of all locations were within the standard limit of ECR'97 (subsequent amendment in 2006).

### **6.3.3 WATER QUALITY ASSESSMENT**

The Gas Engine component of the power plant does not generate any thermal effluent which needs to be discharged in the environment. This is because a closed cycle cooling system using cooling towers and condensers which will dissipate the waste heat into the ambient air rather than the surface water body. Only the intermittent losses of water from the system will be supplemented from the ground water and there will not be a discharge of water out of the system into the river unless there is an accident or a temporary shutdown due to operational maintenance. Although the baseline information of the water quality has been taken into consideration and depicted in Chapter-5 of this report.

### **6.3.4 AIR QUALITY**

The proposed 51 MW Gas Fired Power Plant is a relatively cleaner technology for electricity production, especially when natural gas with no sulfur content (as is the case here) is used as fuel. It is expected to produce minimal impact on the air quality of the surrounding environment. Only NO<sub>x</sub> emission, particularly during operation of the Gas Engine(GE) tends to be a problem because of the high combustion temperature. However, use of Dry Low NO<sub>x</sub> (DNL) burner technology in this project is likely to reduce NO<sub>x</sub> emission significantly. After commissioning of the plant, the stack emissions will satisfy the emissions standards for NO<sub>x</sub>, CO and Particulate Matter (PM). The effect of stack emissions (NO<sub>x</sub> during operation of the GT; and NO<sub>x</sub>, CO and PM during operation of the gas fired power plant) on ambient air quality has been assessed as a part of the ESIA. Thermal emission, particularly during the operation period of the Gas Engine, is also an important issue.

#### **6.3.4.1 EFFECT OF STACK EMISSIONS ON AMBIENT AIR QUALITY**

Computer aided mathematical models are being used to predict the increase in air pollutants concentration on ambient air quality due to any increase in the emission load in the atmosphere. For the proposed project, computations of 24-hour average ground level concentrations were carried out using ISC-AERMOD View model, which is a recommended model by USEPA for prediction of air quality from point, area and line sources. It is based on Gaussian dispersion which incorporates the Pasquile-Gifford (P-G) dispersion parameters for estimating horizontal cross wind and vertical dispersion.

ISCST-3 model has been developed to simulate the effect of emissions from continuous point sources on neighborhood air quality. The ISCST-3 model was adopted from the USEPA guideline models and routinely used as a regulatory tool to predict air pollution impact from as high as 500 point sources simultaneously and at 10,000 receptors. The ISCST-3 is an hour-by-hour steady state Gaussian model which takes into account the following special features:

- Terrain adjustments.
- Stack-tip downwash.
- Gradual plume rise.
- Buoyancy-induced dispersion, Complex terrain treatment
- Consideration of partial reflection.
- Plume reflection off elevated terrain.
- Building downwash.
- Partial penetration of elevated inversions is accounted for.
- Hourly source emission rate, exit velocity and stack gas temperature.

The impacts of primary air pollutant are predicted using ISC-AERMOD View model, which has been selected keeping in view the terrain around the project site. This model is widely recognized as predictive tool in impact assessment for air environment. The model has been

applied with flat terrain, gradual plume rise and buoyancy induced dispersion options in the present study.

The model with the following options has been employed to predict the cumulative ground level concentrations due to the proposed emissions from stacks of boilers and incinerators.

- Predictions have been carried out to estimate concentration values over radial distance of 5 km around the sources.
- Terrain data for the entire study area has been calculated by using SRTM data. This was further processed to generate the study specific terrain data in AERMAP.
- Cartesian receptor network with elevated terrain was considered.
- Emission rates from the point sources were considered as constant during the entire period.
- The ground level concentrations computed are as basis without any consideration of decay coefficient.
- Calm winds recorded during the study period were also taken into consideration.
- 24-hour mean meteorological data extracted from the meteorological data of September 1, 2014 to October 31, 2014 has been employed to compute the mean ground level concentrations to study the impact on study area.
- Average ground level concentrations have been superimposed with the help of ISC-AERMOD View Model in Google Earth.

The results of the Air Quality Modeling clearly indicate that the baseline concentrations of NO<sub>x</sub> as well as predicted concentrations are well within the limits specified in Bangladesh standards. The details of the Air Quality Modeling are described in **Annex-XII**.

#### **6.3.4.2 THERMAL EMISSION**

It should be noted that a number of power generators and industries around the site are contributing to the increase in ambient air temperature. Operation of the proposed power plant, together with the other plants and industries may increase ambient temperature around the project site. Nevertheless, mitigation measures should be adopted to mitigate the adverse impacts resulting from such increase in ambient temperature.

#### **6.3.5 SOCIO-ECONOMIC IMPACTS**

During operation phase, no significant negative impact is anticipated on socio-economic environmental parameters. Significant positive impacts are expected due to improvement in power supply. This will reduce load shedding in Dhaka city and contribute to the national economy. Well-being of the surrounding population, especially Dhaka city, will be significantly improved due to generation of electricity during peak hours. Currently Dhaka

city is reeling under unbearable load shedding. Such load shedding is hampering normal day to day activities of the city including schooling.

**Industrial Activities:**

Existing Industries will be benefited from additional and uninterrupted power supply from this proposed plant. New industries will come up, which will in turn increase socioeconomic growth of the region.

**Employment:**

Employment will be generated in the industrial sector. Besides, some employment will be generated for the operation and maintenance of the new power plant.

**National Economy:**

National economy will be benefited by the availability of additional supply of power to industrial sectors. Industries will be able to use more of their capacity, which now frequently suffers from power outage. Industries will also be able to reduce their dependence on diesel for back-up power generation, which will save additional expenditure and foreign currency. Given the current load shedding situation, impact of this additional power generation on national economy will be significant.

## **6.3.6 CUMULATIVE IMPACT**

### **6.3.6.1 AIR QUALITY**

In this study, efforts have been made to assess cumulative impacts of the proposed power plant on air quality. There are a large number emission sources (e.g., Ashugonj Fertilizer Factory (AFF), other power plants etc.) surrounding the proposed project area (Table-6.3-2), all of which contribute to air pollution. Local data on the nature and rate of emissions from the fertilizer plant sources are almost nonexistent. Similarly, there are significant uncertainties regarding future developments in this area and potential emissions from such sources. Therefore, in this study, the cumulative impact on ambient air quality has been assessed by considering equivalent concentrations of the power plants using data USEPA AP 42 documents. It should be mentioned here that the list of some industries been collected from the project baseline survey work by the consultant. So, all the point sources within 10Km radius were considered to understand the cumulative emission of the project area. It is found that MPCL contribution in the Ashugonj Airshed is only 4.2%. However, the details and assumptions of the air quality modeling exercise are explained in **Annex XII** (Air pollution modeling for operation phase of the power plant). From the model data it is apparent that the baseline concentrations of NO<sub>x</sub> as well as predicted concentrations are well within the limits specified in Bangladesh standards and WHO guidelines. List of Power plant and factories within 10Km radius of the project area is listed in Table 6.3-2.

Table-6.3-2 List of Factories and Power Plants within 10km radius of MPCL,  
Charchartola,Ashugonj,B-Baria

Sl. No.	Name of Installation	Products & Services	Capacity	Equivalent Power (MW)	Remarks
1	Ashugonj Fertilizer and Chemical Company Limited	Urea factory	1300 MT/ day	150*	
2	Ashugonj Fertilizer and Chemical Company Limited	Captive Power Plant	27 MW, Steam Turbine	27	
3	Ashugonj Power Station Company Limited	Govt. Power Plants	774 MW (Steam Turbine, Gas Turbine & Gas Engine based)	774	
4	United Ashuganj Power Ltd.	IPP Power Plant	53 MW, Gas Engine based	53	
5	Agrico Power Plant	IPP Power Plant	95 MW, Gas Engine based	95	
6	Precision Energy Limited	IPP Power Plant	55 MW, Gas Engine based	55	
7	<b>Capacity of Power Plants other than MPCL</b>			1155	4.2% contribution of the total generation
8	Midland Power Co. Ltd.	IPP Power Plant	51 MW, Gas Engine based	51	

\* Calculated using USEPA AP 42 PM emission data (PM emission of 0.17 kg/MT)

### 6.3.6.2 NOISE LEVEL

The cumulative effect of the noise to be generated by the proposed 51 MW gas fired power plant during the operational phase has been modeled during the study. These modeled values are for conditions where there were no noise barriers, such as buildings or trees between these plants. Since there are a number of buildings as well as trees and boundary walls the receptor is expected to experience noise much less than this value. The cumulative effect of the proposed plant is expected to be dominated by the noise generated by AFF the plant nearest to the Power Plant. The model shows that the  $L_{eq}$  of the noise generated by the proposed 51 MW Power Plant at a distance of 200m from the plant site is expected to be about 62.77dBA (**Annex-XIV**). These modeled values are for conditions where there were no noise barriers, such as buildings or trees between these plants. Since there are a number of buildings as well as trees and boundary walls the receptor is expected to experience noise much less than this value. The cumulative effect of both of these proposed plants at a common point is expected to be dominated by the noise generated by the plant nearest to the receptor.

## 6.4 IMPACT EVALUATION

This section provides an evaluation of the impacts of project activities (described in Sections 6.2 and 6.3) on the physico-chemical, ecological and socio-economic parameters, both during construction and operation phases of the project. For convenience, the impacts have been categorized as “positive impact”, “no impact”, and “negative impact”. Again the intensity of positive and negative impacts have been classified (qualitatively) into “low”, “moderate”

and “high” categories. Short-term (Sh) and long-term (Lo) nature of impacts have also been identified.

#### 6.4.1 CONSTRUCTION PHASE

##### 6.4.1.1 IMPACT ON PHYSICO-CHEMICAL PARAMETERS

Table 6.4-1 summarizes the effect of project activities on physico-chemical environmental parameters during construction phase of the project. The physico-chemical environmental parameters that could be affected by the project activities include water and soil quality, air quality and noise level. As discussed in Section 6.2, water and soil quality could be affected mainly by project activities such as mobilization of equipment and personnel (e.g., solid and liquid waste from labor sheds), and site preparation. Effects of solid and liquid wastes generated during construction phase would not be very significant, especially if mitigation measures as outlined in Section 6.5 are adopted. The overall negative impact of such activities is likely to be “short-term (Sh)” and of “low” intensity.

**Table 6.4-1 Effect of project activities on physico-chemical environmental parameters during construction phase**

Physico-chemical parameters	Environmental Examination						
	Positive Impact			No Impact	Negative Impact		
	Low	Moderate	High		Low	Moderate	High
Water and Soil Quality					X (Sh)		
Air Quality					X (Sh)		
Noise Level						X (Sh)	

Sh=Short-term; Lo=Long-term

##### 6.4.1.2 IMPACT ON ECOLOGICAL PARAMETERS

Table 6.4-2 shows the effects of the project activities during construction phase on ecological parameters. As noted earlier in Section 6.2.2, the project area is not very sensitive ecologically and hence the impacts of project activities on most ecological parameters are not very significant. Therefore, impacts of project activities on flora, fauna, and fish would be of “moderate” intensity.

**Table 6.4-2 Effect of project activities on ecological parameters during construction phase**

Ecological parameters	Environmental Examination						
	Positive Impact			No Impact	Negative Impact		
	Low	Moderate	High		Low	Moderate	High
Aquatic flora					X (Lo)		
Terrestrial flora					X (Lo)		
Aquatic fauna					X (Sh)		
Terrestrial fauna					X (Sh)		
Fish					X (Sh)		

Sh=Short-term; Lo=Long-term

### 6.4.1.3 IMPACT ON SOCIO-ECONOMIC PARAMETERS

Table 6.4-3 shows the effects of the project activities during construction phase on socio-economic parameters. The project activities during construction phase will have some adverse impact on public health, transport and communication, and well being due to increased noise pollution and vibration, and local air pollution within and around the project site.

**Table 6.4-3** Effect of project activities on socio-economic parameters during construction

Socio-economic parameters	Environmental Examination						
	Positive Impact			No Impact	Negative Impact		
	Low	Moderate	High		Low	Moderate	High
Health and well being						X (Sh)	
Navigation					X (Sh)		
Transport and Communication						X (Sh)	
Employment	X (Sh)						

Sh=Short-term; Lo=Long-term

## 6.4.2 OPERATION PHASE

### 6.4.2.1 IMPACT ON PHYSICO-CHEMICAL PARAMETERS

Table 6.4-4 summarizes the effect of project activities on physico-chemical environmental parameters during operation phase of the project. Effect of project activities during operation phase on physico-chemical environmental parameters will be mostly of “low” intensity.

**Table 6.4-4** Effect of project activities on physico-chemical environmental parameters during operation phase

Physico-chemical parameters	Environmental Examination						
	Positive Impact			No Impact	Negative Impact		
	Low	Moderate	High		Low	Moderate	High
Water and Soil Quality					X (Sh)		
Traffic Flow					X (Lo)		
Air Quality						X (Lo)	
Noise Level						X (Lo)	

Sh=Short-term; Lo=Long-term

As the Government of Bangladesh has a long term plan to develop the region as the region earmarked for electricity production, it is recommended to impose restrictions on industries generating significant amount of particulate matter.

### 6.4.2.2 IMPACT ON ECOLOGICAL PARAMETERS

Table 6.4-5 summarizes the effect of project activities on ecological parameters during operation phase of the project. Most ecological parameters will not be affected by the project activities during operation phase.

**Table 6.4-5** Effect of project activities on ecological parameters during operation phase

Ecological parameters	Environmental Examination						
	Positive Impact			No Impact	Negative Impact		
	Low	Moderate	High		Low	Moderate	High
Aquatic flora					X (Lo)		
Terrestrial flora				X			
Aquatic fauna					X (Lo)		
Terrestrial fauna				X			
Fish				X			

Sh=Short-term; Lo=Long-term

### 6.4.2.3 IMPACT ON SOCIO-ECONOMIC PARAMETERS

As shown in Table 6.4-6 the project will mostly have beneficial impacts on socio-economic parameters during operation phase. National economy will be benefited by the availability of additional supply of power to industrial sectors. Since the power plant is located in an industrial zone, the industries will benefit from additional and uninterrupted power supply from this proposed plant. New industries will also come up, which will in turn increase socioeconomic growth of the region; employment is also likely to increase in the industrial sector.

**Table 6.4-6:** Effect of project activities on socio-economic parameters during operation phase

Socio-economic parameters	Environmental Examination						
	Positive Impact			No Impact	Negative Impact		
	Low	Moderate	High		Low	Moderate	High
Health and well being		X (Lo)					
Navigation				X			
Transport				X			
Employment		X (Lo)					
Industrial Activities		X (Lo)					
National Economy		X (Lo)					

Sh=Short-term; Lo=Long-term

## 6.5 MITIGATION MEASURES

### 6.5.1 CONSTRUCTION PHASE

#### 6.5.1.1 CONSTRUCTION DEBRIS AND WASTE

Project construction activities will result in generation of considerable amount of inert solid wastes, including lumber, excess concrete, metal and glass scrap, and empty containers used for non-hazardous substances. Management of these wastes will be the responsibility of the Contractors. Typical management practices include recycling, proper temporary storage of waste and debris, and housekeeping of work areas. The wastes left after recycling will be transported to disposal in municipal land fill area. No part of this type of construction waste



should be mixed with the domestic solid waste generated within the MPCL; these solid wastes should be handled separately.

#### **6.5.1.2 SOLID WASTE**

The solid wastes of domestic nature generated mainly in the labor sheds should be collected and stored separately (i.e., without mixing it with construction wastes/debris) in appropriate containers within the construction site. The solid wastes should be disposed of away from the site (e.g., in a municipal landfill/waste dumping ground) outside the complex, at the responsibility of the Contractor. For assessing quantity of solid waste (of domestic nature) to be generated at the construction site, a generation rate of 0.2 kg per worker per day may be used. It should be noted that at present, solid waste generated within the MPCL are collected in drums (approximately one for ten families), where the solid waste from the surrounding residences is disposed off. There are personnel who collect waste from these drums and dispose them at the dumping site.

The current practice of open disposal of solid waste is not a sound and acceptable practice. If open dumping of solid waste is continued disease vectors may grow in number and spread diseases among the inhabitants within and outside the complex.

#### **6.5.1.3 LIQUID WASTE/WASTEWATER**

The human wastes at the labour should be appropriately disposed of through construction of sanitary latrines connected to appropriately designed septic tank system (consisting of septic tank and soakage pit). For this purpose, a wastewater generation rate of 50 lpcd may be assumed. The septic tank system may be designed following the procedure described in Ahmed and Rahman (2003). However, care should be taken in designing the septic tanks and soak pits as the groundwater table in the area remains close to the surface during wet season. Wastewater generated from different construction activities is not likely to be significant in volume. Disposal of such wastewater may be carried out by draining them in shallow pits (1 to 1.5 m deep) dug in the ground at appropriate locations, and filling them up with sand at the end of the construction phase. In all cases, the wastewater streams should be separated from the storm water stream, which will be disposed of separately utilizing the existing storm water disposal system at the MPCL Complex. **Annex-XIII** describes the Storm water drainage layout plan including septic tanks details for 100 users.

#### **6.5.1.4 TRAFFIC FLOW**

Haulage routes should be selected away from sensitive establishments such as residential areas, schools and hospitals. Also, especial care should be taken while transporting the equipment through existing installations. Where routes pass through sensitive sites it is recommended to install barriers to protect sites from noise and emission. Maintenance of engines and exhaust systems are recommended to minimize emission. In order to prevent noise and air pollution it is recommended to construct permanent hard surfaces in the roads connecting to the construction site. It is also recommended to inspect the roadway regularly.

Moreover, unpaved roads should be well compacted and maintained through sprinkling using binder and additives.

#### **6.5.1.5 AIR QUALITY**

Construction materials at the site should be properly covered while hauled and stored, roads properly cleaned and water sprayed in order to minimize concentration of dust in air. Vehicle movement to and from the site should be properly managed to ensure that it does not significantly aggravate the traffic problem and air pollution. Stone (aggregate) crushing activities should not be allowed within the MPCL complex. Health status of working staff should also be monitored regularly at the nearby Health Center of the MPCL complex.

#### **6.5.1.6 NOISE LEVEL**

It should be noted that noise-sources are point sources and will be used for a short duration during the initial stages of the construction works. However, to a receptor at a distance of 60m away from their sources the cumulative effects of the generated noise may cause annoyance. When ground cover or normal unpacked earth (i.e., a soft site) exists between the source and receptor, the ground becomes absorptive to sound energy. Absorptive ground results in an additional noise reduction over distance of 1.5 dB per doubling of distance.

The proposed mitigation measures of the heavy machinery operations for construction works are listed below:

- Normal working hours of the contractor will be between 06:00 and 21:00 hours from Sunday to Saturday. If work needs to be undertaken outside these hours, it should be limited to activities that do not lead to exceedance of the noise criteria at nearby Noise Sensitive Receptors (NSRs);
- Only well-maintained equipment should be operated on-site;
- Regular maintenance of equipment including lubricating moving parts, tightening loose parts and replacing worn out components should be conducted;
- Machines and construction plant items (e.g. trucks) that may be in intermittent use should be shut down or throttled down between work periods;
- Low noise equipment should be used as far as practicable;
- The number of equipment operating simultaneously should be reduced as far as practicable;
- Equipment known to emit noise strongly in one direction should be orientated so that the noise is directed away from nearby NSRs as far as practicable;
- Noise enclosures should be erected around stationary equipment;
- Noise barriers should be installed such that the nearest receptors are shielded from the line of sight;
- Noisy machinery (such as breakers and rollers) should be located as far away from NSRs as practicable;
- Material stockpiles and other structures should be utilized, where practicable, to screen noise from on-site construction activities.

The proposed mitigation measures of the increased traffic volume for construction works are listed below:

- Only those vehicles meeting the standards stipulated in Schedule-5 of the Environmental Conservation Rules, 1997 shall be used;
- Vehicles should be regularly maintained; and
- Transportation of materials on and off site through existing community areas should be avoided at all times.

#### **6.5.1.7 OCCUPATIONAL HEALTH AND SAFETY OF WORKERS**

Workers should have personal protective equipment (PPE) for protection against noise and others hazards. Contractors should comply with the relevant WB guidelines of occupational health and safety of the workers. The Contractors

- Shall observe and maintain standards of Health and Safety towards all of his employees not less than those laid down by the national standards or statutory regulations.
- Shall provide all appropriate protective clothing and equipment for the work to be done and ensure its proper use. Where required, safety nets, the contractor shall provide belts, harnesses and lines. The “safety directives for work equipment” and “safety directives for protective gears”, as specified in the Occupational Health and Safety Guidelines shall be followed.
- Shall provide and maintain in prominent and well-marked positions all necessary first-aid equipment, medical supplies and other related facilities. A sufficient number of trained personnel will be required to be available at all times to render first aid.
- Must provide or ensure that appropriate safety and/or health signs are in place at their work sites where hazards cannot be avoided or reduced.
- Shall report to the Engineer promptly and in writing particulars of any accident or unusual or unforeseen occurrences on the site, whether these are likely to affect progress of the work or not.

#### **6.5.1.8 SOCIO-ECONOMIC IMPACT**

Health hazard resulting from dust and noise pollution will impacted on the society of the nearby residence. Scheduling of project activities should be done in such a way that major noise producing activities are not carried out during nighttimes. Traffic hazard during construction will increase and need to be carefully managed for the safety of locality and many industrial laborers of the surrounding area.

#### **6.5.2 OPERATION PHASE**

Most of the socio-economic parameters will experience beneficial effects during the operation phase of the power plant project. Efforts should be made to enhance these beneficial impacts (see **Table 6.4-6**), which may include incentives for proper growth of industries in the area.

During the operational phase exceedingly high level of noise is expected to be generated within the confines of the turbine and generator installations. Prolonged exposure to such high level of noise may cause permanent hearing loss. Therefore, proper protective measures should be adopted during the operation and inspection of this equipment. Under no circumstances the operators should be allowed to enter these installations without proper

protective gears such as ear muffs. Double-paneled glass doors and windows, along with sound absorbing soft padding on the walls of the turbine and generator room, should be provided for reducing noise exposure to the power plant personnel. Sound proof canopy could be used for reducing the sound level of the engine. This canopy can also help the generator from dust and water.

Some adverse impact during the operation phase of the plant will come from emission of NO<sub>x</sub> and Particulate Matter (PM) from the power plant. Use of Dry Low NO<sub>x</sub> (DNL) technology in this project is likely to reduce NO<sub>x</sub> emission significantly. Plantation of fast growing trees around the project site is recommended to reduce adverse impacts of emissions, especially thermal emission, from the power plant. These trees will also act as sound barriers. The indigenous species of tree suggested for plantation are listed in Table 6.5-1. In addition to this, in the stack design due consideration should be given to providing proper insulation. Since the project is located in an area where the air quality is deteriorating day by day, the WB stack design guidelines for a degraded air-shed should be adopted.

Mitigation measures of the Occupational Health and Safety issues for the workers during the operation of the plant are listed below:

- Comply with Occupational health and safety guidelines presented in Section 2.0 of the General EHS Guidelines published by WB. The General EHS Guidelines of the WB covers various OHS aspects including General facility design and operation; Communication and training; Physical hazards; Chemical hazards; PPE; Special hazard environments; and OHS Monitoring and record keeping programs;
- Comply with Occupational health and safety guidelines presented in Section 1.2 of the EHS Guidelines for Thermal Power Plants published by the WB for the health and safety impacts particular to operation of power plants.
- As part of HSE&SMS, Project will formulate and implement: Occupational H&S Policy, Occupational H&S related Vision and Mission Statements, Occupational H&S Manual, Health and Safety related regulatory register, Health and Safety SOPs, H&S Auditing systems, OHS Training systems, Health and Safety records, Senior Management Review systems etc.

As discussed earlier, presence of excess particulate matter in the air may adversely affect the operation of the Gas Engine power plant through reduction of air filter life. Hence efforts should be made to make sure that industries around the project site comply with national air quality standards (GoB, 1997). Restrictions may also be imposed on installation of industries in the area that emit significant amount of particulate matter. Assistance of DoE may besought in this regard.

**Table 6.5-1** Tree species recommended for plantation within the MPP

Sl. No	Common Name	Scientific Name	Typical spacing between trees
1	Nagessor	<i>Mesua nagassarium</i>	5 m
2	Akasmoni	<i>Acacia longifolia</i>	5 m – 7 m
3	Babla	<i>Acacia Arabica</i>	5 m
4	Bahera	<i>Terminalia belerica</i>	5 m
5	Sissoo	<i>Dalbergia sissoo</i>	5 m
6	Rain tree	<i>Albizia procera</i>	6 m – 10 m
7	Krishnachura	<i>Delomix regia</i>	5 m



## **CHAPTER-7: INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION**

### **7.1 INTRODUCTION**

Participation is a process, through which stakeholders influence and share control over development initiatives, the decisions and the resources, which affects them. Participation of stakeholders in the projects is also a primary requirement in developing an appropriate management plan that addresses project's requirement and suited to the needs of the stakeholders. Stakeholder's involvement is also vastly increases the probability of successful implementation of management plan. In order to make consultation and disclosure process effective and fruitful, comprehensive planning is required to assure that local government, NGOs, host population and project staff interacts regularly and purposefully, throughout all stages of the project and contribute toward a common goal.

Public opinion has been collected through interview and focus group discussion meeting. For better understanding the socio-economic and environmental condition two focus group discussions were held with the local people in the closest settlement area of the existing power plant. Interview was held with different government official representatives.

### **7.2 APPROACH AND METHODOLOGY FOR CONSULTATION**

The approach undertaken for consultation involved the following key processes.

- Mapping and Identification of key stakeholders such as primary (direct project influence) and secondary (indirect project influence) stakeholders;
- Undertaking interviews and focus group discussions (FGD) with the respective stakeholders;
- Assessing the influence and impact of the project on these stakeholder groups;
- Summarizing of key findings and observations from the consultations; and

### **7.3 STAKEHOLDER ASSESSMENT**

A stakeholder is defined as "a person, group, or organization that has direct or indirect stake in a project/organization because it can affect or be affected by the Project or its Proponent's actions, objectives, and policies". Stakeholders vary in terms of degree of interest, influence and control they have over the Project or the proponent. In the present study, all the stakeholders have been primarily categorized into two categories that have been identified as:

- Primary Stakeholders: include people, groups, institutions that either have a direct influence on the project or are directly impacted (positively or adversely) by the project and its activities; and
- Secondary stakeholders: are those that have a bearing on the project and its activities by the virtue of their being closely linked or associated with the primary stakeholders and due to the influence they have on the primary stakeholder groups.

- Apart from categorization, the stakeholders have also been classified in accordance with the level of influence they have over the project as well as their priority to the project proponent in terms of importance.
- The influence and priority have both been primarily rates as:
  - ✓ High Influence/Priority: This implies a high degree of influence of the stakeholder on the project in terms of participation and decision making or high priority for project proponent to engage that stakeholder.
  - ✓ Medium Influence/Priority: This implies a moderate level of influence and participation of the stakeholder in the project as well as a priority level for project proponent to engage the stakeholder who are neither highly critical nor are insignificant in terms of influence.
  - ✓ Low Influence/Priority: This implies a low degree of influence of the stakeholder on the project in terms of participation and decision making or low priority for project proponent to engage that stakeholder.

Based on the above attributes, the following

**Table 7.3-1** delineates the stakeholders identified for the project and their analysis.

**Table 7.3-1: Stakeholder Mapping for the Project**

Stakeholders	Category of stakeholder	Brief profile	Overall influence on the project	Basis of Influence Rating
<b>Project Management</b>				
Midland Power Company Limited (MPCL)	Primary	MPCL is the primary project proponent own a controlling stake of 100% in the project	Highest	<ul style="list-style-type: none"> <li>• Are the primary project proponents</li> <li>• Responsible for operation of this project</li> <li>• Primary financial beneficiaries</li> <li>• Responsible for all the project related risks and impact liabilities</li> </ul>
<b>Community</b>				
Land Losers	Primary	Land Owners impacted with respect to loss of land and potential livelihood impact.	Medium	<ul style="list-style-type: none"> <li>• Lack of information during land acquisition process</li> <li>• Support to land losers in terms to temporary sustenance and employment opportunities</li> <li>• Preference for Employment opportunities</li> </ul>
Local Community	Primary	<ul style="list-style-type: none"> <li>• Primarily includes adjacent community to the power plant especially CharChartala</li> </ul>	Medium	<ul style="list-style-type: none"> <li>• No major restrictions around the project site especially with respect to grazing land</li> <li>• Project bring development to the area</li> <li>• Increase in employment opportunities and preference in job</li> </ul>

Stakeholders	Category of stakeholder	Brief profile	Overall influence on the project	Basis of Influence Rating
				<ul style="list-style-type: none"> <li>Improvement in electrical supply and infrastructure in the area</li> <li>Minimise impact</li> </ul>
<b>Regulatory/Administrative Authorities &amp; Agencies</b>				
Dept. of Environment, Bangladesh	Primary	The Department of Environment is the primary government regulatory authority for Environmental protection in Bangladesh.	High	<ul style="list-style-type: none"> <li>Responsible for monitoring project's Environmental compliance throughout the project lifecycle</li> </ul>
Other Regulatory & Permitting Authorities	Primary		High	<ul style="list-style-type: none"> <li>Agencies required for obtaining permits and licenses for operation of the project</li> <li>Primary involvement during operation phases</li> </ul>
<b>Political Administration</b>				
Upazilla (sub District Level) Political Administration	Secondary	Elected representative of people at sub-district level for a fixed tenure	Medium	<ul style="list-style-type: none"> <li>Key linkage between the community and the project proponent</li> </ul>
Union leaders & local Representatives	Secondary	Elected representative at union level i.e. village level for a fixed tenure	Medium	<ul style="list-style-type: none"> <li>Plays important role in providing public opinion and sentiment on the project</li> <li>Empowered to provide consent and authorization for establishment of project on behalf of the community</li> </ul>

## 7.4 SUMMARY OF CONSULTATION

The details of consultations held with issues raised or discussed and suggestions provided by the respective stakeholders are presented in **Table 7.4-1** and Photographs are presented in ANNEXVII.

**Table 7.4-1: Details of Consultations Held for the Project**

Date	Stakeholder Details	Details of participants	Issues discussed/raised	Response/ Suggestions made
29/09/14	Department of Fisheries	1. Md. Shafayet Alam, Ashuganj Upazila Fisheries officer, 01718687063 2. Md. Shahidul Hossain, Asst. Fisheries	<ul style="list-style-type: none"> <li>Primary fishing sanctuary located in and around in Ashuganj</li> <li>Understanding on the Fishermen community</li> </ul>	<ul style="list-style-type: none"> <li>There is no designated fishing sanctuary in the Meghna River of Ashuganj Upazila</li> <li>Approximately 3000</li> </ul>



Date	Stakeholder Details	Details of participants	Issues discussed/raised	Response/ Suggestions made
		Officer 01716664756	<ul style="list-style-type: none"> <li>Any impacts on the aquatic population in the Meghna River from the Midland Power Plant</li> </ul>	<p>lives in the Ashuganj upazila involved in fishing activities</p> <ul style="list-style-type: none"> <li>Due to their zero discharge in surface. No impact ever recorded by the Midland power plant to the Meghna river.</li> </ul>
29/09/14	Upazila Women Vice Chairman	1. Rehana Akter	<ul style="list-style-type: none"> <li>Benefit from the project</li> <li>Any women involvement during construction of the power plant</li> <li>Any impact due to the power plant</li> </ul>	<ul style="list-style-type: none"> <li>It is a national asset and we require more plant to meet the national electricity demand.</li> <li>Local people were involved in this power plant during construction and benefited</li> <li>No local women were involved during construction</li> <li>Till present no impact recorded or any complain raise after construction of the power plant.</li> </ul>
29/09/14	Department of Agriculture Extension	1. Towfique Ahmed Khan, Upazila Agriculture Officer, Ashuganj, 01938815761 2. Jewel Rana, Agricultural Extension Officer, Ahuganj, 01716017856 3. Narayan Cahndra Das, Sub Asst. Agricultural Officer, Ashuganj, 01813154520	<ul style="list-style-type: none"> <li>Understanding and Broad overview of the agricultural sector in Ashuganj</li> <li>Information on the crops grown in the area and agricultural practices</li> <li>Any direct impact in agriculture due to the establishment of the power plant</li> </ul>	<ul style="list-style-type: none"> <li>Agriculture is the primary mainstay of the upazila and contain 300 hactor cultivable land</li> <li>Net food demand is 30870 metric ton and net production is 24903 metric ton whereas the food deficiency is 5967 metric ton in this upazila.</li> <li>The agricultural practices in the region are a mix of both cultivating one's own land as well as sharecropping.</li> <li>There is no agricultural land close to the power plant so no chance to contaminate the</li> </ul>

Date	Stakeholder Details	Details of participants	Issues discussed/raised	Response/ Suggestions made
29/09/14	Union Parishad office, Char Chartala	1. Md. Ayub Khan, Chairman, Char Chartala Union, Ashuganj, 01718125936 2. Ashiqur Rahman, Secretary, Char Chartala Union, Ashuganj	<ul style="list-style-type: none"> <li>• Understanding about the power plant</li> <li>• Expectations from the plant authority</li> <li>• Any local people involvement in the power plant</li> <li>• Any impact or complain arise due to the plant operation</li> </ul>	<p>agricultural field.</p> <ul style="list-style-type: none"> <li>• This power plant develop the area as an industrial setup and in this region the land value is increasing day by day.</li> <li>• Local peoples were involved during the construction period and presently 7-8 persons are doing job in this power plant.</li> <li>• No complain arisen after the plant operation</li> <li>• Only the noise level is high of the power plant.</li> <li>• Demand from the authority is to establish a primary school and mosque</li> </ul>

## 7.5 FOCUS GROUP DISCUSSION

Discussions were held with the communities who are lives in close to the power plant. Two focus group discussions were held in the char chartala village. The overall outputs from the FGD are given below. Photographs of FGDs and list of participants are presented in the **ANNEX VIII**.

1. Main environmental concern is noise pollution that is generated from the power plant. Overall the noise of this power is comparatively low compared to other industry.
2. During construction stage all of the affected households got proper compensation.
3. During winter season transmission line wire make noise which is disturbing.
4. This plant do not causes any surface water pollution
5. The plant authority should develop the existing connecting road
6. Few local people have gotten job in this power plant
7. Required more job opportunity in the plant specially jobless young people
8. Proper fire fighting system is to be preserved in the plant for safety

Public Comments	Responses of Management
Main environmental concern is noise pollution that is generated from the power plant. Overall the noise of this power plant is	Plant authority properly maintain the noise pollution management procedure

<b>Public Comments</b>	<b>Responses of Management</b>
comparatively low rather than other industry.	
During construction stage all of the affected households got proper compensation	Authority has been provided proper compensation to the affected people.
This plant do not causes any surface water pollution	This plant does not discharge effluent in the surface water.
The plant authority should develop the existing connecting road	Authority is on process to develop the connection road by taking help from LGED.
Few local people have gotten job in this power plant. Require more job opportunity in the plant specially jobless young people	If any opportunities arise for non-technical work the affected households will get this benefit as a priority basis.
Proper firefighting system is to be preserved in the plant for safety	This plant has well fire fighting facilities

## **7.6 PUBLIC DISCLOSURE**

The final ESIA report will need to be disclosed in an accessible place (e.g. local government offices, libraries, community centers, etc.), and a summary translated into local language (Bengali) for the project-affected people and other stakeholders. The World Bank will post the final ESIA document on its website so affected people, other stakeholders, and the general public can provide meaningful inputs into the project design and implementation.

## **CHAPTER 8: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN**

### **8.1 SCOPE OF ESMP**

The primary objective of the environmental management and monitoring is to record environmental impacts resulting from the project activities and to ensure implementation of the “mitigation measures” identified earlier in order to reduce adverse impacts and enhance positive impacts from specific project activities. Besides, it would also address any unexpected or unforeseen environmental impacts that may arise during construction and operation phases of the project.

The ESMP should clearly lay out: (a) the measures to be taken during both construction and operation phases of the project to eliminate or offset adverse environmental impacts, or reduce them to acceptable levels; (b) the actions needed to implement these measures; and (c) a monitoring plan to assess the effectiveness of the mitigation measures employed. Environmental management and monitoring activities for the proposed power plant project could be divided into management and monitoring: (a) during construction phase, and (b) during operation phase.

### **8.2 WORK PLANS AND SCHEDULES**

#### **8.2.1 CONSTRUCTION PHASE**

The environmental management program should be carried out as an integrated part of the project planning and execution. It must not be seen merely as an activity limited to monitoring and regulating activities against a pre-determined checklist of required actions. Rather it must interact dynamically as project implementation proceeds, dealing flexibly with environmental impacts, both expected and unexpected.

For this purpose, it is recommended that the MPCL for this specific project should take the overall responsibility of environmental management and monitoring. The MPCL will form a team with required manpower and expertise to ensure proper environmental monitoring, as specified in Section 8.4, and to take appropriate measures to mitigate any adverse impact and to enhance beneficial impacts, resulting from the project activities. The MPCL through its team will make sure that the Contractor undertake and implement appropriate measures as stipulated in the contract document, or as directed by the GM, MPCL to ensure proper environmental management of the project activities. It should be emphasized that local communities should be involved in the management of activities that have potential impacts on them (e.g., traffic congestion in the surrounding areas). They should be properly consulted before taking any management decision that may affect them. Environmental management is likely to be most successful if such decisions are taken in consultation with the local community. The environmental management during the construction phase should primarily be focused on addressing the possible negative impacts arising from:

(a) Generation and disposal of sewage, solid waste and construction waste

- (b) Increased traffic
- (c) Generation of dust (particulate matter)
- (d) Generation of noise
- (e) Deterioration of water quality

The environmental management should also focus on enhancing the possible beneficial impacts arising from employment of local workforce for construction works. Table 8.2-1 summarizes the potentially significant environmental impacts during construction phase, the measures needed to eliminate or offset adverse impacts and enhance positive impacts. The monitoring plan and monitoring schedule has been presented in Section 8.4.

**Table 8.2-1** Potentially significant environmental impact during construction phase and mitigation measures

Activity/Issues	Potentially Significant Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
Influx of workers	<ul style="list-style-type: none"> <li>Generation of sewage and solid waste</li> </ul>	<ul style="list-style-type: none"> <li>Construction of sanitary latrine and septic tank system (one latrine for 20 persons)</li> <li>Erecting "no litter" sign, provision of waste bins/cans, where appropriate</li> <li>Waste minimization, recycle and reuse</li> <li>Proper disposal of solid waste (in designated waste bins)</li> </ul>	Contractor (Monitoring by MPCL)
	<ul style="list-style-type: none"> <li>Possible spread of disease from workers</li> </ul>	<ul style="list-style-type: none"> <li>Clean bill of health a condition for employment</li> <li>Regular medical monitoring of workers</li> </ul>	Contractor (Monitoring by MPCL)
Transportation of equipment, materials and personnel; storage of materials	<ul style="list-style-type: none"> <li>Increased traffic/navigation</li> <li>Generation of noise, especially affecting the nearby residential areas</li> </ul>	<ul style="list-style-type: none"> <li>Speed reduction to 10 km per hour within the MPCL complex</li> </ul>	Contractor (Monitoring by MPCL)
	<ul style="list-style-type: none"> <li>Deterioration of air quality from increased vehicular movement, affecting people in the surrounding areas</li> <li>Wind-blown dust from material (e.g., line aggregate) storage areas</li> </ul>	<ul style="list-style-type: none"> <li>Keeping vehicles under good condition, with regular checking of vehicle condition to ensure compliance with national standards</li> <li>Watering unpaved/dusty roads (at least twice a day; cost estimate provided)</li> <li>Sprinkling and covering stockpiles</li> <li>Covering top of trucks carrying materials to the site and carrying construction debris away from the site</li> </ul>	Contractor (Monitoring by MPCL)
Construction activities, including operation of construction equipment	<ul style="list-style-type: none"> <li>Generation of noise from construction activities (general plant and access road construction),</li> </ul>	<ul style="list-style-type: none"> <li>Use of noise suppressors and mufflers in heavy equipment</li> <li>Avoiding, as much as possible, construction equipment producing excessive noise during night</li> <li>Avoiding prolonged exposure to noise (produced by equipment) by workers</li> <li>Creating a buffer zone around the construction site to reduce disturbance to protect from the</li> </ul>	Contractor (Monitoring by MPCL)

Activity/Issues	Potentially Significant Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
		health hazard	
	<ul style="list-style-type: none"> <li>Deterioration of air quality from wind-blown dust and possible use of equipment, such as stone (aggregate crushers)</li> </ul>	<ul style="list-style-type: none"> <li>Not using equipment such as stone crushers at site, which produce significant amount of particulate matter</li> <li>Keeping construction equipment and generators in good operating condition</li> <li>Using equipment, especially generators with high levels of emission control (e.g., TIER-4).</li> <li>Immediate use of construction spoils as filling materials</li> <li>Immediate disposal/sale of excavated materials</li> <li>Continuous watering of bare areas</li> </ul>	Contractor (Monitoring by MPCL)
	<ul style="list-style-type: none"> <li>Generation of construction waste</li> </ul>	<ul style="list-style-type: none"> <li>Hauling of construction debris away from the site and their appropriate disposal in a sanitary landfill</li> </ul>	Contractor (Monitoring by MPCL)
	<ul style="list-style-type: none"> <li>Accidents</li> </ul>	<ul style="list-style-type: none"> <li>Regular inspection and maintenance of equipment</li> <li>Environmental health and safety briefing</li> <li>Provision of protective gear</li> </ul>	Contractor (Monitoring by MPCL)
	<ul style="list-style-type: none"> <li>Spills and leaks leading to soil and water contamination with hydrocarbon and PAHs</li> </ul>	<ul style="list-style-type: none"> <li>Good house keeping</li> <li>Proper handling of lubricating oil and fuel</li> <li>Collection, proper treatment, and disposal of spills</li> </ul>	Contractor (Monitoring by MPCL)
	<ul style="list-style-type: none"> <li>Employment of work/labor force</li> </ul>	<ul style="list-style-type: none"> <li>Local people should be employed in the project activities as much as possible.</li> </ul>	Contractor (Monitoring by MPCL)
	<ul style="list-style-type: none"> <li>If cultural resources are found during construction</li> </ul>	<ul style="list-style-type: none"> <li>Follow the "Chance Find Procedure" World Bank Operational guidelines OP 4. 11</li> </ul>	Contractor (Monitoring by MPCL)

### **Implementation Schedule**

In accordance to the provision of the Contract document, the Contractor shall prepare an “Implementation Schedule” for the measures to be carried out as part of the environmental management and monitoring. Table 8.2-2 shows a tentative plan for environmental reporting.

**Table 8.2-2** Environmental management and monitoring reporting

Stage or Topic	Frequency/ Stage	Contributors
Initial review	Before start of work	MPCL, Consultant
Routine Progress Report	Monthly	Project Engineer
Specific Problems and Solutions	As required	Project Engineer
Mid-term Review: <ul style="list-style-type: none"> <li>review of activities</li> <li>possible modification to</li> </ul>	Approximate mid-way through the project	Consultant

Stage or Topic	Frequency/ Stage	Contributors
procedure and/or overall plan		
Final Review: <ul style="list-style-type: none"> <li>• review of program</li> <li>• recommendation for similar future program</li> </ul>	Toward the end of the project	MPCL, Consultant, Contractor

## 8.2.2 OPERATION PHASE

Most of the environmental parameters will experience beneficial effects during the operation phase of the power plant project. Efforts should be made to enhance these beneficial impacts, which may include incentives for proper growth of industries in the area. The plant management authority (MPCL) should be responsible for overall environmental management during operation phase of the project. The environmental management during the operation phase should primarily be focused on addressing the following issues:

- a. Emission from the power plant
- b. Generation of noise
- c. Waste generation at the plant

Table 8.2-3 summarizes the potentially significant environmental impacts during operation phase, the measures needed to eliminate or offset adverse impacts and enhance positive impacts. The monitoring plan and monitoring schedule has been presented in Section 8.4. As mentioned earlier, the implementation schedule for environmental management and monitoring during the construction phase will be prepared by the Contractor as part of construction contract following recommended mitigation measures of potentially significant impacts given in Table 8.2-1. Resources required for implementation of mitigation and enhancement measures and monitoring during construction will be borne by the Contractor. Most of the mitigation and enhancement measures identified for operation phase (see Table 8.2-3), e.g., use of tall stack, using low NO<sub>x</sub> burners, selective catalytic converters, using silencers for generators and turbines, have already been addressed during the design phase and resources required will be within the estimated cost of the plant construction. Resources required for implementing environmental monitoring plans during both construction and operation phases are given in Section 8.3

**Table 8.2-3** Potentially significant environmental impact during operation phase and mitigation measures

Activity/Issues	Potentially Significant Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
Power Generation	<ul style="list-style-type: none"> <li>• Emission from the power plant</li> </ul>	<ul style="list-style-type: none"> <li>• Using stack as specified in the bid document</li> <li>• Using low nitrogen oxide burners, as specified in the bid document</li> <li>• Installation of stack emission monitoring equipment for major pollutants. An in-house Continuous Air Monitoring Station (CAMS) may be established.</li> <li>• In stack design due consideration</li> </ul>	MPCL

Activity/Issues	Potentially Significant Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
		should be given to proper insulation • Planting of trees around the project site • Restrictions may also be imposed on installation of industries in the area that emit significant amount of particulate matter	
	• Generation of noise	• Provision of silencers for generators and turbines • Planting of trees around the project site • Regular plant maintenance • Regular noise monitoring • Use of ear-muffs and ear-plugs by plant personnel working in the generator and turbine facilities of the plant	MPCL
Water Consumption	• Depletion of groundwater resources	• Regular monitoring of groundwater level	MPCL
Waste generation	• Inappropriate disposal of sewage causing environmental pollution • Generation of solid waste including sludge from demineralizer. • Possible water pollution	• Good housekeeping • Proper construction and maintenance of wastewater disposal system for the plant premises • Ensuring proper storage, treatment, and disposal of all solid waste • Monitoring of effluent quality from treatment plant (monitoring requirement and cost estimate provided) • Monitoring of river water quality (monitoring requirement and cost estimate provided)	MPCL

## 8.3 ENVIRONMENTAL MONITORING PLAN

### 8.3.1 MONITORING PARAMETERS

#### 8.3.1.1 CONSTRUCTION PHASE

Ambient air quality monitoring: Measurements of selected air quality parameters, particulate matter (PM<sub>10</sub>, PM<sub>2.5</sub>) need to be carried out during the construction period in accordance with the monitoring plan presented in Table 8.3-1. Measurement should be carried out at a location, which is sensitive with respect to air quality, e.g., near the residences.

River water monitoring: A water quality monitoring program is necessary for the Meghna river as the project is at the bank of the River. During construction work there might have some disturbances to the surface water. For this some baseline water quality i.e. Water temperature and dissolved oxygen (DO) along with BOD<sub>5</sub>, COD, Oil and Grease need to be monitored every month as a part of the program.



Groundwater monitoring: Groundwater level should be monitored during construction phase, particularly during the dry weather period from October to May. This should be done in order to prevent excessive lowering of groundwater level while abstracting for construction purposes.

Soil quality monitoring: Contamination of soil and bed sediment may occur due to accidental spillage of chemicals. Therefore, selected heavy metal content (Cr, Cd, Pb) and presence of Oil and Grease need to be monitored during the construction period.

Noise level monitoring: Use of heavy construction equipment may increase the noise level at the work location of the project site. Therefore, comprehensive noise monitoring during different stages of construction is essential.

Process waste monitoring: Records of generated process wastes should be kept according to the regulations concerning types of waste. Registration sheets for hazardous waste and for process non-hazardous waste should be maintained.

#### **8.3.1.2 OPERATIONAL PHASE**

Meteorological measurements: Meteorological monitoring should be conducted to monitor the wind direction and speed, temperature, humidity and precipitation.

Atmospheric emissions monitoring: Monitoring of emissions of CO, NO<sub>x</sub>, PM<sub>10</sub>, PM<sub>2.5</sub>, and temperature of flue gases should be carried out.

Ambient air quality monitoring: Continuous and/or periodic measurement of the air quality indicators e.g., NO<sub>x</sub>, PM<sub>10</sub>, PM<sub>2.5</sub>, and temperature needs to be carried out. At least one stationary monitoring station may be installed.

River water monitoring: Although the proposed plant is not expected to be a contributor to the deterioration of water quality of the Meghna river, a water quality monitoring program during the dry periods is necessary for the region. Water temperature and dissolved oxygen (DO) during March -May and October-December can to be monitored as part of the program.

Groundwater monitoring: The groundwater level along with the selected drinking water quality parameters (e.g., pH, Color, Turbidity, TDS, Ammonia, Nitrate, Phosphate, As, Fe, Mn and Coliforms) may be monitored.

Noise level monitoring: Indoor noise levels in the generator and turbine facilities along with the outdoor noise at the nearby residence premises and near the air condenser system need to be monitored regularly.

**Table 8.3-1** Monitoring plan during construction phase of the project

Issue	Parameters	Monitoring Frequency
Ambient air quality	CO, NOx, PM <sub>10</sub> and PM <sub>2.5</sub>	Once a month
River water	Water temp., DO, BOD5, COD, Oil and Grease	Once a month
Groundwater	Groundwater level	Once every two months during October to May
Soil Quality	Cr, Cd, Pb and Oil and Grease	Twice during the construction phase
Noise level	Noise at different locations	Every week, particularly during operation of heavy equipment
Process waste	Solid waste	Every week
Occupational health and Safety (worker health, working environment)	Noise, air quality, worker health status check	Once in a month (surveillance of workplace environment)

*Note: Actual monitoring time and location will be decided by MPCL. The Contractor will be responsible for carrying out the monitoring during the construction phase.*

### 8.3.2 MONITORING SCHEDULE

Tables 8.3-1 and 8.3-2 provide a summary of the monitoring schedule for the construction and operational phases, respectively for the proposed power plant. Table 8.3-3 gives the estimated cost of environmental monitoring during the construction phase. Table 8.3-4 and 8.3-5 provide estimated amount of environmental monitoring and training costs. **Table 8.3-2 Monitoring plan during operational phase of the project**

Issue	Parameters	Monitoring Frequency
Meteorological measurements	Wind direction and speed, temperature, humidity and precipitation.	Continuous monitoring by installing appropriate instrument
Stack emissions	CO, NOx, PM <sub>10</sub> , PM <sub>2.5</sub> and temperature	Once every six month and after major repair/maintenance
Ambient air quality	CO, NOx, PM <sub>10</sub> , PM <sub>2.5</sub> , temperature	Once quarterly**
River water	Water temperature and DO	Once a month (March-May, October-December)
Effluent quality	pH, DO, Sulfate, TSS, TDS, BOD, COD, Total N, Total P	Once a week
Groundwater	pH, Color, Turbidity, TDS, Ammonia, Nitrate, Phosphate, As, Fe, Mn and Coliforms; Groundwater level	Twice a year
Noise level	Noise at different locations	Once every three months
River morphology	River cross-section	Once a year during design life of the plant
Vegetation	Number and Condition	Once a year
Occupational health and safety	Health status and safety	Twice a year

*Actual monitoring time and location will be decided by the proposed Environmental Management Unit (EMU). During the operation phase, the monitoring may be carried out by the EMU through its own staff and equipment, if available, or can be out-sourced to a competent Contractor. \*\* Continuous monitoring if a CAMS is established. Proposed EMU is structured in Annex-XVI of the Emergency Preparedness and Response Plan of MPCL.*

Table 8.3-3 Cost Estimate for Environmental Monitoring during Construction Phase

Items	Number	Per Unit Cost (Tk.)	Total Cost (per Month)(Tk.)
Ambient air	PM2.5, PM10 = 2	16,000/-	32000
	NOx, CO = 1	8,000/-	8000
River water	2	12,000/-	24000
Groundwater	1	8500/-	8500
Noise level	4	10000/-	40000
Process waste	4	7000/-	28000
Water spraying for dust control	At least twice a day	10,000/-per month	10000
Plantation of Trees	250	300/-	75000
<b>Total Cost During Construction Phase</b>			<b>2,25,500</b>

Table 8.3-4 Cost estimate for environmental monitoring during operational phase

Items	Number (Per Year)	Per Unit Cost (Tk.)	Total Cost (Per Year) (Tk.)
Meteorological instrumentation with continuous data recorder	LS = unit	3,000,000/-*	3,000,000
Ambient Air	12	40000/-	480,000
Atmospheric Emissions	12	50,000/-	600,000
River water	6	20,000/-	120,000
Groundwater	2	15,000/-	30,000
Noise level	4	15000/-	60,000
<b>Total Cost During Operation Phase</b>			<b>4,290,000</b>

\*Meteorological Instrument with data recorder will be purchased in the 1<sup>st</sup> year of operation.

Table 8.3-5 Cost estimate for training during operational phase

Items	Number (Per Year)	Per Unit Cost (Tk.)	Total Cost (Per Year) (Tk.)
Safety and occupational health	2	250,000/-	500,000
Environmental management system	2	250,000/-	500,000
<b>Total cost during operational phase</b>			<b>1,000,000</b>

### 8.3.3 RESOURCES AND IMPLEMENTATION

The environmental parameters to be monitored during the construction and operational phases along with the monitoring schedule have been presented in the previous sections. The responsibilities for the implementation of the proposed monitoring plan may be entrusted with the contractor in association with the MPCL personnel.

It is very important to make sure that the potentially significant impact during both the construction and operation phases are properly addresses through adaptation of the proposed mitigation and enhancement measures outlined in Tables 8.2-1 and 8.2-3. It is equally important to undertake environmental monitoring during both the construction and operation phases according to the proposed monitoring plan outlined in Tables 8.3-1 and 8.3-2. These tables should therefore be made integral parts of the Contract Document of the proposed power plant project.

## 8.4 OCCUPATIONAL HEALTH AND SAFETY

Occupational health and safety means preventing accidents and work related ill health. Improved health and safety management can bring significant benefits to the business. It reduces individual and human costs of accidents and ill health, direct and indirect cost to the business, improves customer perception and company profile and workers' morale.

Under occupational health hazards, one can group several categories of working conditions impairing the health conditions of workers, though this impairment is slow. Safety relates more to health hazards that results from accidents and can cause instantaneous impairment of the workers' health.

### 8.4.1 GENERAL REQUIREMENTS

In Bangladesh the main law related to occupational health and safety is Labor Law 2006. The law has provisions on occupational hygiene, occupational diseases, industrial accidents, protection of women and young persons in dangerous occupation. The salient features of the general requirements for the workers' health and safety stated in this law is presented in Table 8.4-1.

### 8.4.2 WORKPLACE ENVIRONMENTAL QUALITY

The proposed power plant project has several phases - the construction of infrastructure and installation and commissioning of plant equipment, operation of the plant etc.

#### 8.4.2.1 HEALTH HAZARDS

The construction phase includes site preparation and plant construction, access road construction etc. The health hazards associated with these activities are mainly due to dust and noise pollution. Excessive noise contributes to loss of hearing and triggers physiological and psychological body changes. Dust pollution can cause eye and respiratory irritation and in some cases allergic reactions. The inhalation of exhaust gases from vehicles and machinery are also harmful for health. Stress can be caused by working in shifts, high work load, poor living condition of workers etc.

**Table 8.4-1** General requirements for workers' health and safety

Issues	Requirements
Health and Hygiene	<ul style="list-style-type: none"><li>• Cleanliness</li><li>• Ventilation and temperature</li><li>• Dust and fumes</li><li>• Disposal of wastes and effluents</li><li>• Overcrowding</li><li>• Illumination</li><li>• Latrines and urinals</li><li>• Spittoons and dustbins</li></ul>
Safety	<ul style="list-style-type: none"><li>• Safety for building and equipment</li><li>• Precautions in case of fire</li></ul>

Issues	Requirements
	<ul style="list-style-type: none"> <li>Fencing of machinery</li> <li>Floor, stair and passage way</li> <li>Work on or near machinery in motion</li> <li>Carrying of excessive weights</li> </ul>
Compensation for accidents at work	<ul style="list-style-type: none"> <li>Owner's responsibility for compensation</li> <li>Amount of compensation</li> <li>Report on fatal accident and treatment</li> <li>Compensation on contract and contract registration</li> <li>Appeal</li> </ul>
Dust and Fumes	<ul style="list-style-type: none"> <li>Any dust or fumes or other impurities likely to be injurious to the workers, effective measures shall be taken to prevent its accumulation and its inhalation by workers</li> </ul>
Overcrowding	<ul style="list-style-type: none"> <li>No work room in any factory shall be overcrowded</li> <li>At least five hundred cubic feet of space shall be provided for every worker employed in a work room</li> </ul>
Latrines and urinals	<ul style="list-style-type: none"> <li>Sufficient latrines and urinals shall be provided</li> <li>Shall be maintained in clean and sanitary condition</li> <li>Shall be adequately lighted and ventilated</li> </ul>
Precautions in case of fire	<ul style="list-style-type: none"> <li>Shall be provided with means of escape in case of fire</li> <li>Effective measures shall be taken to ensure that all the workers are familiar with the means of escape</li> <li>Fire fighting apparatus should be provide and maintained</li> </ul>
First aid	<ul style="list-style-type: none"> <li>Provided and maintained first aid facility</li> <li>One for everyone hundred and fifty workers</li> <li>Shall be kept with a responsible trained person who shall be available during the working hours</li> <li>In every facility where five hundred or more workers are employed, a dispensary shall be provided and maintained</li> </ul>
Disposal of wastes and effluents	<ul style="list-style-type: none"> <li>Provide with proper disposal system for solid waste and effluents.</li> <li>In case of a factory where no public sewerage system exists, prior approval of the arrangements should be made for the disposal of wastes and effluents</li> </ul>
Occupational and poisoning diseases	<ul style="list-style-type: none"> <li>16 occupational diseases notifiable to the Chief Inspector of Factories:               <ol style="list-style-type: none"> <li>1. lead poisoning</li> <li>2. lead tetraethyl poisoning</li> <li>3. phosphorous poisoning</li> <li>4. mercury poisoning</li> <li>5. manganese poisoning</li> <li>6. arsenic poisoning</li> <li>7. poisoning by nitrous fume</li> <li>8. carbon di sulfide poisoning</li> <li>9. benzene poisoning</li> <li>10. Chrome ulceration</li> <li>11. Anthrax</li> <li>12. silicosis</li> <li>13. Poisoning by halogens</li> <li>14. Primary epitheliomatous cancer of the skin</li> <li>15. Toxic anemia</li> <li>16. pathological manifestation due to radium or x-rays</li> </ol> </li> </ul>
Compensation	<ul style="list-style-type: none"> <li>If personal injury is caused to workmen by accident arising in the course of employment, employer shall be liable to pay compensation</li> <li>36 occupational diseases for compensation payable</li> <li>Monthly payment as compensation for temporary disablement are:</li> <li>Compensation should be paid for the period of disablement or for one year whichever period is shorter               <ol style="list-style-type: none"> <li>1. Such compensation shall be paid at the rate of full monthly wages for the first two months</li> <li>2. Two thirds of the monthly wages for the next two months and at the rate of the half of the monthly wages for the subsequent months</li> <li>3. In case of chronic occupational diseases , half of the monthly wages during the period of disablement for a maximum period of two years shall be paid</li> </ol> </li> </ul>

A quantification of the measure of severity in health hazards is not well defined. They are

slow acting and cumulative, their effects may not be visible for years. During plant installation and commissioning phase, use of chemicals (paints, solvents, thinners etc) batteries, welding materials, lubricants etc. may contribute to health hazards to the workers. These substances may be carcinogenic or detrimental in other ways. Use of industrial solvents can cause anemia, liver and kidney damage, cardiovascular diseases and neurological disorder.

#### **8.4.2.2 REMEDIAL MEASURE**

To minimize the hazards arising from the activities at different phases of plant construction and operation, the following measures should be taken:

- employees should be informed of the potential health impacts they are facing
- the employer should inform his employees of these potential hazards, arrange proper medical examination prior to and during employment, as well as tests and analyses necessary for the detection of diseases
- works with volatile toxic chemicals should be undertaken in a well ventilated place
- laborers handling offensive toxic chemicals should be provided with and forced to use protective clothing
- workers exposed to an excessive amount of noise should be provided with protective gear and be relieved frequently from their post
- workers exposed to large amounts of dust should be provided with adequate protective gear
- frequent spraying of water should be undertaken to minimize dust pollution
- persons undertaking construction and installation works should have access to amenities for their welfare and personal hygiene needs such as sanitary toilets, potable drinking water, washing facilities, shelter sheds etc.
- proper disposal of waste and sullage should be arranged
- health education and information on hygiene should be provided to the workers
- regular checks on food quality should be arranged within the work site

#### **8.4.2.3 SAFETY**

Safety implies the reduction of risk of accidents at the work site. Accident prevention is more valuable than any mitigatory or compensatory measures. This may be achieved through strict rules and procedures for the execution of specific tasks, enforcement of the rules, and discipline amongst workers, maintenance of machineries used and by providing all necessary gear or equipment that may enhance the safety of the workers.

The following guidelines should be followed to maintain the safety of the workers:

- workers have to be informed about the possible damage or hazards related to their respective jobs
- if pedestrian, traffic or plant movements at or near the site are affected by construction works, the person with control of the construction project must ensure that these movements are safely managed so as to eliminate or otherwise to control any associated health and safety risks

- must ensure sufficient lighting in the area where a person performs construction work or may be required to pass through, including access ways and emergency exit or passage without risk to health and safety
- construction site needs to provide safe access to and egress from all places where they may be required to work or pass through. This includes the provision of emergency access and egress route that must be free from obstructions
- adequate perimeter fencing should be installed on the site before construction work commences and that should be maintained during the construction work and signs should be placed which is clearly visible from outside the site including emergency telephone numbers.
- must ensure that electrical installations materials, equipment and apparatus are designed, installed, used, maintained and tested to eliminate the risk of electrical shock, burns, fire or explosion.
- construction site should be kept orderly and tidy. Access ways should be kept clear of materials and debris and maintained in a non-slippery condition. Materials should be stored in an orderly manner so that it does not pose any risk to the health or safety of any person
- arrangements of first aid facility should be made accessible when construction work is being undertaken.

#### **8.4.3 WORK IN CONFINED SPACES**

In the operational phase of the plant, the work will mainly be limited in confined spaces. In this phase, noise pollution may pose risk to health. It has been observed that the measured noise level near the generators and turbines ranged from 90 dBA to 110 dBA. This level of noise limits the continuous exposure to the workers from 2 to 4 hrs beyond which hearing impairment may be caused. If the installation of generators and turbines are within a confined space and monitored through glass windows, it will not pose any serious threat. However precautions should be undertaken during routine inspections and maintenance works. Supervisors, inspectors and related personnel should wear noise protectors like ear plugs or ear muffs. Wearer should be given a choice between ear muffs and plugs as muffs are easy to use but may be a nuisance in a confined work space and be uncomfortable in hot environment. Whereas ear plugs don't get in the way in confined spaces but may provide little protection if not used carefully.

As the employees will work in confined spaces, the air pollution may not pose a health risk. However, the ambient temperature may be high due to plant operation and measures should be taken to keep temperature within a comfortable limit. Where damage to plant presents an electrical hazard, the plant should be disconnected from the electricity supply main and should not be used until the damaged part is repaired or replaced. Adequate care should be taken to minimize stress and ergonomic design should be improved to minimize health hazards. First aid facilities should be available and evacuation plans for emergency situations should be in place with adequate drills, instructions and signs. Adequate fire fighting arrangements should be installed and maintained on a regular basis.

Where appropriate strict work procedure and guidelines are to be defined for different jobs

and be informed to the relevant staff. Regular medical examination should be arranged for the staff exposed to occupational health hazards. Areas where people may be exposed to excessive noise should be sign posted as “Hearing Protection Areas” and their boundaries should be clearly defined. No person should enter this area unless wearing personal hearing protectors.

#### **8.4.4 HAZARDOUS MATERIAL HANDLING AND STORAGE**

During construction of the plant, commercially available chemicals (paints, thinners, etc.) will be used and stored in the construction area. Hence small amount of unused or spent chemicals (used paints, motor oils) will be generated. Hazardous wastes likely to be generated during routine project operations include oily water, spent catalyst, lubricants and cleaning solvents. Operation and maintenance of the plant also generates some hazardous wastes. These include waste oil, boiler bottom ash, spent solvents, batteries, fluorescent light tubes, lubricating oils etc. The project will also involve the construction and operation of gas pipe line and handling of large amount of natural gas. Natural gas poses some risk of both fire and explosion. Continuous gas pipeline monitoring, installation of shutoff valves is essential to avoid any fire/explosion and rupture risks of the pipeline. Any kind of leakage monitoring of the pipeline should be taken care of through regular patrolling of the gas pipeline route by patrolman.

Used lead acid batteries contain lead, sulfuric acid and several kinds of plastics which are hazardous to human health. Therefore the ideal place to store used lead acid batteries is inside an acid resistant sealed container to minimize the risk of an accidental spillage. However this is not often the case and the following set of storage guidelines should be adopted:

- the storage place must be sheltered from rain and other water sources and if possible, away from heat sources
- the storage place must have a ground cover
- the storage place must have an exhaust ventilation system in order to avoid gas accumulation
- the storage place must have a restricted access and be identified as a hazardous material storing place
- any other lead materials which may eventually arise, such as plumbing, should be conveniently packaged and stored in accordance with its characteristics

It is recommended that where dangerous goods are stored and handled, that premises should be provided with fire protection and firefighting equipment. These equipment should be installed, tested and maintained in accordance with the manufacturer’s guidelines. The employer must ensure that a procedure for dealing with emergencies is in place, implemented, maintained and communicated to persons on the premises who may be affected by or respond to an emergency. Ignition sources in hazardous areas should be eliminated. The facility staff should be trained and equipped with personal protective gear such as rubber gloves, boots, hard hats, apron or splash suit and a face shield with safety glasses or goggles.

Laborers handling offensive toxic chemicals should be provided with and forced to use



protective clothing. Works with volatile toxic chemicals should be undertaken in a well ventilated place. Arrangements should be made for sufficient and suitable lighting.

Safe access within and to and from the premises should be ensured. Unauthorized access and activity on the premises should be prevented. These measures will reduce the chances of accidents and facilitate a safe environment for the workers, the staff and the plant.

#### **8.4.5 TRAINING**

Training is an integral part of a preventive strategy. The target groups requiring training should be managers, supervisors, and technicians and related staff who may be exposed to risk at work. The following issues should be addressed in training of the managers, staff and workers:

- Workers should be trained to use the engineering controls where installed
- Arrange workplace consultation on noise control
- Workers should participate in training and contribute to the noise management strategy
- Employee representatives should represent the views of workers to management about occupational health and safety and report to workers about management policy
- Persons likely to be exposed to risks should be provided with information and instruction in safety procedures associated with the plant at the work place.
- Relevant health and safety information should be provided to persons involved in installation and commissioning, use and testing of the plant.
- Information on emergency procedures relating to the plant should be displayed in a manner that can be readily observed by persons who may be affected by the operation of the plant.
- Training should be provided to use firefighting equipment when necessary.
- Facility staff needs to be trained in the safety procedures that are to be implemented during unloading, transfer and storage of hazardous materials.

#### **8.4.6 RECORD KEEPING AND REPORTING**

Record keeping and reporting is one of the requirements of any QA/QC system and essentially of a good management tool. Properly maintained records of construction, installation, training, equipment maintenance, operation, fault detection and remedy can help in reducing risks of accidents, legal costs and thereby overall cost of operation of a plant. Records also help in identifying causes of any accident and elimination of the same accident in future. Records may be maintained for the proposed plant as follows.

##### **8.4.6.1 PLANT CONSTRUCTION**

A person with control of a construction project or control of construction work should retain records for a reasonable period after the completion of the construction project of the occupational health and safety induction training and any other training given to persons directly engaged or trained by them to undertake construction work on the project.

#### **8.4.6.2 PLANT OPERATION**

During operation of the plant, arrangements should be made to keep records on any relevant tests, maintenance, inspection, commissioning and alteration of the plant, and make those records available to any employee or relevant health and safety representative.

#### **8.4.6.3 NOISE**

Audiometric test records of employees should be kept during the employee's period of employment and longer as necessary, as they may provide a useful reference for workers' compensation. The records should be kept in a safe, secure place and held as confidential documents.

#### **8.4.6.4 HAZARDOUS SUBSTANCES**

Assessment reports which indicate a need for monitoring and/or health surveillance together with the results of monitoring and/or health surveillance shall be kept as records in a suitable form for at least 30 years from the date of the last entry made. Retention for a period of at least 30 years is necessary because some health effects, such as cancers, may take a long time to become evident. The information kept will be valuable in epidemiological studies and for developing effective control strategies.

All other records, including assessment reports not indicating a need for monitoring and/or health surveillance and records of induction and training, shall be maintained for at least five years in a suitable form.

### **8.5 ENVIRONMENTAL MANAGEMENT SYSTEMS (EMS)**

An EMU shall be established to properly implement the ESMP in the power plant. Proposed EMU in the MPCL organogram is proposed and details are annexed in Annex-XVI. The environmental manager will be responsible for monitoring of the implemented ESMP. The responsibility of the EMU will follow as per assignment indicated in the organizational setup as placed at the organogram. Project management may equip the unit with appropriate manpower, equipment and fund for smooth implementation of the monitoring works. An EMS is a tool designed to enable organizations to target, achieve and demonstrate continuous improvement in environmental performance. It is one integrated management process with a number of stages, which includes an environmental audit. There are a number of standards (e.g. the British Standard BS7750 (BS11992), the European Eco-Management and Audit Scheme for Industry (CEC, 1993)). These consist of most or all of the following elements depending on the standard, to:

- adopt an environmental policy to confirm and promote commitment to continual improvement in environmental performance;
- undertake an environmental review to identify significant environmental issues and effects;
- set up environmental programs of objectives, targets and actions;

- establish an environmental management system to ensure the implementation of the necessary actions to achieve these objectives;
- undertake periodic environmental audits to assess the performance of such components;
- prepare an environmental statement on environmental performance; and
- obtain independent verification of the environmental statement.

Also there is ISO 14001 which is a voluntary international standard for environmental management systems ("EMS"). ISO 14001:2004 provides the requirements for an EMS and ISO 14004:2004 gives general EMS guidelines. An EMS meeting the requirements of ISO 14001:2004 is a management tool enabling an organization of any size or type to: (1) identify and control the environmental impact of its activities, products or services; (2) improve its environmental performance continually, and (3) implement a systematic approach to setting environmental objectives and targets, to achieving these and to demonstrating that they have been achieved.

It is expected that the Environmental and Social Management Team of the MPCL will be trained to conduct environmental auditing of its power generation facilities so that the objective of achieving a better environment is realized. Culmination of such activities will be successful ISO 14001 certification.

## **CHAPTER 9: RISK ASSESSMENT AND MANAGEMENT**

### **9.1 INTRODUCTION**

The problem of protecting human health and the environment may best be defined as the management of risk. The failure to manage risk effectively and to establish priorities rationally translates ultimately into a failure to protect health, safety, and the environment. Through the use of risk assessment, concerned authorities can estimate the relative level of risks posed by different substances, products and activities and can establish priorities in determining whether, and how, to regulate.

The risk assessment should constitute an organization's best effort to employ advanced scientific and technical methods to predict accurately the sizes of the risks. Once the relevant risks are estimated accurately and objectively through the risk assessment process, it can then be decided how best that risks could be addressed in the risk management phase.

Risk assessment is the technical process for estimating the level of risks posed by operational processes or products, i.e. the probability that a given harm will occur as a result of the processes or products. Risk assessment is applied to a substance, proceeds in four major steps:

- Hazard identification: determining what kinds of adverse health effects a substance, product or activity can cause
- Dose - response assessment: predicting the degree of adverse effects at a given exposure level
- Exposure assessment: estimating the amount of exposure, and
- Risk characterization: combining the foregoing into a numerical range of predicted deaths or injuries associated with actual exposure event

Risk management options are then evaluated in a proposed solution to provide reduction of risk to the exposed population. Specific actions that are identified and selected may include consideration of engineering constraints as well as regulatory, social, political and economic issues related to the exposure. Quantitative assessment of risks associated with hazard identification, dose-response assessment, exposure estimation and risk characterization were beyond the scope of the present study. However, this study takes a qualitative approach to identify common hazards within the power plant and recommends measures for managing these risks with accidents and external threats.

### **9.2 POWER PLANT RISKS ASSESSMENT**

The process of electricity generation from gas is by no means risk free because of high temperature and pressure conditions within the plants, rotating machineries and high voltages involved. Apart from risks associated with emissions, noise generation, solid waste, hazardous waste and wastewater disposal as a result of construction and operation, the gas fired power plants put human beings and the environment inside and outside of the plant to a certain degree of risk of accident and sometime loss of life. It is therefore essential that a

risk management plan be devised in order to both reduce risk of accident and to take the correct action during accidents. Important risks of accidents in thermal power plants leading to disasters or emergency situations may occur during following events:

- Risks during emergency
  - Fire
  - Explosion
  - Oil/acid spillage
  - Toxic chemical spillage
  - Electrocution
- Risks due to natural disasters
  - Flood
  - Cyclone
  - Earthquake
  - Storm
  - Lightning
- Risks due to external threats
  - Sabotage
  - War situation
  - Water/food poisoning

Several strategic areas within the power plant can be identified as places of potential risks during plant operation: Areas prone to explosion are:

- Boiler area
- Turbine hall

Premises prone to fire and electrocution are:

- Electrical rooms
- Transformer area
- Cable tunnel Premises where people can be exposed to toxic chemicals:
- Storage facilities for chemicals

In power plants accidents can occur at two different levels. First, these may occur due to fires, explosions, oil or chemical spillage and spontaneous ignition of inflammable materials. In such events, operators working inside the plant and at various strategic hazard locations will be affected.

Second, risks are also associated with external threats of sabotage. Failure of automatic control/warning systems, failure of fuel oil storage tanks and chemical release from acid and alkali stores and handling also pose great degree of associated risks.

### **9.3 MANAGING THE RISKS**

As mentioned earlier, in order to reduce the risks associated with accidents, internal and external threats, and natural disasters, a risk management program is essential. Risk management planning can be done during design and planning stage of the plant as well as during plant operation. While risk management is mainly preventive in nature during the plant operation stage, the design and planning stage of the plant can incorporate changes in

basic engineering to include safety design for all processes, safety margins for equipment, and plant layout. The following steps among others are important in managing the risks mentioned:

- The power plant should be located on a reasonably large plot of land giving ample space to locate all units whilst maintaining safe distances between them.
- The plant layout should provide roads of adequate width and service corridors so that no undue problems arise in the event of fires or other hazards.
- Gas storage is to be designed with adequate precautions in respect of fire hazard control.
- Storage of hazardous substances such as acids and alkalis should be sited in protected areas.
- With respect to plant operation, safe operating procedures should be laid down and followed to ensure safety, optimum operation and economy.
- A firefighting group with adequate manpower and facilities such as water tank of sufficient capacity, CO<sub>2</sub> tank, foam tank, portable fire extinguishers should be provided and facilities located at strategic locations e.g. generator area, high voltage panel, control rooms, and fuel tank area.
- Regular checks on safe operating practices should be performed.

In order to achieve the objective of minimizing risks at the Midland power plant complex, in addition to Environmental Management Unit for the complex, a disaster management unit with adequate manpower and facilities for each plant within the complex must be in place. The unit will be trained to act in a very short time in a pre-determined sequence to deal effectively and efficiently with any disaster, emergency or major accident to keep the loss of life, human injury, material, plant machineries, and impacts on the environment to the minimum.

## **9.4 EMERGENCY RESPONSE PLAN**

Emergency response plans are developed to address a range of plausible risk scenarios and emphasize the tasks required to respond to a physical event. The emergency response plan (ERP) for the proposed power plant has been developed listing various actions to be performed in a very short period of time in a pre-determined sequence if it is to deal effectively and efficiently with any emergency, major accident or natural disaster. The primary objective of the plan is to keep the loss of life, material, machinery/equipment damage, and impacts on the environment to minimum.

### **9.4.1 Emergency Response Cell**

It is highly recommended that an Emergency Response Cell (ERC) adequately equipped with highly trained manpower and appropriate gears is established within the power plant complex in order to effectively implement the emergency response plan. The main functions of the emergency response cell should include the following:

- Identification of various types of emergencies

- Identification of groups, communities, and areas those are vulnerable to different kinds of emergencies
- Preparing service teams for various operations within the organization through extensive training
- Establishment of early detection system for emergencies
- Developing reliable, instant information communication system
- Mobilizing all units in the complex within a very short time to address any emergency

#### **9.4.2 Emergency Preparedness**

The ERC headed by a trained Manager should establish an Emergency Control Room with links to all plant control rooms and all other services. The ERC shall work as a team of the following officials:

- Emergency Manager (Team Leader),
- Fire Officer,
- Safety Officer,
- Chief Security Officer,
- Chief Medical Officer,
- Rescue Officer, and
- Public Relations Officer

The Senior Environmental Engineer of the proposed Environmental and Social Management Unit for the Midland Power Plant Complex with adequate skills of facing emergency situation can act as the Emergency Manager of ERC. The Emergency Manager shall have the prerogative of shutting down the relevant units or the complete plant, which are affected or may further deteriorate damages, in case of an emergency. The EM however, shall have to report to the Chief Engineer of the complex of such an event without any delay.

The team will be responsible for preparing and executing a specific emergency response plan for the power plant complex. The team should meet at regular intervals to update the plan, based on plant emergency data and changes in support agencies.

The team should undertake some trial runs, e.g. fire drill, in order to be fully prepared and to improve upon the communication links, response time, availability and workability of emergency gears and other critical factors.

Upon receiving information about an accident, the ERC team will assemble in the Emergency Control Room within the shortest possible time and formulate emergency control procedure.

#### **9.4.3 Fire Fighting Services**

- The Fire Officer (FO) will be the commanding officer of the firefighting services. The FO will head a fire fighting team of trained officers and workers. The size of the team

should be determined by the MPCL considering requirement of all existing and proposed power plants within the complex.

- Adequate firefighting equipment e.g. fire extinguishers of different types appropriate for different strategic locations must be planned according to requirements of existing and future plants in the complex.
- Depending on the scale of emergency, the firefighting team will work in close association with security and maintenance personnel of the complex. Additional assistance may also be sought from outside fire stations when required.
- Preparedness is extremely important for efficient and effective firefighting services at the time of emergency. This can be better achieved by organizing fire drills at regular intervals, e.g. once every two weeks during dry summer months and once every two months during wet months involving all team members, all other service groups, all staff of the power plant complex, and utilizing all firefighting gears.

#### **9.4.4 Emergency Medical Services**

- The Chief Medical Officer will be responsible for providing medical services within the Midland Power plant complex at the time of any emergency. The services should also be rendered to people living in the close vicinity of the complex and affected by any accident within the plant complex.
- The existing Medical Center, nearby the Midland Power Plant (MPP) must be equipped with adequate medical personnel and equipment for providing emergency services in addition to normal Medicare services to population of the complex.
- A team of well trained Medical Officers specializing in burn injury, orthopedics, electrocution, chemical toxicity or poisoning, and shock treatment must be available at the nearby power plant Medical Center. The number of officers may be determined considering the total number of staff and their family members in the complex. Special attention must be given to child injury treatment.

The following services must be on alert at all times in the plant complex.

- First aid services for attending patients on the spot. The Medical Center should provide training on first aid services to some designated staffs of important areas of operation, e.g. boiler area, turbine hall, transformer area, electrical rooms, and chemical storage facilities, for immediate attention to the injured.
- Ambulance services for transport of casualties from spot to nearby Medical Center, and from nearby Medical Center to outside hospital, as necessary. Facilities for transportation of fatalities to appropriate hospital or to relatives or to the police following prescribed procedure should be available.
- All potential areas for emergency/ accidents in the plant complex must have an information chart including contact phone numbers of relevant services.

#### **9.4.5 Rescue Services**

Without going for additional manpower, the rescue team can be formed with potential staffs of the Power Plant Complex, e.g. from medical services, security services and fire fighting



services, for conducting rescue operations following an emergency. A senior member can be designated Rescue Officer who will be responsible for formulating rescue plan and guiding the team. Important functions include:

- Cut-off electricity, gas or water supply to accident spots
- Rescue people from debris of collapsed structures
- Demolish damaged structures that may endanger human lives
- Rescue people from fire areas with adequate protection
- Assist other services promptly to save human lives
- Salvage equipment from debris
- Isolate damaged equipment or machineries that may endanger human lives
- Provide repair services as appropriate to restore operations

#### **9.4.6 Security Services**

The Midland Power Plant Complex will have a strong independent security team headed by the Chief Security Officer and will be responsible for the overall security of the plant complex, its equipment, machineries, buildings, utilities, and the community living within the complex. The security office shall maintain liaison with other emergency services at the time of emergency and during normal hours.

The Chief Security Officer shall communicate with local police and other law enforcing agencies and seek assistance as may be needed during an emergency. The security team will also regulate vehicular traffic inside the complex. In particular they will ensure that all roads are unobstructed during emergencies.

#### **9.4.7 Public Relations Services**

- The Public Relations Officer (PRO) of the Power Plant Complex will be responsible for communicating emergency related information to concerned officials within the complex. The PRO however, will consult the Emergency Manager before communication with outside agencies.
- The PRO will be responsible for warning people in and around the complex against potential fire hazards, or possible chemical contamination of water.
- The PRO will keep close contact with outside local community and provide direction, and participate along with management team in the welfare services for the affected communities.

### **9.5 CONCLUDING REMARKS**

Apart from the services mentioned above, the Environmental and Social Management Unit and the Emergency Response Cell must ensure that all staffs working within the Power Plant Complex are oriented, through orientation programs, about the dos and don'ts during emergencies as well as overall environmental aspects and issues related to power plant operations. Annex-XVI Emergency Preparedness and Response Plan describes the risk assessment and its management of the MPCL.

It is however, to be emphasized that the emergency response plan (ERP) outlined above is to be used as guide only and that the Environmental and Social Management Unit and the Emergency Response Cell shall develop their own environmental management system (EMS) following ISO 14001 and the emergency response plan (ERP) respectively in consultation with and involving the Midland Power Plant (MPP).

## **CHAPTER 10: GRIEVANCE REDRESS MECHANISM**

### **10.1 INTRODUCTION**

Experience from past projects shows that project implementation is a complex process involving numerous interested and aggrieved parties giving rise to likely instances of conflict, allegations, etc. Most of the conflicts and allegations appear not to be of a serious nature but may snowball into a bigger issue if not given adequate attention from the beginning itself.

Some of the potential points that could give rise to grievances could be related to compensation payment, improper estimation of affected assets, failure to fulfill commitments, poor management of construction activities, inappropriate planning of vehicle movement, and cultural conflicts between migrant workers and local communities etc.

Therefore, it is imperative to have an internal mechanism in place where the aggrieved party/s can lodge their complaints and get it amicably settled prior to approaching the formal mode of solution available to them i.e. access to legal system through courts. In order to provide a formal forum to the aggrieved parties to deal with issues arising out of project, it is proposed that a joint grievance redress mechanism be instituted for both environmental and social related issues.

The proposed Grievance Redress mechanism (GRM) will be developed for the Project in order to settle as many disputes as possible through consultations. Such a mechanism is important as it is expected that most cases, if not all, would be resolved amicably; and the process, as a whole, will promote dispute settlement through mediation to reduce litigation. However, the options of legal recourse will not be restricted in any way by the project proponent.

### **10.2 OBJECTIVES OF GRIEVANCE REDRESS MECHANISM**

The basic objective of the GRM shall be to provide an accessible mechanism to the affected people, community and any stakeholder(s) having stake in the project to raise their issues and grievances as well as concerns. The Grievance Redress Cell (GRC) shall be officially recognized “non-judicial” body that will seek to resolve non-judicial disputes arising out of various matters related to the implementation of the ESMP, as well as other aspects of the project, as may deemed fit to be raised before the GRC.

The fundamental objective of GRM is to resolve any resettlement and environmental related grievances locally in consultation with the aggrieved party to facilitate smooth implementation of the ESMP. Another important objective is to democratize the development process at the local level and to establish accountability towards the stakeholders.

### **10.3 COMPOSITION OF GRC AND ULC**

It is suggested to have two levels of grievance redress mechanism for the project, viz. Grievance redress Cell (GRC) at the project level and another at Union level committee (ULC). The aim of having two levels of grievance redress mechanism is to provide a higher forum to the aggrieved party, if the same is not satisfied with the decision of GRC.

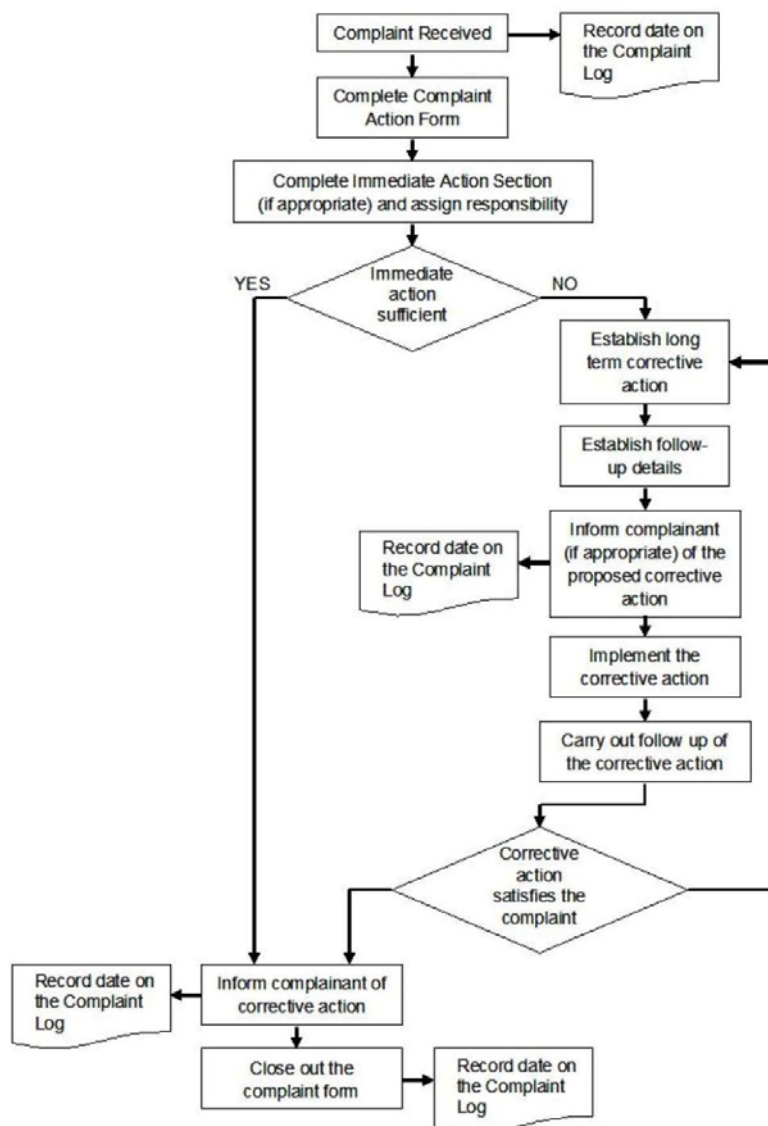
GRC will be driven internally by MPCL and shall have the following representation to ensure fair and timely solution to the grievances:

- Community officer serving as grievance officer;
- MPCL Environment and social officer
- Project management representative;
- MPCL EHS representative;

The composition of ULC will have the following members:

- Char Chartala Union Parishad Chairman or his representative
- MPCL Project Manager
- MPCL Environment and social officer
- Local elected Union Member
- Representative of affected people and women

The normal route to be followed for any grievance shall be GRC, and in case not satisfied then to ULC; however, the grievances can be directly taken to ULC too. The ULC shall be empowered to take a decision which is binding on MPCL and considered final. However, the decision of ULC is not binding on aggrieved person; he or she can take the legal course if not satisfied with the outcome of GRC decision.



### Figure-10.3-1 Flow Chart of Grievance Procedure

The representation in the committee makes project affected persons to have trust and build confidence in the system. The grievance redress committee reports its plan and activities to the Implementation committee.

GRC will maintain a Complaints Database, which will contain all the information on complaints or grievances received from the communities or other stakeholders. This would include: the type of complaint, location, time, actions to address these complaints, and final outcome.

The procedures to be followed and adopted by the grievance redress should be transparent and simple to understand or uniform process for registering complaints provide project affected persons with free access to the procedures. The response time between activating the procedure and reaching a resolution should be as short as possible. An effective monitoring system will inform project management about the frequency and nature of grievances. GRC will arrange half yearly meetings where the activities and the outcomes/measures taken according to the Complaints Database are to be monitored and reviewed by third party consultant to ensure the required transparency. In addition to the above, if there are any grievances related to social or environmental management issues in the project area, the GRC will record these grievances and suggestions and pass it on to the relevant consultant for necessary action and follow-up.

In case a dispute is not resolved by arbitrational tribunal, then if any of the Party disagrees, the aggrieved party has the right to appeal to the ordinary courts of law.

However, the preferred option of dispute settlement ought to be the option of settling the dispute amicably because recourse to courts may take a very long time even years before a final decision is made and therefore, should not be the preferred option for both parties concerned.

A grievance form is presented below and hard copies of both English and Bangla will be made available at the MPCL project office.

**Table 10.3-1: Sample Grievance Reporting Form**

Reference No.	Date:
Contact Details	Name
	Address
	Telephone Number/Cell Number:
	Email:
How would you prefer to be contacted (please tick box)	<input type="checkbox"/> By Phone <input type="checkbox"/> By Email
Details of your Grievance: (Please describe the problems, how it happened, when , where, and how many times, as relevant)	
What is your suggested resolution for the grievance?	
Signature of complainant/ Thump impression of complainant	Signature of person filling the form (MPCL Representative )

## **CHAPTER 11: CONCLUSIONS AND RECOMMENDATIONS**

### **11.1 CONCLUSION**

There is no alternative but to add more power generating units to the existing power system of Bangladesh within a shortest possible time frame. This is due not only to meet the increase in demand, but also due to aging of the existing power generating units, many of which will near their life cycle very shortly. Both, base load and peaking plants are necessary to be added to the system, so that the whole system can run economically and efficiently. Gas Engines are most suited for meeting the peaking demand and also have the capacity to run at continuous base load.

In accordance with the agreement with the MPCL, an Environmental and Social Impact Assessment (ESIA) of the 51 MW Gas Fired Power Plant at Ashugonj has been carried out, which included development of an Environmental and Social Management Plan (ESMP), covering both the construction and operational phases of the project. The detailed ESIA of the power plant was conducted following the guideline (GoB, 1997) of the Department of Environment (DoE) of GoB and the relevant operational policies (e.g., OP 4.01) of the World Bank, and in consultation with the Environmental Consultant of World Bank.

In this study, the effects of the project activities on physico-chemical, ecological and socioeconomic (i.e., human interest related) parameters during both construction and operation phases have been assessed. The impacts have been identified, predicted and evaluated, and mitigation measures suggested for both construction and operation phases of the proposed power plant. The important physico-chemical environmental parameters that are likely to be affected by the project activities include air quality and noise level.

The study suggests that most of the adverse impacts on the physico-chemical environment are of low to moderate in nature and therefore, could be offset or minimized if the mitigation measures are adequately implemented. Since the project site is located in a developed area that does not appear to be very sensitive ecologically, the impacts of project activities on most ecological parameters (e.g., floral and faunal habitat and diversity) are mostly insignificant.

Noise level has been identified as a significant potential impact of the proposed power plant during both the construction and operation phases. The noise generated from construction activities during the construction phase might become a source of annoyance at the habitat located close to the project site.

The project workers should not be exposed to the noise produced by the construction equipment for a prolonged period to prevent permanent hearing loss. A rotational work plan is advised for the workers and operators of this equipment. During the operational phase, high level of noise is expected to be generated within the confines of the turbine and

generator installations. Prolonged exposure to such high level of noise may cause permanent hearing loss. Therefore, proper protective measures should be adopted during the operation and inspection of this equipment. Modeling study revealed that the cumulative noise effect of the proposed 51MW gas fired Power plant during the operational phase at a common point is expected to be dominated by the noise generated by the plant nearest to the receptor.

Some adverse impact during the operation phase of the plant will come from thermal emission and NO<sub>x</sub> and PM emission from the power plant. However, modeling study suggests that the effect of increased NO<sub>x</sub> and PM in the ambient air due to emission from the power plants will not be very significant.

The power plant has been constructed within a designated area inside the MPCL owned complex. So there was no need for land acquisition. Additionally, there was no settlement in this designated area, and the area was not used for any income generation activities. Therefore, no population has been displaced and no resettlement was required for the construction of the power plant, and no loss of income was associated with the project.

During operation phase, no significant negative impact is anticipated on socio-economic environmental parameters. Significant positive impacts are expected due to improvement in power supply. This will reduce load shedding in Dhaka city and contribute to the national economy. Well-being of the surrounding population, especially Dhaka city, will be significantly improved due to generation of electricity during peak hours. Currently Dhaka city is reeling under unbearable load shedding.

During public consultations carried out as a part of the ESIA study, people welcomed the proposed power plant project at Ashugonj. However, they recommended installing a plant of good quality, which will be able to provide uninterrupted power and will be able to keep anticipated air and noise pollution to a minimum level.

## **11.2 RECOMMENDATIONS**

An environmental assessment have been carried out for the proposed Midland Power Plant at Ashugonj, which shows low to moderate scale of adverse impacts. These can be reduced to acceptable level through recommended mitigation measures as mentioned in the ESMP. Further, since the project is expected to be financed by the World Bank, it has to comply with the concerned operational policies and guidelines of the Bank in force; so that it is environmentally sound and sustainable. Such compliance will enable the project proponent in improving their environmental performance of the plant during its operational life.. It is also recommended that the environmental and social monitoring plan be effectively implemented in order to identify any changes in the predicted impacts; so that appropriate measures can be taken to off-set any unexpected adverse impacts. Furthermore, the sponsor should also make efforts to strictly follow the conditions imposed by DoE in its environmental clearance.

Apart from risks associated with emissions, noise generation, solid waste, hazardous waste and wastewater disposal as a result of construction and operation activities, the power plant like any other industrial plants, has some inherent risks. These risks arise due to accident/disasters and may even sometime cause loss of life. An emergency response plan (ERP) for the proposed power plant has been developed listing various actions to be performed in a very short period of time in a pre-determined sequence in order to deal effectively and efficiently with any emergency, major accident or natural disaster.

The environmental and Social Management Action Plan (ESMAP) has been effectively implemented during construction period and no untoward events/accidents happened during the period. The EMAP does specify all affected environmental values, all potential impacts on environmental values, mitigation strategies, relevant monitoring together with appropriate indicators and performance criteria, reporting requirements and, if an undesirable impact or unforeseen level of impact occurs, the appropriate corrective actions available in it.



## LIST OF REFERENCES

1. Environment and Engineering Associates, March 2012, Environmental Impact Assessment (ESIA) for “Midland Power Company Ltd.” 51MW Gas Fired Power Plant, Asugonj, Brahmanbaria, Bangladesh.
2. Banglapedia (2003), ‘Banglapedia: National Encyclopedia of Bangladesh (Volume 1 to 10)’, Asiatic Society of Bangladesh, Dhaka, Bangladesh
3. BBS (2011), ‘Bangladesh Population Census 2011’, Bangladesh Bureau of Statistics, Dhaka, Bangladesh.
4. BPDB (2011), Official Website of the Bangladesh Power Development Board, Ministry of Power Energy and Mineral Resources, <http://www.bpdb.gov.bd/bpdb/>
5. BRTC, BUET (2012), Updating the Environmental Impact Assessment of the World Bank Financed 335 MW Combined Cycle Power Plant at Siddhirganj.
6. GoB (1997), Environmental Conservation Rules 1997, Department of Environment, Ministry of Environment and Forest, Government of the People’s Republic of Bangladesh, June 1997.
7. GoB (1997a), EA Guidelines for Industries, Department of Environment, Ministry of Environment and Forest, Government of the People’s Republic of Bangladesh, June 1997.
8. GoB (2005), SRO No. 220-Rule/2005, Revision of the Environment Conservation Rules 1997, Ministry of Environment and Forest, Government of the People’s Republic of Bangladesh, Dhaka.
9. IUCN Bangladesh (2002), Bio-ecological Zones of Bangladesh. The World Conservation Union, Bangladesh Country Office, Dhaka, Bangladesh. pp.139.
10. IUCN Bangladesh (2000a), Red book of Threatened Amphibians and Reptiles of Bangladesh. IUCN-Bangladesh, House 11, Road 138, Gulshan 1, Dhaka, Bangladesh. Pp. 95.
11. IUCN Bangladesh (2000b), Red book of Threatened Birds of Bangladesh. IUCN-Bangladesh, House 11, Road 138, Gulshan 1, Dhaka, Bangladesh. Pp.116.
12. IUCN Bangladesh (2000c), Red book of Threatened Mammals of Bangladesh. IUCN Bangladesh, House 11, Road 138, Gulshan 1, Dhaka, Bangladesh. Pp. 71.
13. IUCN Bangladesh (2000d), Red Book of Threatened Fishes of Bangladesh. IUCN Bangladesh, House 11, Road 138, Gulshan 1, Dhaka, Bangladesh. Pp. 116.
14. Ministry of Power Energy and Mineral Resources (2011), Official website, <http://www.powerdivision.gov.bd/>
15. World Bank Group Environmental Health and Safety Guidelines, International Finance Corporation and the World Bank.
16. World Bank (1999a), Operational Manual –OP 4.01, The World Bank operation manual for environmental assessment, Washington.
17. Environmental Resources Management (S) Pte. Ltd (August 2012), Draft Environmental Impact Assessment Report of 217.9 MW Gas-Fired Combined Cycle Power Plant Project, Bhola, Bangladesh,
18. Uncontrolled Emission Factors For 2-Stroke Lean-Burn Engines information from AP42

## **ANNEX-I to XX**

## ANNEX-I

### The World Bank Operational Manual OP 4.01

#### OP 4.01 - Environmental Assessment

These policies were prepared for use by World Bank staff and are not necessarily a complete treatment of the subject.

OP 4.01  
January, 1999

Note: OP/BP 4.01 *Environmental Assessment*, were revised on April 2013 to take into account the recommendations in “Investment Lending Reform: Modernizing and Consolidating Operational Policies and Procedures” (R2012-0204 [IDA/R2012-0248]), which were approved by the Executive Directors on October 25, 2012. As a result of these recommendations, OP/BP 10.00, *Investment Project Financing*, have been revised, among other things, to incorporate and expand parts of OP/BP 8.00, *Rapid Response to Crises and Emergencies*, and to incorporate OP/BP 8.30, *Financial Intermediary Lending* and OP/BP 13.05, *Supervision*, (which have accordingly been retired). OP/BP 4.01 have consequently been updated to reflect these changes.

Additional information related to these statements is provided in the *Environmental Assessment Sourcebook* (Washington, D.C.: World Bank, 1991) and subsequent updates available from the Environment Sector Board, and in the [World Bank Group Environment, Health and Safety Guidelines \(EHSGs\)](#).<sup>1</sup> Other Bank statements that relate to the environment include OP/BP 4.02, *Environmental Action Plans*; OP/BP 4.04, *Natural Habitats*; OP 4.07, *Water Resources Management*; OP 4.09, *Pest Management*; OP/BP 4.10, *Indigenous Peoples*; OP/BP 4.11, *Physical Cultural Resources*; OP/BP 4.12, *Involuntary Resettlement*; OP/BP 4.36, *Forests*; and OP/BP 10.00, *Investment Project Financing*.

Questions may be addressed to the Safeguard Policies Helpdesk in OPCS ([Safeguards@worldbank.org](mailto:Safeguards@worldbank.org)).

Revised April 2013

1. The Bank<sup>2</sup> requires environmental assessment (EA) of projects proposed for Bank financing to help ensure that they are environmentally sound and sustainable, and thus to improve decision making.

2. EA is a process whose breadth, depth, and type of analysis depend on the nature, scale, and potential environmental impact of the proposed project. EA evaluates a project's potential environmental risks and impacts in its area of influence;<sup>3</sup> examines project alternatives; identifies ways of improving project selection, siting, planning, design, and implementation by preventing, minimizing, mitigating, or compensating for adverse environmental impacts and enhancing positive impacts; and includes the process of mitigating and managing adverse environmental impacts throughout project implementation. The Bank favors preventive measures over mitigatory or compensatory measures, whenever feasible.

3. EA takes into account the natural environment (air, water, and land); human health and safety; social aspects (involuntary resettlement, indigenous peoples, and physical cultural resources);<sup>4</sup> and transboundary and global environmental aspects.<sup>5</sup> EA considers natural and social aspects in an integrated way. It also takes into account the variations in project and country conditions; the findings of country environmental studies; national environmental action plans; the country's overall policy framework, national legislation, and institutional capabilities related to the environment and social aspects; and obligations of the country, pertaining to project activities, under relevant international environmental treaties and agreements. The Bank does not finance project activities that would contravene such country obligations, as identified during the EA. EA is initiated as early as possible in project processing and is integrated closely with the economic, financial, institutional, social, and technical analyses of a proposed project.

4. The borrower is responsible for carrying out the EA. For Category A projects,<sup>6</sup> the borrower retains independent EA experts not affiliated with the project to carry out the EA.<sup>7</sup> For Category A projects that are highly risky or contentious or that involve serious and multidimensional environmental concerns, the borrower should normally also engage an advisory panel of independent, internationally recognized environmental specialists to advise on all aspects of the project relevant to the EA.<sup>8</sup> The role of the advisory panel depends on the degree to which project preparation has progressed, and on the extent and quality of any EA work completed, at the time the Bank begins to consider the project.

5. The Bank advises the borrower on the Bank's EA requirements. The Bank reviews the findings and recommendations of the EA to determine whether they provide an adequate basis for processing the project for Bank financing. When the borrower has completed or partially completed EA work prior to the Bank's involvement in a project, the Bank reviews the EA to ensure its consistency with this policy. The Bank may, if appropriate, require additional EA work, including public consultation and disclosure.

6. The *Pollution Prevention and Abatement Handbook*<sup>9</sup> describes pollution prevention and abatement measures and emission levels that are normally acceptable to the Bank. However, taking into account borrower country legislation and local conditions, the EA may recommend alternative emission levels and approaches to pollution prevention and abatement for the project. The EA report must provide full and detailed justification for the levels and approaches chosen for the particular project or site.

### **EA Instruments**

7. Depending on the project, a range of instruments can be used to satisfy the Bank's EA requirement: environmental impact assessment (EIA), regional or sectoral EA, strategic environmental and social assessment (SESA), environmental audit, hazard or risk assessment, environmental management plan (EMP) and environmental and social management framework (ESMF).<sup>10</sup> EA applies one or more of these instruments, or elements of them, as appropriate. When the project is likely to have sectoral or regional impacts, sectoral or regional EA is required.<sup>11</sup>

### **Environmental Screening**

8. The Bank undertakes environmental screening of each proposed project to determine the appropriate extent and type of EA. The Bank classifies the proposed project into one of four categories, depending on the type, location, sensitivity, and scale of the project and the nature and magnitude of its potential environmental impacts.

(a) *Category A*: A proposed project is classified as Category A if it is likely to have significant adverse environmental impacts that are sensitive,<sup>12</sup> diverse, or unprecedented. These impacts may affect an area broader than the sites or facilities subject to physical works. EA for a Category A project examines the project's potential negative and positive environmental impacts, compares them with those of feasible alternatives (including the "without project" situation), and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance. For a Category A project, the borrower is responsible for preparing a report, normally an EIA (or a suitably comprehensive regional or sectoral EA) that includes, as necessary, elements of the

other instruments referred to in para. 7.

(b) *Category B*: A proposed project is classified as Category B if its potential adverse environmental impacts on human populations or environmentally important areas—including wetlands, forests, grasslands, and other natural habitats—are less adverse than those of Category A projects. These impacts are site-specific; few if any of them are irreversible; and in most cases mitigatory measures can be designed more readily than for Category A projects. The scope of EA for a Category B project may vary from project to project, but it is narrower than that of Category A EA. Like Category A EA, it examines the project's potential negative and positive environmental impacts and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance. The findings and results of Category B EA are described in the project documentation (Project Appraisal Document and Project Information Document).<sup>13</sup>

(c) *Category C*: A proposed project is classified as Category C if it is likely to have minimal or no adverse environmental impacts. Beyond screening, no further EA action is required for a Category C project.

(d) *Category FI*: A proposed project is classified as Category FI if it involves investment of Bank funds through a financial intermediary, in subprojects that may result in adverse environmental impacts.

### **EA for Special Project Types**

#### *Projects Involving Subprojects*

9. For projects involving the preparation and implementation of annual investment plans or subprojects, identified and developed over the course of the project period during the preparation of each proposed subproject, the project coordinating entity or implementing institution carries out appropriate EA according to country requirements and the requirements of this policy.<sup>14</sup> The Bank appraises and, if necessary, includes in the SIL components to strengthen, the capabilities of the coordinating entity or the implementing institution to (a) screen subprojects, (b) obtain the necessary expertise to carry out EA, (c) review all findings and results of EA for individual subprojects, (d) ensure implementation of mitigation measures (including, where applicable, an EMP), and (e) monitor environmental conditions during project implementation.<sup>15</sup> If the Bank is not satisfied that adequate capacity exists for carrying out EA, all Category A subprojects and, as appropriate, Category B subprojects—including any EA reports—are subject to prior review and approval by the Bank.

#### *Projects Involving Financial Intermediaries*

10. For a project involving a financial intermediary (FI), the Bank requires that each FI screen proposed subprojects and ensure that subborrowers carry out appropriate EA for each subproject. Before approving a subproject, the FI verifies (through its own staff, outside experts, or existing environmental institutions) that the subproject meets the environmental requirements of appropriate national and local authorities and is consistent with this OP and other applicable environmental policies of the Bank.<sup>16</sup>

11. In appraising a proposed FI operation, the Bank reviews the adequacy of country environmental requirements relevant to the project and the proposed EA arrangements for subprojects, including the mechanisms and responsibilities for environmental screening and review of EA results. When necessary, the Bank ensures that the

project includes components to strengthen such EA arrangements. For FI operations expected to have Category A subprojects, prior to the Bank's appraisal each identified participating FI provides to the Bank a written assessment of the institutional mechanisms (including, as necessary, identification of measures to strengthen capacity) for its subproject EA work.<sup>17</sup> If the Bank is not satisfied that adequate capacity exists for carrying out EA, all Category A subprojects and, as appropriate, Category B subprojects--including EA reports--are subject to prior review and approval by the Bank.<sup>18</sup>

*Projects in Situations of Urgent Need of Assistance or Capacity Constraints under [OP 10.00](#)*

12. The policy set out in OP 4.01 normally applies to projects processed under paragraph 11 of [OP/BP 10.00](#), *Investment Project Financing*. However, when compliance with any requirement of this policy would prevent the effective and timely achievement of the objectives of such a project, the Bank may (subject to the limitations set forth in paragraph 11 of [OP 10.00](#)) exempt the project from such a requirement. The justification for any such exemption is recorded in the project documents. In all cases, however, the Bank requires at a minimum that (a) the extent to which the situation of urgent need of assistance or the capacity constraints were precipitated or exacerbated by inappropriate environmental practices be determined as part of the preparation of such projects, and (b) any necessary corrective measures be built into either the project or a future lending operation.

### **Institutional Capacity**

13. When the borrower has inadequate legal or technical capacity to carry out key EA-related functions (such as review of EA, environmental monitoring, inspections, or management of mitigatory measures) for a proposed project, the project includes components to strengthen that capacity.

### **Public Consultation**

14. For all Category A and B projects proposed for IBRD or IDA financing, during the EA process, the borrower consults project-affected groups and local nongovernmental organizations (NGOs) about the project's environmental aspects and takes their views into account. The borrower initiates such consultations as early as possible. For Category A projects, the borrower consults these groups at least twice: (a) shortly after environmental screening and before the terms of reference for the EA are finalized; and (b) once a draft EA report is prepared. In addition, the borrower consults with such groups throughout project implementation as necessary to address EA-related issues that affect them.<sup>19</sup>

### **Disclosure**

15. For meaningful consultations between the borrower and project-affected groups and local NGOs on all Category A and B projects proposed for IBRD or IDA financing, the borrower provides relevant material in a timely manner prior to consultation and in a form and language that are understandable and accessible to the groups being consulted.

16. For a Category A project, the borrower provides for the initial consultation a summary of the proposed project's objectives, description, and potential impacts; for consultation after the draft EA report is prepared, the borrower provides a summary of the EA's conclusions. In addition, for a Category A project, the borrower makes the draft EA report available at a public place accessible to project-affected groups and local NGOs. For projects described in paragraph 9 above, the borrower/FI ensures that EA reports for Category A subprojects are made available in a

public place accessible to affected groups and local NGOs.

17. Any separate Category B report for a project proposed for IDA financing is made available to project-affected groups and local NGOs. Public availability in the borrowing country and official receipt by the Bank of Category A reports for projects proposed for IBRD or IDA financing, and of any Category B EA report for projects proposed for IDA funding, are prerequisites to Bank appraisal of these projects.

18. Once the borrower officially transmits the Category A EA report to the Bank, the Bank distributes the summary (in English) to the executive directors (EDs) and makes the report available through its InfoShop. Once the borrower officially transmits any separate Category B EA report to the Bank, the Bank makes it available through its InfoShop.<sup>20</sup> If the borrower objects to the Bank's releasing an EA report through the World Bank InfoShop, Bank staff (a) do not continue processing an IDA project, or (b) for an IBRD project, submit the issue of further processing to the EDs.

## Implementation

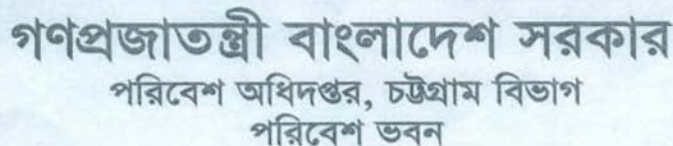
19. During project implementation, the borrower reports on (a) compliance with measures agreed with the Bank on the basis of the findings and results of the EA, including implementation of any EMP, as set out in the project documents; (b) the status of mitigatory measures; and (c) the findings of monitoring programs. The Bank bases supervision of the project's environmental aspects on the findings and recommendations of the EA, including measures set out in the legal agreements, any EMP, and other project documents.<sup>21</sup>

- 
1. World Bank Group Environment, Health and Safety Guidelines (EHSs) have replaced the 1998 Pollution Prevention and Abatement Handbook (PPAH). Guidelines as to what constitutes acceptable pollution prevention and abatement measures and emission levels in a Bank financed project can be found in the EHSs. For complete reference, consult the [World Bank Group Environmental Health and Safety Guidelines](#). Please check the website [[www1.ifc.org/wps/wcm/connect/Topics\\_Ext\\_Content/IFC\\_External\\_Corporate\\_Site/IFC+Sustainability/Sustainability+Framework/Environmental,+Health,+and+Safety+Guidelines/](http://www1.ifc.org/wps/wcm/connect/Topics_Ext_Content/IFC_External_Corporate_Site/IFC+Sustainability/Sustainability+Framework/Environmental,+Health,+and+Safety+Guidelines/)] for the most recent version.
  2. "Bank" includes IBRD and IDA; "EA" refers to the entire process set out in OP/BP 4.01; "loans" includes IDA credits and IDA grants; "borrower" includes, for guarantee operations, a private or public project sponsor receiving from another financial institution a loan guaranteed by the Bank; and "project" covers all operations financed by Investment Project Financing or Bank guarantees ("project" does not cover operations supported by Development Policy lending (for which the environmental provisions are set out in OP/BP 8.60, *Development Policy Lending*), or operations supported by Program-for-Results Financing (for which environmental provisions are set out in OP/BP 9.00, *Program-for-Results Financing*) and also includes projects and components funded under the Global Environment Facility. The project is described in the Loan/Credit/Grant Agreement. This policy applies to all components of the project, regardless of the source of financing.
  3. For definitions, see [Annex A](#). The area of influence for any project is determined with the advice of environmental specialists and set out in the EA terms of reference.
  4. See OP/BP 4.12, *Involuntary Resettlement*; OP/BP 4.10, *Indigenous Peoples*; and OP/BP 4.11, *Physical Cultural Resources*.
  5. Global environmental issues include climate change, ozone-depleting substances, pollution of international waters, and adverse impacts on biodiversity.
  6. For screening, see para. 8.
  7. EA is closely integrated with the project's economic, financial, institutional, social, and technical analyses to ensure that (a) environmental considerations are given adequate weight in project selection, siting, and design decisions; and (b) EA does not delay project processing. However, the borrower ensures that when individuals or entities are engaged to carry out EA activities, any conflict of interest is avoided. For example, when an independent EA is required, it is not carried out by the consultants hired to prepare the engineering design.
  8. The panel (which is different from the dam safety panel required under OP/BP 4.37, *Safety of Dams*) advises the borrower specifically on the following aspects: (a) the terms of reference for the EA, (b) key issues and methods for preparing the EA, (c) recommendations and findings of the EA, (d) implementation of the EA's recommendations, and (e) development of environmental management capacity.
  9. See footnote 1.

10. These terms are defined in [Annex A](#).
11. Annexes Guidance on the use of sectoral and regional EA is available in [EA Sourcebook Updates 4 and 15](#).
12. A potential impact is considered "sensitive" if it may be irreversible (e.g., lead to loss of a major natural habitat) or raise issues covered by [OP 4.04, Natural Habitats](#); [OP/BP 4.10, Indigenous Peoples](#); [OP/BP 4.11, Physical Cultural Resources](#) or [OP 4.12, Involuntary Resettlement](#).
13. When the screening process determines, or national legislation requires, that any of the environmental issues identified warrant special attention, the findings and results of Category B EA may be set out in a separate report. Depending on the type of project and the nature and magnitude of the impacts, this report may include, for example, a limited environmental impact assessment, an environmental mitigation or management plan, an environmental audit, or a hazard assessment. For Category B projects that are not in environmentally sensitive areas and that present well-defined and well-understood issues of narrow scope, the Bank may accept alternative approaches for meeting EA requirements: for example, environmentally sound design criteria, siting criteria, or pollution standards for small-scale industrial plants or rural works; environmentally sound siting criteria, construction standards, or inspection procedures for housing projects; or environmentally sound operating procedures for road rehabilitation projects.
14. In addition, if there are sectorwide issues that cannot be addressed through individual subproject EAs (and particularly if the project is likely to include Category A subprojects), the borrower may be required to carry out sectoral EA before the Bank appraises the project.
15. Where, pursuant to regulatory requirements or contractual arrangements acceptable to the Bank, any of these review functions are carried out by an entity other than the coordinating entity or implementing institution, the Bank appraises such alternative arrangements; however, the borrower/coordinating entity/implementing institution remains ultimately responsible for ensuring that subprojects meet Bank requirements.
16. The requirements for projects involving FI are derived from the EA process and are consistent with the provisions of para. 6 of this OP. The EA process takes into account the type of finance being considered, the nature and scale of anticipated subprojects, and the environmental requirements of the jurisdiction in which subprojects will be located.
17. Any FI included in the project after appraisal complies with the same requirement as a condition of its participation.
18. The criteria for prior review of Category B subprojects, which are based on such factors as type or size of the subproject and the EA capacity of the financial intermediary, are set out in the legal agreements for the project.
19. For projects with major social components, consultations are also required by other Bank policies--for example, [OP/BP 4.10, Indigenous Peoples](#), and [OP/BP 4.12, Involuntary Resettlement](#).
20. For a further discussion of the Bank's disclosure procedures, see [The World Bank Policy on Access to Information](#) which as of July 1, 2010, replaced *The World Bank Policy on Disclosure of Information*. Specific requirements for disclosure of resettlement plans and indigenous peoples development plans are set out in [OP/BP 4.10, Indigenous Peoples](#), and [OP/BP 4.12, Involuntary Resettlement](#).
21. See [OP/BP 10.00, Investment Project Financing](#).



# Environmental Clearance Certificate (ECC) of DOE



नम्रत ०२२५

বাংলাদেশ পরিবেশ সংরক্ষণ আইন, ১৯৯৫-এর ১২ ধারা এবং পরিবেশ সংরক্ষণ বিধিমালা ১৯৯৭-এর ৭ বিধি অনুসারে পরিবেশগত ছাড়পত্র

স্মারক সংখ্যা: পদ/সি/স্বাস্থ্য-১৭৭৪০/২০১২/ ৩৩৬

24/12/2020

୧୧/୦୫/୨୦୧୫ ପ୍ରିଣ୍ଟାଉଟ

বিষয় : মিডিয়াসহ শাহজাদ কোম্পানী লি. মাসিক বিন্যাস উৎপাদন কোম্পার অন্তর্ভুক্ত পরিবেশনাৎ ২৪৩৭৫ (শ্রেণীঃ "মাল")

প্রাক্ষরিকভাবে ফোনের আওতাধীন উপজেলায় অবস্থিত মিজল্লাজ পাওয়ার বেস্টমনি সি. ন্যাক বিল্ডার উপগ্রামের কেন্দ্রের অনুষ্ঠানে পরিবেশের ক্ষতিপূরণের জন্য ০৬/০১/২০১৪ ইং তারিখে আবেদনকারী ও জনস্বার্থার্থী বিনিয়োগকারীরা দীর্ঘকাল ধরে বিবাদিত কাগজপত্র/তথ্যাদি পর্যালোচনা ও সমীক্ষা করার সত্ত্বেও পরিদপ্তর পরিদর্শনকারী পরিবেশ সংরক্ষণ বোর্ডের, ১৯৯৬ সালের "লান" শ্রেণিকৃত বিধিমালায় সর্বমুখ্য পরিবেশের পরিচালনা ক্ষমতা বিধিত ৩৮৪ নম্বর সভার ১৯ নম্বর সিদ্ধান্ত মোতাবেক নির্দিষ্ট শর্ত পরিবেশের ক্ষতিপূরণ করা হওয়া।

॥१॥

- [illegible]

জনাব ফিরোজ আলম  
গ্ৰাউন্ড ব্যবস্থাপক  
মেগাস মিডিয়ায়াক শাওর কোম্পানী লিমিটেড  
ঠিকানা: চৌধুরীকলা, পো: আতপল্লী, জেলা: ব্রাহ্মণবাড়িয়া

( মোঃ জাহাঙ্গীর আলম )

अविभाज्य

7374-522-9926

10

## ANNEX III- AMBIENT AIR QUALITY MONITORING RESULTS

---

Sample code	Sample Collection Date	Ambient Air Pollutants Concentration ( $\mu\text{g}/\text{m}^3$ )		
		SO <sub>2</sub>	NO <sub>x</sub>	CO
AQ-1	28-Sep-14	27.45	42.61	340
	3-Oct-14	21.52	36.84	280
	8-Oct-14	18.23	26.68	175
	14-Oct-14	20.38	32.08	225
AQ-2	29-Sep-14	12.32	25.48	120
	4-Oct-14	9.45	16.31	80
	10-Oct-14	10.55	18.56	90
	16-Oct-14	13.87	21.32	100
AQ-3	1-Oct-14	9.76	20.51	90
	6-Oct-14	11.34	13.62	70
	12-Oct-14	8.02	10.26	40
	17-Oct-14	9.51	18.15	60

## ANNEX IV-CHECKLIST OF FLORA

### Cropland Vegetation: 13 species

**IUCN Status:** CR – Critically Endangered, EN - Endangered, VU – Vulnerable, LR – Lower Risk/LC-Least Concern, DD- Data Deficient, NA- Not Available

**Local Status:** VC – Very Common C – Common, R – Rare, VR – Very rare

Sl.	Common Name	Family Name	Scientific Name	Habit	Usage	IUCN Status	Local Status
1.	Indian Acalypha	Euphorbiaceae	<i>Acalypha indica</i>	Herb	Medicine	NA	C
2.	Sessile Joyweed	Amaranthaceae	<i>Alternanthera sessilis</i>	Herb	Medicine	NA	C
3.	Prickly Chaff Flower	Amaranthaceae	<i>Achyranthes aspera</i>	Herb	Medicine	NA	C
4.	Spiny amaranth	Amaranthaceae	<i>Amaranthus spinosus</i>	Herb	Medicine	NA	VC
5.	Crown flower	Asclepiadaceae	<i>Calotropis gigantea</i>	Shrub	Medicine & Ornamental	NA	C
6.	Buttonweeds	Compositae	<i>Cotula hemisphaerica</i>	Herb	Medicine & Ornamental	NA	VC
7.	Australian Dodder	Convolvulaceae	<i>Cuscuta australis</i>	Herb	Medicine	NA	C
8.	Bermuda grass	Poaceae	<i>Cynodon dactylon</i>	Shrub	Medicine	NA	VC
9.	Creeping lickstoop	Rubiaceae	<i>Dentella repens</i>	Herb	Medicine	NA	C
10.	Creeping woodsorrel	Oxalidaceae	<i>Oxalis corniculata</i>	Herb	Medicine	NA	C
11.	Knotweed	Polygonaceae	<i>Polygonum sp.</i>	Herb	-	NA	C
12.	Sesbania	Leguminosae	<i>Sesbania rostrata</i>	Shrub	Fuel wood	NA	VC
13.	Rorippa	Cruciferae	<i>Rorippa indica</i>	Herb	Medicine	NA	C

### Homestead Vegetation: 32 species

**IUCN Status:** CR – Critically Endangered, EN - Endangered, VU – Vulnerable, LR – Lower Risk/LC-Least Concern, DD- Data Deficient

**Local Status:** VC – Very Common C – Common, R – Rare, VR – Very rare

Sl.	Common Name	Family Name	Scientific Name	Habit	Usage	IUCN Status	Local Status
1.	Stone apple	Rutaceae	<i>Aegle marmelos</i>	Tree	Fruit & Medicine	Not Available	R
2.	White siris	Leguminosae	<i>Albizia procera</i>	Tree	Timber and fuel wood	Not Available	C
3.	Blackboard tree	Apocynaceae	<i>Alstonia scholaris</i>	Tree	Timber	LC	R
4.	Kadam	Rubiaceae	<i>Anthocephalus chinensis</i>	Tree	Timber and fuel wood	Not Available	C
5.	Betel nut palm	Palmae	<i>Areca catechu</i>	Tree	Fruit and Timber	Not Available	VC
6.	Jackfruit	Moraceae	<i>Artocarpus heterophyllus</i>	Tree	Fruit, Timber and fuel wood	Not Available	C
7.	Neem	Meliaceae	<i>Azadirachta indica</i>	Tree	Timber and medicine	Not Available	C
8.	Bamboo	Gramineae	<i>Bambusa sp.</i>	Tree	Thatching	Not Available	VC
9.	Cotton tree	Bombacaceae	<i>Bombax ceiba</i>	Tree	Cotton and Fuel wood	Not Available	C
10.	Papaya	Caricaceae	<i>Carica papaya</i>	Shrub	Fruit	Not Available	C
11.	Kola	Umbelliferae	<i>Centella asiatica</i>	Herb	Medicine and Vegetables	Not Available	C
12.	Queen of the night	Compositae	<i>Cestrum nocturnum</i>	Shrub	Ornamental	Not Available	R
13.	Pomelo	Rutaceae	<i>Citrus grandis</i>	Tree	Fruit	Not Available	C
14.	Coconut	Palmae	<i>Cocos nucifera</i>	Tree	Fruit and Fuel wood	Not Available	VC
15.	Gaabh Herb	Ebanaceae	<i>Diospyros peregrina</i>	Tree	Fruit	Not Available	C
16.	Hairy Fig	Moraceae	<i>Ficus hispida</i>	Tree	Fruit and Fuel wood	Not Available	VC
17.	Lychee	Sapindaceae	<i>Litchi chinensis</i>	Tree	Fruit	Not Available	C

Sl.	Common Name	Family Name	Scientific Name	Habit	Usage	IUCN Status	Local Status
18.	Mango	Anacardiaceae	<i>Mangifera indica</i>	Tree	Fruit and Timber	Not Available	VC
19.	Banana	Musaceae	<i>Musa paradisiaca var. sapientum</i>	Shrub	Fruit	Not Available	VC
20.	Hoary basil	Labiatae	<i>Ocimum americanum</i>	Herb	Medicine	Not Available	R
21.	Guava	Myrtaceae	<i>Psidium guajava</i>	Shrub	Fruit	Not Available	C
22.	Golden apple	Anacardiaceae	<i>Spondias dulcis</i>	Tree	Fruit	Not Available	R
23.	Mahogany	Meliaceae	<i>Swietenia mahagoni</i>	Tree	Timber and medicine	LC	C
24.	Night-flowering Jasmine	Oleaceae	<i>Nyctanthes arbortristis</i>	Shrub	Ornamental	Not Available	C
25.	Passion fruit	Passifloraceae	<i>Passiflora edulis</i>	Vine	Fruit & Ornamental	Not Available	VR
26.	Beechwood	Lamiaceae	<i>Gmelina arborea</i>	Tree	Timber	Not Available	C
27.	Rangan	Rubiaceae	<i>Ixora Coccinea</i>	Shrub	Ornamental	Not Available	C
28.	Hibiscus	Malvaceae	<i>Hibiscus rosa-sinensis</i>	Shrub	Ornamental	Not Available	VC
29.	Royal Poinciana	Fabaceae	<i>Delonix regia</i>	Tree	Ornamental	VU	R
30.	Lemon	Rutaceae	<i>Citrus limon</i>	Shrub	Fruit	Not Available	VC
31.	Eucalyptus	Myrtaceae	<i>Eucalyptus obliqua</i>	Tree	Timber	Not Available	C
32.	Rain Tree	Fabaceae	<i>Samanea saman</i>	Tree	Timber & Ornamental	Not Available	C

### Wetland Vegetation: 17

**IUCN Status:** CR – Critically Endangered, EN - Endangered, VU – Vulnerable, LR – Lower Risk/LC-Least Concern, DD- Data Deficient, NA-Not Available

**Local Status:** VC – Very Common C – Common, R – Rare, VR – Very rare

Sl.	Common Name	Family Name	Scientific Name	Habit	IUCN Status	Local Status
1.	Alligator weed	Amaranthaceae	<i>Alternanthera philoxeroides</i>	Herb	NA	C
2.	Water spinach	Convolvulaceae	<i>Ipomoea reptans</i>	Herb		
3.	Water Sprite	Pteridaceae	<i>Ceratopteris thalictroides</i>	Herb	NA	C
4.	Common water hyacinth	Pontaderiaceae	<i>Eichhornia crassipes</i>	Herb	NA	VC
5.	Helencha	Cyperaceae	<i>Altemathera philoxeroides</i>	Herb	NA	VC
6.	Minute duckweed	Lemnaceae	<i>Lemna perpusilla</i>	Herb	NA	C
7.	Four Leaf Clover	Mersileaceae	<i>Marsilea quadrifolia</i>	Herb	LC	C
8.	Arrow Leaf Pondweed	Pontaderiaceae	<i>Monochoria hatata</i>	Herb	NA	C
9.	Water Lily	Nymphaeaceae	<i>Nymphaea nouchali</i>	Herb	LC	VC
10.	Jointweed	Polygonaceae	<i>Polygonum barbatum</i>	Herb	NA	C
11.	Denseflower knotweed	Polygonaceae	<i>Polygonum glabrum</i>	Herb	NA	C
12.	Bishkatali	Polygonaceae	<i>Polygonum lanatum</i>	Herb	NA	C
13.	Asian Watermoss	Salviniaceae	<i>Salvina cucullata</i>	Herb	NA	C
14.	Common duckweed	Lemnaceae	<i>Spirodela polyrhiza</i>	Herb	LC	C
15.	Watermeal	Lemnaceae	<i>Wolffia microscopica</i>	Herb	NA	C
16.	Sticky Nightshade	Solanaceae	<i>Solanum sisymbriifolium</i>	Shrub	NA	C
17.	Water lettuce	Araceae	<i>Pistia stratiotes</i>	Herb	NA	C

## ANNEX-V: CHECKLIST OF FAUNA

### **Birds: 14 Species**

**IUCN Status:** CR – Critically Endangered, EN - Endangered, VU – Vulnerable, LR – Lower Risk/LC-Least Concern, DD- Data Deficient, \* This taxon has not yet been assessed = NYA

**Local Status:** CR – Common Resident, C – Common, UR – Uncommon Resident, RR – Rare Resident, V – Vagrant

**Birdlife Status:** EX – Extinct, EW - Extinct In The Wild, CR - Critically Endangered, CR (PE) - Critically Endangered (Possibly Extinct), CR (PEW) - Critically Endangered (Possibly Extinct In the Wild), EN – Endangered, VU – Vulnerable, NT - Near Threatened, LC - Least Concern, DD - Data Deficient

Sl.	Common Name	Family Name	Scientific Name	IUCN Status	Birdlife Status	Local Status
1.	Red-vented Bulbul	Passerines	<i>Pycnonotus cafer</i>	LC	LC	CR
2.	House Crow	Corvidae	<i>Corvus splendens</i>	NYA	LC	CR
3.	Spotted Dove	Columbidae	<i>Streptopelia chinensis</i>	NYA	-	CR
4.	House Sparrow	Passeridae	<i>Passer domesticus</i>	LC	LC	CR
5.	Oriental Magpie-Robin	Muscicapidae	<i>Copsychus saularis</i>	LC	LC	CR
6.	Black Drongo	Dicruridae	<i>Dicrurus macrocercus</i>	LC	LC	C
7.	Common Flame-backed Woodpecker	Picidae	<i>Dinopium javanense</i>	LC	LC	RR
8.	Common Myna	Sturnidae	<i>Acridotheres tristis</i>	LC	LC	C
9.	Jungle Myna	Sturnidae	<i>Acridotheres fuscus</i>	LC	LC	CR
10.	Black-breasted Weaver	Ploceidae	<i>Ploceus benghalensis</i>	LC	LC	UR
11.	Common Pigeon	Columbidae	<i>Columba livia</i>	LC	LC	CR
12.	Black-hooded Oriole	Oriolidae	<i>Oriolus xanthornus</i>	LC	LC	UR
13.	Common Tailorbird	Sylviidae	<i>Orthotomus sutorius</i>	LC	LC	C
14.	Black Kite	Accipitridae	<i>Milvus migrans</i>	LC	LC	V



## Undertaking

We, Midland Power Co. Ltd. have procured 717.30 Decimal of null land at Char Chartala, Ashuganj, Brahmanbaria for implementing 51 MW Gas Base IPP power plant.

We hereby certify that-

01. The land were procured as a willing buy and willing seller term basis; and
02. There is no squatter or did not ascertained in any involuntary resettlement.

Details of Land are as follows:

District	Thana	Mouza	BS Khatian No.	Dag No.
Brahmanbaria	Ashuganj	Char Chartola	3516 , 3517, 3518, 3502 1650, 1655	CS: 1240/3543 SA:1240/3543
			16, 3503, 3504, 3521, 1661, 3515, 3516, 3518, 1650, 3502	CS: 1210, 1240 SA:1210, 1240

Details of Title Deeds are as follows:

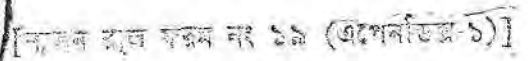
Sl.No.	Deed No.	Seller Name	Seller Address	Seller Contract Number	Area of Land (decimals)	Price Per decimal BDT	Date of Purchase
01.	3571	Syed Md. Faisal	House No: 34, Road No:136, Gulshan, Dhaka-1216	Not Available	91.675	76,629.40	18.12.2011
		Syed A.B.M Humayan	House No: 34, Road No:136, Gulshan, Dhaka-1216	Not Available	91.675	76,629.40	18.12.2011
		Syed A.F.M Shahjahan	House No: 34, Road No:136, Gulshan, Dhaka-1216	Not Available	91.675	76,629.40	18.12.2011
		Syed A.K.M Selim	House No: 34, Road No:136, Gulshan, Dhaka-1216	Not Available	91.675	76,629.40	18.12.2011
02.	3570	Syed Mohammad Kaiser	House No: 34, Road No:136, Gulshan, Dhaka-1216	Not Available	70.120	76,725.61	18.12.2011
		Syed Md. Faisal	House No: 34, Road No:136, Gulshan, Dhaka-1216	Not Available	70.120	76,725.61	18.12.2011
		Syed A.B.M Humayan	House No: 34, Road No:136, Gulshan, Dhaka-1216	Not Available	70.120	76,725.61	18.12.2011
		Syed A.F.M Shahjahan	House No: 34, Road No:136, Gulshan, Dhaka-1216	Not Available	70.120	76,725.61	18.12.2011
		Syed A.K.M Selim	House No: 34, Road No:136, Gulshan, Dhaka-1216	Not Available	70.120	76,725.61	18.12.2011

We also certify that the information stated above is correct to the best of our knowledge and belief.



**Feroz Alam**  
Managing Director





॥ श्रीगणेशाय नमः ॥

[illegible]

6890 265289 2022

নবমাসের ত্রিভুজিক নং

[illegible]

দরখাস্তের তারিখ

2

তালপীর বৎসর/বৎসরসমূহ

উত্তরঃ

যে অফিসের সেক্রেট তালিকা করা অথবা দেখা হইবে উহার নাম

অন্যান্য সাপেক্ষে ব্যক্তি বা সম্পত্তির নাম

2,4600,000

দাশিন্বেয় শ্রীকার

যে রেকর্ড দেখা হইবে তাহার প্রকরণ (রোজাসমুদৃত নব্বির বেলার ভহার জন, নখর, বই, বালায় ও পুষ্ঠা)

কাহার নিকট হইতে প্রাপ্ত

যে দক্ষিণে বিল জয় হইল—

FL (5) (1)

11 (5) (11)

(2)

কক্স অফিসের নথি নং-৪৪/০৫-০৬/১৯৭৭

ଅନୁମତି — ଗୋପବନ୍ଧୁ ମାତ୍ର - ୨୭/୩/୫୫

2-266000

2-200

2-2001

22-000-331

জান-বেলিস্টার

श्री. कृष्णबाई

כב | כז | עב

জনপ্রজাতন্ত্রী বাংলাদেশ সরকার

৳২০



৳২০

বিশ টাকা

০৪৭৯০০৫

১৮-১২-২০১১

৩৫৮৯

১৮-১২-২০১১

১৮-১২-২০১১

১৮-১২-২০১১

১৮-১২-২০১১

১৮-১২-২০১১

১৮-১২-২০১১

১৮-১২-২০১১

১৮-১২-২০১১

১৮-১২-২০১১

১৮-১২-২০১১

১৮-১২-২০১১

১৮-১২-২০১১

১৮-১২-২০১১

১৮-১২-২০১১

৩৫৮৯

১৮-১২-২০১১

১৮-১২-২০১১

১৮-১২-২০১১

১৮-১২-২০১১

১৮-১২-২০১১

২০১১

৩৫৮৯

১৮-১২-২০১১

১৮-১২-২০১১

১৮-১২-২০১১

১৮-১২-২০১১

১৮-১২-২০১১

১৮-১২-২০১১

১৮-১২-২০১১

২০১১

৩৫৮৯

১৮-১২-২০১১

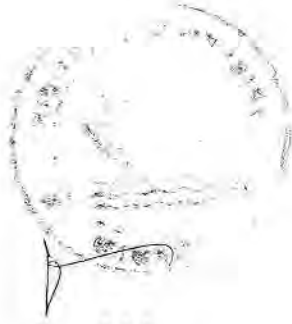
১৮-১২-২০১১

১৮-১২-২০১১

১৮-১২-২০১১

দলিলের প্রকৃতি	মোজার নাম	ইউনিয়ন / ওয়ার্ড	থানা / উপজেলা	জেলা
সাফ কবলা	চরচারতলা	চরচারতলা	আশুগঞ্জ	ব্রাহ্মনবাড়ীয়া
হস্তান্তরিত সম্পত্তির পরিমাণ		জমির শ্রেণী	মূল্য (অংকে ও কথায়)	
৩৫০.৬০ (তিনশত পঞ্চাশ দশমিক ছয় শূন্য) শতাংশ ভূমি।		নাল	সম্পত্তির মোট মূল্য = ২,৬৯,০০,০০০/- (দুই কোটি ঊনসত্তর লক্ষ) টাকা মাত্র।	

০৮-  
১৫/০৮/১৮  
১৮/০৮/১৮  
১৯/০৮/১৮  
২০/০৮/১৮  
২১/০৮/১৮  
২২/০৮/১৮  
২৩/০৮/১৮  
২৪/০৮/১৮  
২৫/০৮/১৮  
২৬/০৮/১৮  
২৭/০৮/১৮  
২৮/০৮/১৮  
২৯/০৮/১৮  
৩০/০৮/১৮  
৩১/০৮/১৮



Syed md Faisal  
Syed Abm Humayun  
Syed FAm Shagahan  
Syed AKm Salim

Syed md Faisal

০৮/০৮/১৮

সাব-রেজিস্ট্রার  
আওল  
১৮/০৮/১৮

দলিল গ্রহীতাগণের নাম ও ঠিকানা : (আদালত, সরকারী বা বেসরকারী প্রতিষ্ঠানের ক্ষেত্রে ছবি প্রযোজ্য নয়) :

নাম : মিডল্যান্ড পাওয়ার কোং লিঃ  
[যাহার রেজি নং-সি-৯৭২৬৭/১১, তাং-২৭/১১/২০১১]  
ইয়ুথ টাওয়ার, ৮২২/২ রোকেয়া স্মরনী, মিরপুর, ঢাকা।  
এর পক্ষে- পরিচালক

নাম : রেজাকুল হায়দার  
পিতার নাম : মরহুম মুসী আব্দুল মান্নান  
মাতার নাম : জিন্নাতের নূর  
জন্ম তারিখ : ০১/০২/১৯৫৪ ইং  
ধর্ম : ইসলাম  
পেশা : ব্যবসা  
জাতীয়তা : বাংলাদেশী  
জাতীয় পরিচিতি নং : ২৬৯১৬৪৯১১৩০৫৯

স্থায়ী ঠিকানা : বর্তমান ঠিকানা :

ইয়ুথ টাওয়ার, ৮২২/২ রোকেয়া স্মরনী, মিরপুর, ঢাকা।	ইয়ুথ টাওয়ার, ৮২২/২ রোকেয়া স্মরনী, মিরপুর, ঢাকা।
--	--

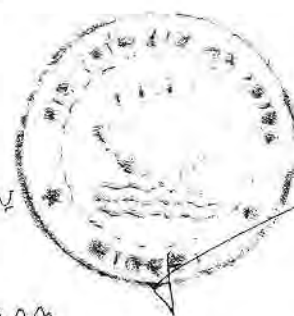
৪। দলিল দাতাগণের নাম ও ঠিকানা : (আদালত, সরকারী বা বেসরকারী প্রতিষ্ঠানের ক্ষেত্রে ছবি প্রযোজ্য নয়)।

(ক) নাম : সৈয়দ মোহাম্মদ কায়সার  
পিতার নাম : মরহুম সৈয়দ মঈদ উদ্দিন আহাম্মদ  
মাতার নাম : বেগম হামিদা বানু  
জন্ম তারিখ : ১৯/০৬/১৯৪০ ইং  
ধর্ম : ইসলাম  
পেশা : ব্যবসা  
জাতীয়তা : বাংলাদেশী  
জাতীয় পরিচিতি নং : ৩৬১৭১৮৬১২৬৫০২  
স্থায়ী ঠিকানা : বর্তমান ঠিকানা :

সাং-ইটাখোলা (সাহেব বাড়ী), ডাকঘর-সায়হামনগর-৩৩৩৩, থানা-মাধবপুর, জেলা-হবিগঞ্জ।	বাড়ী নং-৩৪, রোড নং-১৩৬, গুলশান, ঢাকা-১২১২।
---	---

হুজির মোহাম্মদ ও সৈয়দ  
[Signature]  
Director  
midlandpower co ltd

স্বাক্ষরিত, মোহাম্মদ ফয়সাল  
 সৈয়দ মোহাম্মদ ফয়সাল  
 সৈয়দ মোহাম্মদ ফয়সাল  
 সৈয়দ মোহাম্মদ ফয়সাল  
 সৈয়দ মোহাম্মদ ফয়সাল  
 সৈয়দ মোহাম্মদ ফয়সাল



Syed md Aisul  
 Syed md Faisal  
 Syed ABM Humayun  
 Syed FAM Shagahon  
 Syed AKM Salem

সৈয়দ মোহাম্মদ ফয়সাল : নাম  
 (মহম্মদ-ফয়সাল) পিতার নাম : মরহুম সৈয়দ মঈদ উদ্দিন আহাম্মদ  
 মাতার নাম : বেগম হামিদা বানু  
 জন্ম তারিখ : ০১/০১/১৯৮২ ইং  
 ধর্ম : ইসলাম  
 পেশা : ব্যবসা  
 জাতীয়তা : বাংলাদেশী  
 জাতীয় পরিচিতি নং : ৩৬১৭১৮৬১২৬৫০৮  
 স্থায়ী ঠিকানা : বর্তমান ঠিকানা :

স্বাক্ষরিত, মোহাম্মদ ফয়সাল  
 মোহাম্মদ ফয়সাল

সাং-ইটাখোলা (সাহেব বাড়ী), ডাকঘর- সায়হামনগর-৩৩৩৩, থানা-মাধবপুর, জেলা-হবিগঞ্জ।	বাড়ী নং-৩৪, রোড নং-১৩৬, গুলশান, ঢাকা-১২১২।
--	--

Syed md Aisul  
 e-4.9.88  
 Syed md Faisal  
 e-4.9.88  
 Syed ABM Humayun  
 e-4.9.88 (গ) নাম : সৈয়দ এ.বি.এম. হুমায়ুন  
 পিতার নাম : মরহুম সৈয়দ মঈদ উদ্দিন আহাম্মদ  
 মাতার নাম : বেগম হামিদা বানু  
 জন্ম তারিখ : ২৯/০১/১৯৮৮ ইং  
 ধর্ম : ইসলাম  
 পেশা : ব্যবসা  
 জাতীয়তা : বাংলাদেশী  
 জাতীয় পরিচিতি নং : ৩৬১৭১৮৬১২৬৫০৬  
 স্থায়ী ঠিকানা : বর্তমান ঠিকানা :

স্বাক্ষরিত, মোহাম্মদ ফয়সাল  
 মোহাম্মদ ফয়সাল

সাং-ইটাখোলা (সাহেব বাড়ী), ডাকঘর- সায়হামনগর-৩৩৩৩, থানা-মাধবপুর, জেলা-হবিগঞ্জ।	বাড়ী নং-৩৪, রোড নং-১৩৬, গুলশান, ঢাকা-১২১২।
--	--



সৈয়দ সাগিব আহমদ  
পিতার বাড়ি বনু হামুদ

সৈয়দ

Syed Sagib Ahmed

সৈয়দ সাগিব আহমদ  
(ম) নাম

পিতার নাম

পিতার নাম

: সৈয়দ এফ.এ.এম. শাহ জাহান

মাতার নাম

মাতার নাম

: মরহুম সৈয়দ মঈদ উদ্দিন আহাম্মদ

: বেগম হামিদা বানু

জন্ম তারিখ

: ০২/০২/১৯৫২ ইং

ধর্ম

: ইসলাম

পেশা

: ব্যবসা

জাতীয়তা

: বাংলাদেশী

জাতীয় পরিচিতি নং : ৩৬১৭১৮৬১২৬৫০৮

স্থায়ী ঠিকানা :

বর্তমান ঠিকানা :

সাং-ইটাখোলা (সাহেব বাড়ী), ডাকঘর- সায়হামনগর-৩৩৩৩, থানা-মাধবপুর, জেলা-হবিগঞ্জ।	বাড়ী নং-৩৪, রোড নং-১৩৬, গুলশান, ঢাকা-১২১২।
--	--

(ঙ) নাম : সৈয়দ এ.কে.এম. সেলিম

পিতার নাম

: মরহুম সৈয়দ মঈদ উদ্দিন আহাম্মদ

মাতার নাম

: বেগম হামিদা বানু

জন্ম তারিখ

: ৩১/১২/১৯৫৬ ইং

ধর্ম

: ইসলাম

পেশা

: ব্যবসা

জাতীয়তা

: বাংলাদেশী

জাতীয় পরিচিতি নং : ৩৬১৭১৮৬১২৬৫১০

স্থায়ী ঠিকানা :

বর্তমান ঠিকানা :

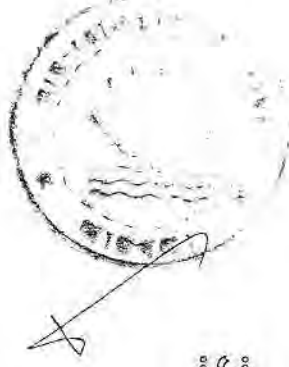
সাং-ইটাখোলা (সাহেব বাড়ী), ডাকঘর- সায়হামনগর-৩৩৩৩, থানা-মাধবপুর, জেলা-হবিগঞ্জ।	বাড়ী নং-৩৪, রোড নং-১৩৬, গুলশান, ঢাকা-১২১২।
--	--

Syed md dardal  
Syed md Faisal  
Syed Akm Humayun  
Syed FAm shaghar  
Syed Akm Salim

: ৪ :

স্বাক্ষরিত ও সত্যায়িত  
[স্বাক্ষর]

স্বাক্ষরিত ও সত্যায়িত  
[স্বাক্ষর]



ঃ ৫ :ঃ

Syed md Raisul  
Syed md Faisal  
Syed A Om Humayun  
Syed FAm Shagahan  
Syed AKm Salim

৫। আমমোক্তার / প্রতিনিধি / অভিভাবকের মাধ্যমে দলিল সম্পাদিত হইয়া থাকিলে তাহার নাম, ঠিকানা ও বিবরণ : (আদালত / সরকারী / বেসরকারী প্রতিষ্ঠানের ক্ষেত্রে ছবি প্রযোজ্য নয়)। প্রযোজ্য নহে।

৬। আমমোক্তার নামার বিবরণ (প্রযোজ্য ক্ষেত্রে) : প্রযোজ্য নহে।

৭। হস্তান্তরাধীন জমির ন্যূনপক্ষে ২৫ বছরের মালিকানার ধারাবাহিক বিবরণ (যথাযথ ক্ষেত্রে ওয়ারিশ ও বায়া দলিল সমূহের বিস্তারিত বিবরণ এবং হস্তান্তরের উদ্দেশ্য, সম্পত্তির দখল, ইজমেন্ট স্বত্ব এবং হস্তান্তর সম্পর্কিত উল্লেখযোগ্য মন্তব্য (যদি থাকে) সম্পর্কিত বিবরণ :

পরম করুণাময় মহান আল্লাহ তায়ালা নাম স্মরণ করিয়া অত্র সাফ কবলা দলিলের আইনানুগ বর্ণনা আরম্ভ করিলাম।

যেহেতু নিম্ন তফসিল বর্ণিত কতক সম্পত্তি ব্রাহ্মনবাড়ীয়া জেলার আশুগঞ্জ থানাধীন চরচারতলা মৌজার এস.এ.- ৩৯৬ নং খতিয়ানে ১২১০ ও ১২৪০ নং দাগসহ আরো অন্যান্য দাগের সম্পত্তিতে চরচারতলা গ্রাম নিবাসী কলিম উদ্দিন আহাম্মদ ওরফে কালা মিয়া, মোহন মিয়া, পিতা-সুরুজ মিয়া এবং জিন্মতের নেছা স্বামী-সুরুজ মিয়া রেকর্ডীয় মালিক ও ভোগদখলকার বিদ্যমান থাকেন।

এবং

যেহেতু নিম্ন তফসিল বর্ণিত কতক সম্পত্তি ব্রাহ্মনবাড়ীয়া জেলার আশুগঞ্জ থানাধীন চরচারতলা মৌজার এস.এ.- ৪০০ নং খতিয়ানে ১২১০ ও ১২৪০ নং দাগসহ আরো অন্যান্য দাগের সম্পত্তিতে চরচারতলা গ্রাম নিবাসী আলী আকবর-এর পুত্র আব্দুল গফুর রেকর্ডীয় মালিক ও ভোগদখলকার বিদ্যমান থাকেন।

২



ঃ ৬ ঃ

এবং

যেহেতু নিম্ন তফসিল বর্ণিত কতক সম্পত্তি ব্রাহ্মনবাড়ীয়া জেলার আশুগঞ্জ থানাধীন চরচারতলা মৌজার এস.এ.- ৭৪৬ নং খতিয়ানে চরচারতলা গ্রাম নিবাসী বাদশা মিয়া-এর পুত্র লাল মিয়া ও আব্দুর রহমান, চেরাগ আলী পুত্র সুরজ মিয়া, আলী আকবর-এর পুত্র আব্দুল গফুর রেকর্ডীয় মালিক ও ভোগদখলকার বিদ্যমান থাকেন।

এবং

যেহেতু নিম্ন তফসিল বর্ণিত কতক সম্পত্তি ব্রাহ্মনবাড়ীয়া জেলার আশুগঞ্জ থানাধীন চরচারতলা মৌজার এস.এ.- ১৫৬ নং খতিয়ানে ১২১০ নং দাগসহ আরো অন্যান্য দাগের সম্পত্তিতে চরচারতলা গ্রাম নিবাসী তমিজ উদ্দিন-এর পুত্র তুফানী সরকার, রমিজ উদ্দিন-এর পুত্র আঃ হাফিজ, সুরজ মিয়া, আঃ রহিম, তুফানী সরকার-এর পুত্র ফুল মিয়া, লাল মিয়া, সোনা মিয়া, জমির উদ্দিন-এর পুত্র নূর মিয়া, শের আলী-এর পুত্র গফুর মুল্লুক-গং রেকর্ডীয় মালিক ও ভোগদখলকার বিদ্যমান থাকেন।

এবং

যেহেতু নিম্ন তফসিল বর্ণিত কতক সম্পত্তি ব্রাহ্মনবাড়ীয়া জেলার আশুগঞ্জ থানাধীন চরচারতলা মৌজার এস.এ.- ৩৮৬ নং খতিয়ানে ১২১০ ও ১২৪০ নং দাগসহ আরো অন্যান্য দাগের সম্পত্তিতে চরচারতলা গ্রাম নিবাসী নাগর আলী-এর পুত্র আব্দুল গনি ও আব্দুর রউপ, বাদশা গাজী-এর পুত্র লাল মিয়া ও আব্দুর রহমান, চেরাগ আলী-এর পুত্র সুরজ মিয়া, সাদিম বেপারী-এর পুত্র মজনুর আলী, আলী আকবর-এর পুত্র আব্দুল গফুর, আব্দুল ছমেদ-এর স্ত্রী ফুলবরে নেছা, পান্ডব আলী-এর পুত্র চান্দ মিয়া, রজব আলী-এর পুত্র আব্দুল মজিদ, জিন্নত আলী-এর পুত্র আব্দুল মোতালেব, রইস মিয়া, দীন ইসলাম, আতর আলী ওরফে আদম মিয়া-এর পুত্র মকবুল মিয়া, আমির আলী, অলিউর রহমান, নূরুল ইসলাম, মতিয়ার রহমান, আব্দুল জব্বার-এর পুত্র চৌধুরী মিয়া, আইন উদ্দিন-এর পুত্র আব্দুল মান্নান, সুরজ মিয়া-এর পুত্র সিদ্দিক মিয়া-গণ রেকর্ডীয় মালিক ও ভোগদখলকার বিদ্যমান থাকেন।

এবং

অতঃপর উক্ত সুরজ মিয়া রেকর্ডীয় মালিক ও ভোগদখলকার বিদ্যমান থাকারস্থায় বিগত ১২/১২/১৯৫৬ ইং তারিখে ব্রাহ্মনবাড়ীয়া সদর সাব-রেজিস্ট্রি অফিসে রেজিস্ট্রিকৃত ৯৫৪ নং একখানা হেবা নামা দলিল মূলে তাহার পুত্র কলিম উদ্দিন আহাম্মদ ওরফে কালা মিয়ার বরাবরে কতক সম্পত্তি হেবা করিয়া দিলে উক্ত হেবানামা দলিল মূলে কলিম উদ্দিন আহাম্মদ ওরফে কালা মিয়া পিতার নিকট হইতে হেবাই সূত্রে প্রাপ্ত হন।



Syed md anwar  
Syed md Raibat  
Syed A.M. Humayun  
Syed F.A.M. Shagahat  
Syed A.M. Salim

অতঃপর উক্ত কলিম উদ্দিন আহম্মদ ওরফে কালা মিয়া পিতার ওয়ারিশ সূত্রে ও রেকর্ডীয় সূত্রে এবং পিতার নিকট হইতে হেবাই সূত্রে প্রাপ্ত হইয়া বি.এস.- ৬৪৯ নং ও ৬৫০ নং খতিয়ানে রেকর্ডীয় মালিক ও ভোগদখলকার বিদ্যমান থাকাবস্থায় বিগত ১৬/০৪/১৯৯৫ ইং তারিখে ব্রাহ্মণবাড়ীয়া সদর সাব-রেজিষ্ট্রি অফিসে রেজিষ্ট্রিকৃত ২৪৯১ নং ও বিগত ২৩/০৪/১৯৯৫ ইং তারিখে ব্রাহ্মণবাড়ীয়া সদর সাব-রেজিষ্ট্রি অফিসে রেজিষ্ট্রিকৃত ২৬৩৮ নং দুইখানা সাফ কবলা দলিল দ্বারা (১) মজিবুর রহমান (২) শহীদুল্লাহ (৩) অহিদুল্লাহ (৪) কাউছার (৫) আফছার (৬) নাবালক কেরামত আলী (৭) নাবালক রহমত আলী (৮) নাবালক হযরত আলী (৯) নাবালিকা শিরিন আক্তার ওরফে স্বপ্না, সকলের পিতা-তারা মিয়া (১০) জোহরা খাতুন, স্বামী-তারা মিয়া, সর্বসাং-চরচারতলা-এর বরাবরে সাফ বিক্রয় করিয়া দিয়া উক্ত কলিম উদ্দিন আহম্মদ ওরফে কালা মিয়া বিক্রিত সম্পত্তি হইতে চিরতরে নিঃস্বত্ববান ও দখলত্যাগী হন।

অতঃপর উক্ত (১) মজিবুর রহমান (২) শহীদুল্লাহ (৩) অহিদুল্লাহ (৪) কাউছার (৫) আফছার (৬) নাবালক কেরামত আলী (৭) নাবালক রহমত আলী (৮) নাবালক হযরত আলী (৯) নাবালিকা শিরিন আক্তার ওরফে স্বপ্না, সকলের পিতা-তারা মিয়া (১০) জোহরা খাতুন, স্বামী-তারা মিয়া-গণ উপরোক্ত ২৬৩৮ নং ও ২৪৯১ সাফ কবলা দলিল মূলে এবং উক্ত মজিবুর রহমান ও তাহার কতিপয় ভ্রাতা বিগত ০৮/০৪/১৯৯৫ ইং তারিখে ব্রাহ্মণবাড়ীয়া সদর সাব-রেজিষ্ট্রি অফিসে রেজিষ্ট্রিকৃত ২৩২২ নং ও ২৩২৪ নং দুইখানা সাফ কবলা দলিল দ্বারা খরিদ করিয়া খরিদা সূত্রে মালিক ও ভোগদখলকার বিদ্যমান থাকাবস্থায় উক্ত মজিবুর রহমান গং এবং নাবালক ও নাবালিকাগণের পক্ষে তাহাদের পিতা তারা মিয়া স্বাভাবিক অভিভাবক হিসাবে বিগত ১৩/০৪/১৯৯৭ ইং তারিখে ব্রাহ্মণবাড়ীয়া সদর সাব-রেজিষ্ট্রি অফিসে রেজিষ্ট্রিকৃত ২৮৪৩ নং একখানা সাফ কবলা দলিল দ্বারা মজিবুর রহমান মজনু, পিতা-মরহুম আব্দুর রহমান, সাং-চরচারতলা, থানা-আশুগঞ্জ, জেলা-ব্রাহ্মণবাড়ীয়া-এর বরাবরে সাফ বিক্রয় করিয়া দিয়া উক্ত কলিম উদ্দিন আহম্মদ ওরফে কালা মিয়া বিক্রিত সম্পত্তি হইতে চিরতরে নিঃস্বত্ববান ও দখলত্যাগী হন।

৮





ঃ ৮ ঃ

এবং

Syed md ahsan  
Syed md faisal  
Syed ABM Humayun  
Syed FAm Shagahar  
Syed AXm Salim

উক্ত কলিম উদ্দিন আহম্মদ ওরফে কালা মিয়া পিতার ওয়ারিশ সূত্রে ও রেকর্ডীয় সূত্রে এবং পিতার নিকট হইতে হেবাই সূত্রে প্রাপ্ত হইয়া বি.এস.- ৬৪৯ নং ও ৬৫০ নং খতিয়ানে রেকর্ডীয় মালিক ও ভোগদখলকার বিদ্যমান থাকাবস্থায় বিগত ১০/০৪/১৯৯৭ ইং তারিখে ব্রাহ্মণবাড়ীয়া সদর সাব-রেজিষ্ট্রি অফিসে রেজিস্ট্রিকৃত ২৭৪৭ নং একখানা সাফ কবলা দলিল দ্বারা মজিবুর রহমান মজনু, পিতা-মরহুম আব্দুর রহমান, সাং-চরচারতলা, থানা-আশুগঞ্জ, জেলা-ব্রাহ্মণবাড়ীয়া-এর বরাবরে সাফ বিক্রয় করিয়া দিয়া উক্ত কলিম উদ্দিন আহম্মদ ওরফে কালা মিয়া বিক্রিত সম্পত্তি হইতে চিরতরে নিঃস্বত্ববান ও দখলত্যাগী হন।

এবং

যেহেতু নিম্ন তফসিল বর্ণিত কতক সম্পত্তি ব্রাহ্মণবাড়ীয়া জেলার আশুগঞ্জ থানাধীন চরচারতলা গ্রাম নিবাসী জিন্নত আলী-এর পুত্র আব্দুল মালেক বিগত ০৫/০৪/১৯৯৩ ইং তারিখে ব্রাহ্মণবাড়ীয়া সদর সাব-রেজিষ্ট্রি অফিসে রেজিস্ট্রিকৃত ৭৮৪ নং একখানা সাফ কবলা দলিল মূলে কতক সম্পত্তি ও পিতার ওয়ারিশ সূত্রে কতক সম্পত্তিতে মালিক ও ভোগদখলকার বিদ্যমান থাকাবস্থায় বিগত ১৭/০৮/১৯৯৩ ইং তারিখে ব্রাহ্মণবাড়ীয়া সদর সাব-রেজিষ্ট্রি অফিসে রেজিস্ট্রিকৃত ৬০৮৫ নং একখানা সাফ কবলা দলিল দ্বারা দীন ইসলাম, পিতা-আব্দুল গফুর মিয়া, সাং-চরচারতলা-এর বরাবরে সাফ বিক্রয় করিয়া দিয়া উক্ত আব্দুল মালেক বিক্রিত সম্পত্তি হইতে চিরতরে নিঃস্বত্ববান ও দখলত্যাগী হন।

এবং

উক্ত আব্দুল মালেক বিগত ২৫/০১/১৯৯৫ ইং তারিখে ব্রাহ্মণবাড়ীয়া সদর সাব-রেজিষ্ট্রি অফিসে রেজিস্ট্রিকৃত ৫১৭ নং একখানা বিনিময় দলিল দ্বারা দীন ইসলাম, পিতা-আব্দুল গফুর মিয়া, সাং-চরচারতলা-এর বরাবরে কতক সম্পত্তি ছাড়িয়া দিয়া ও কতক সম্পত্তি নিজ ভোগদখলে রাখিয়া নেন।



৯৯

এবং

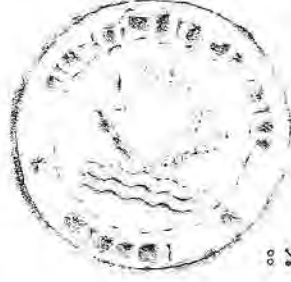
Syed Md Ausar  
Syed Md Faisal  
Syed Abm Humayun  
Syed FAm Shaghoron  
Syed Akm Salim

যেহেতু নিম্ন তফসিল বর্ণিত কতক সম্পত্তি ব্রাহ্মণবাড়ীয়া জেলার আশুগঞ্জ থানার চরচারতলা গ্রাম নিবাসী উক্ত লাল মিয়া উপরোক্ত বর্ণনা মতে রেকর্ডীয় মালিক ও ভোগদখলে বিদ্যমান থাকাবস্থায় মৃত্যুবরণ করিলে পর তাহার তৎতাজ্যবিহীন সম্পত্তিতে দুই পুত্র যথাক্রমে- (১) আবুল কাশেম (২) কাঞ্চন মিয়া পিতার ওয়ারিশ সূত্রে মালিক নিয়ত থাকাবস্থায় তাহাদের নগদ টাকার প্রয়োজনে বিগত ০৮/০৪/১৯৯৭ ইং তারিখে ব্রাহ্মণবাড়ীয়া সদর সাব-রেজিষ্ট্রি অফিসে রেজিষ্ট্রিকৃত ২৬৮৫ নং একখানা সাফ কবলা দলিল দ্বারা মজিবুর রহমান মজনু, পিতা-মরহুম আব্দুর রহমান, সাং-চরচারতলা, থানা-আশুগঞ্জ, জেলা-ব্রাহ্মণবাড়ীয়া-এর বরাবরে সাফ বিক্রয় করিয়া দিয়া উক্ত আবুল কাশেম-গং বিক্রিত সম্পত্তি হইতে চিরতরে নিঃস্বত্ববান ও দখলত্যাগী হন।

এবং

যেহেতু নিম্ন তফসিল বর্ণিত কতক সম্পত্তি ব্রাহ্মণবাড়ীয়া জেলার আশুগঞ্জ থানাধীন চরচারতলা গ্রাম নিবাসী লাল মিয়া-এর পুত্র মোঃ আছাকিন বিগত ১২/০৮/১৯৮২ ইং তারিখে ব্রাহ্মণবাড়ীয়া সদর সাব-রেজিষ্ট্রি অফিসে রেজিষ্ট্রিকৃত ৪২৩৪ নং একখানা সাফ কবলা দলিল মূলে ও বিগত ০৮/০৩/১৯৮৩ ইং তারিখে ব্রাহ্মণবাড়ীয়া সদর সাব-রেজিষ্ট্রি অফিসে রেজিষ্ট্রিকৃত ১৫৪২ নং একখানা সাফ কবলা দলিল মূলে কতক সম্পত্তিতে খরিদ সূত্রে মালিক নিয়ত থাকাবস্থায় বিগত ০৬/০৩/১৯৮৬ ইং তারিখে ব্রাহ্মণবাড়ীয়া সদর সাব-রেজিষ্ট্রি অফিসে রেজিষ্ট্রিকৃত ২০৩৬ নং একখানা সাফ কবলা দলিল দ্বারা মোঃ ফুল মিয়া সরদার, পিতা-আব্দুল গফুর মিয়া, সাং-চরচারতলা-এর বরাবরে সাফ বিক্রয় করিয়া দিয়া উক্ত মোঃ আছাকিন বিক্রিত সম্পত্তি হইতে চিরতরে নিঃস্বত্ববান ও দখলত্যাগী হন।

৬



ঃ ১০ ঃ

এবং

Syed md alifor  
Syed md Faizal  
Syed Abm Hamayun  
Syed FAm Shagaban  
Syed Abm Salam

যেহেতু নিম্ন তফসিল বর্ণিত কতক সম্পত্তি ব্রাহ্মণবাড়ীয়া জেলার আশুগঞ্জ থানার চরচারতলা গ্রাম নিবাসী আলী আকবর-এর পুত্র আব্দুল গফুর মিয়া এস.এ.-৪০০ নং খতিয়ানে ১২১০ নং ও ১২৪০ নং দাগ সহ আরো অন্যান্য দাগের সম্পত্তিতে মালিক ও ভোগদখলকার বিদ্যমান থাকাবস্থায় মৃত্যুবরণ করিলে পর তাহার পুত্র ফুল মিয়া কতক সম্পত্তি পিতার ওয়ারিশ সূত্রে মালিক নিয়ত হন এবং উল্লেখিত ২০৩৬ নং একখানা সাফ কবলা দলিল দ্বারা খরিদ করিয়া খরিদা সূত্রে মালিক নিয়ত হইয়া বি.এস.- ১২৫১ নং খতিয়ানে ৩৫২১ নং দাগসহ আরো অন্যান্য দাগের সম্পত্তিতে যৌথভাবে নিজ নাম শুদ্ধরূপে রেকর্ডভুক্ত করাইয়া ভোগদখলে বিদ্যমান থাকাবস্থায় বিগত ২০/০২/১৯৯৫ ইং তারিখে ব্রাহ্মণবাড়ীয়া সদর সাব-রেজিষ্ট্রি অফিসে রেজিস্ট্রিকৃত ১২৬৮ নং একখানা সাফ কবলা দলিল দ্বারা (১) মোঃ দীন ইসলাম পিতা-মরহুম আব্দুল গফুর (২) মাহমুদা আহমেদ বেবী, স্বামী-কলিম উদ্দিন আহমেদ, সাং-চরচারতলা-এদের বরাবরে সমান অংশে ১৩ শতাংশ ভূমি বিক্রয় করেন।

অতঃপর উক্ত মাহমুদা আহমেদ বেবী উপরোক্ত ১২৬৮ নং একখানা সাফ কবলা দলিল মূলে যৌথভাবে মালিক নিয়ত হইয়া ঘরোয়া আপোষ বন্টন মতে প্রাপ্ত ছাহামে ভোগদখলকার বিদ্যমান থাকাবস্থায় বিগত  $\frac{০৯/০৮/১৯৯৭}{১০/০৮/১৯৯৭}$  ইং তারিখে ব্রাহ্মণবাড়ীয়া সদর সাব-রেজিষ্ট্রি অফিসে রেজিস্ট্রিকৃত ২৭৪৮ নং একখানা সাফ কবলা দলিল দ্বারা মজিবুর রহমান মজনু, পিতা-মরহুম আব্দুর রহমান, সাং-চরচারতলা, থানা-আশুগঞ্জ, জেলা-ব্রাহ্মণবাড়ীয়া-এর বরাবরে ০৬.৫০ শতাংশ ভূমি সাফ বিক্রয় করিয়া দিয়া উক্ত মাহমুদা আহমেদ বেবী বিক্রিত সম্পত্তি হইতে চিরতরে নিঃস্বত্ববান ও দখলত্যাগী হন।

৩



ঃ ১১ ঃ

Syed md Raifar  
Syed md Raibal  
Syed Akm Humayun  
Syed FAm Shogorahon  
Syed Akm salim

অতঃপর উক্ত মজিবুর রহমান মজনু উপরোক্ত বর্ণনা মতে ২৭৪৭ নং, ২৬৮৫ নং ও ২৭৪৮ নং তিনখানা সাফ কবলা দলিল মূলে মালিক ও ভোগদখলকার নিয়ত থাকাবস্থায় তাহার নগদ টাকা আবশ্যক হওয়ায় বিগত ১৩/০৪/১৯৯৭ ইং তারিখে ব্রাহ্মণবাড়ীয়া সদর সাব-রেজিষ্ট্রি অফিসে রেজিষ্ট্রিকৃত ১১৭৭ নং একখানা সাফ কবলা দলিল দ্বারা ও বিগত ১৯/০৫/১৯৯৭ ইং তারিখে ব্রাহ্মণবাড়ীয়া সদর সাব-রেজিষ্ট্রি অফিসে রেজিষ্ট্রিকৃত ১৫৬৮ নং একখানা সাফ কবলা দলিল দ্বারা (১) সৈয়দ মোহাম্মদ কায়সার (২) সৈয়দ মোঃ ফয়সল (৩) সৈয়দ এ.বি.এম. হুমায়ুন (৪) সৈয়দ এফ.এ.এম. শাহজাহান (৫) সৈয়দ কে.এম. সেলিম, সকলের পিতা-মরহুম সৈয়দ মঈদ উদ্দিন আহাম্মদ, সাং-ইটাখোলা, থানা-মাধবপুর, জেলা-হবিগঞ্জ-এদের বরাবরে সাফ বিক্রয় করিয়া দিয়া উক্ত মজিবুর রহমান মজনু বিক্রিত সম্পত্তি হইতে চিরতরে নিঃস্বত্বান ও দখলত্যাগী হন।

এবং

উক্ত মজিবুর রহমান মজনু উপরোক্ত ২৮৪৩ নং একখানা সাফ কবলা দলিল মূলে খরিদ করিয়া খরিদা সূত্রে মালিক ও ভোগদখলকার নিয়ত থাকাবস্থায় তাহার নগদ টাকা আবশ্যক হওয়ায় বিগত ১৬/০৪/১৯৯৭ ইং তারিখে ব্রাহ্মণবাড়ীয়া সদর সাব-রেজিষ্ট্রি অফিসে রেজিষ্ট্রিকৃত ১২১৩ নং একখানা সাফ কবলা দলিল দ্বারা (১) সৈয়দ মোহাম্মদ কায়সার (২) সৈয়দ মোঃ ফয়সল (৩) সৈয়দ এ.বি.এম. হুমায়ুন (৪) সৈয়দ এফ.এ.এম. শাহ জাহান (৫) সৈয়দ কে.এম. সেলিম, সকলের পিতা-মরহুম সৈয়দ মঈদ উদ্দিন আহাম্মদ, সাং-ইটাখোলা, থানা-মাধবপুর, জেলা-হবিগঞ্জ-এদের বরাবরে বিক্রয় করিয়া দিয়া উক্ত মজিবুর রহমান মজনু বিক্রিত সম্পত্তি হইতে চিরতরে নিঃস্বত্বান ও দখলত্যাগী হন।

এবং

উক্ত কলিম উদ্দিন আহাম্মদ ওরফে কালা মিয়া উপরোক্ত বর্ণনা মতে এস.এ.- ১২১০ নং ও ১২৪০ নং দাগের সম্পত্তিতে মালিক ও ভোগদখলকার বিদ্যমান থাকাবস্থায় বিগত ২৩/০৪/১৯৯৫ ইং তারিখে ব্রাহ্মণবাড়ীয়া সদর সাব-রেজিষ্ট্রি অফিসে রেজিষ্ট্রিকৃত ২৬৩৩ নং একখানা এওয়াজ বদল দলিল দ্বারা দীন ইসলাম, পিতা-মরহুম আব্দুল গফুর, সাং-চরচারতলা, থানা-আশুগঞ্জ, জেলা-ব্রাহ্মণবাড়ীয়া-এর বরাবরে এওয়াজ করিয়া দেন।



Syed md Auifor  
Syed md Faifal  
Syed Abm Humayun  
Syed FAm Shaghor  
Syed Axm Salim

অতঃপর উক্ত দীন ইসলাম উপরোক্ত বর্ণনা মতে ২৬৩৩ নং একখানা এওয়াজ বদল দলিল মূলে এবং উক্ত ১২৬৮ নং একখানা সাফ কবলা দলিল মূলে মালিক ও ভোগদখলকার নিয়ত থাকাবস্থায় তাহার নগদ টাকা আবশ্যক হওয়ায় বিগত ১৩/০৪/১৯৯৭ ইং তারিখে ব্রাহ্মণবাড়ীয়া সদর সাব-রেজিস্ট্রি অফিসে রেজিস্ট্রিকৃত ১১৭৬ নং একখানা সাফ কবলা দলিল দ্বারা (১) সৈয়দ মোহাম্মদ কায়সার (২) সৈয়দ মোঃ ফয়সল (৩) সৈয়দ এ.বি.এম. হুমায়ুন (৪) সৈয়দ এফ.এ.এম. শাহ জাহান (৫) সৈয়দ কে.এম. সেলিম, সকলের পিতা-মরহুম সৈয়দ মঈদ উদ্দিন আহাম্মদ, সাং-ইটাখোলা, থানা-মাধবপুর, জেলা-হবিগঞ্জ-এদের বরাবরে সাফ বিক্রয় করিয়া দিয়া উক্ত মোঃ দীন ইসলাম বিক্রিত সম্পত্তি হইতে চিরতরে নিঃস্বত্বান ও দখলত্যাগী হন।

এবং

অতঃপর আমরা অত্র দলিল দাতাগণ যথাক্রমে- (১) সৈয়দ মোহাম্মদ কায়সার (২) সৈয়দ মোঃ ফয়সল (৩) সৈয়দ এ.বি.এম. হুমায়ুন (৪) সৈয়দ এফ.এ.এম. শাহজাহান (৫) সৈয়দ কে.এম. সেলিম, সকলের পিতা-মরহুম সৈয়দ মঈদ উদ্দিন আহাম্মদ উপরোক্ত বর্ণনা মতে মালিক নিয়ত থাকাবস্থায় বি.এস.-১৩৭৬ নং খতিয়ানে নিজেদের নাম শুদ্ধরূপে রেকর্ডভুক্ত করাইয়া এবং বিগত ১০/০৫/১৯৯৭ ইং তারিখে সহকারী কমিশনার (ভূমি) ব্রাহ্মণবাড়ীয়া সদর সার্কেলের ২৯৯/৯৬-৯৭ নং নামজারী মোকদ্দমায় ৫০৪ নং নামজারী খতিয়ানে আশুগঞ্জ সদর ইউনিয়ন ভূমি অফিসে ১৩১৯ নং জোতে নিজেদের নামে নামজারী করাইয়া সরকারের ধার্যকৃত বার্ষিক খাজনাদী পরিশোধক্রমে ভোগদখলে বিদ্যমান আছি।

অতঃপর, আমরা অত্র দলিলের দাতাগণের ব্যবসায়িক প্রয়োজনে নগদ টাকার আবশ্যক হওয়ায় নিম্ন তফসিলভূক্ত সম্পত্তি বিক্রয়ের জন্য প্রস্তাব ঘোষণা করিলে পর আপনি অত্র দলিল গ্রহীতা তাহা খরিদ করিতে ইচ্ছা প্রকাশ করেন।

৮





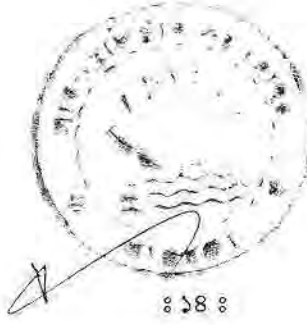
Syed md Raisul  
Syed md Faisal  
Syed Abm Humayun  
Syed FAm Shaghoran  
Syed Abm Salim

অতঃপর আমরা উভয় পক্ষ আলাপ আলোচনার পর উহার বর্তমান বাজার যাচাই পূর্বক নিম্ন তফসিল বর্ণিত সম্পত্তির আপনি সর্বোচ্চ দরদাতা সাব্যস্ত হওয়ায় আপনার নিকট নিম্ন তফসিল বর্ণিত সম্পত্তি বিক্রয়ের মনস্থির করতঃ অদ্য রোজ হাজিরান মজলিসে স্বাক্ষীগণের মোকাবেলায় আপনার নিকট হইতে নিম্ন তফসিল বর্ণিত সম্পত্তির ধার্যকৃত মূল্যের সাকুল্য টাকা বুঝিয়া পাইয়া ও নিম্ন নিম্ন তফসিল বর্ণিত সম্পত্তি আপনি অত্র দলিল গ্রহিতার নিকট সাফ বিক্রয় করিলাম এবং বিক্রীত সম্পত্তির সর্বস্বত্ব ও দখল প্রয়োজনীয় দলিলপত্র সহ আপনার বরাবরে বুঝাইয়া দিয়া বিক্রীত সম্পত্তি হইতে চিরতরে ওয়ারিশানক্রমে নিঃস্বত্ববান ও দখলত্যাগী হইলাম।

অদ্য হইতে আপনি দলিল গ্রহিতা অত্র সাফ কবলা দলিল মূলে তফসিল বর্ণিত সম্পত্তির স্বত্ববান মালিক নিয়ত হইলেন, সিটি কর্পোরেশন, গ্যাস, ওয়াসা, বিদ্যুৎ, ভূমি ও রাজস্ব অফিস সহ সংশ্লিষ্ট অন্যান্য সকল অফিসে আমাদের নামের স্থলে মিডল্যান্ড পাওয়ার কোং লিঃ-এর নামে নামজারী করাওয়া সরকারী ধার্যকৃত খাজনা, বিল ইত্যাদি পরিশোধ করতঃ উহার চেক দাখিলা গ্রহণ পূর্বক গ্রহিতার প্রয়োজনে দান, বিক্রয়, হেবা, মর্টগেজ, বিনিময় ইত্যাদি সর্ব প্রকার হস্তান্তরের ক্ষমতা ধরনে ও পরিচালনে স্থলবর্তী ও পরবর্তীগনক্রমে ভোগ দখল করিতে রহেন ও রহুক।

ইহাতে আমরা অত্র দলিল দাতাগণ কিংবা আমাদের স্থলবর্তী ও পরবর্তী ওয়ারিশগণের কোন প্রকার দাবী দাওয়া নাই বা রহিল না। করিলেও তাহা সর্ব আইন আদালতে অগ্রাহ্য ও বাতিল বলিয়া গণ্য হইবে।

উল্লেখ্য যে, নিম্ন তফসিল বর্ণিত সম্পত্তি আমরা অন্যত্র কাহারো নিকট বিক্রয় করি নাই বা বিক্রয়ের চুক্তিতে আবদ্ধ হই নাই, কিংবা কোন সরকারী, আধাসরকারী বা বেসরকারী প্রতিষ্ঠানের নিকট দায়বদ্ধ রাখি নাই, যদি ভবিষ্যতে তদ্রূপ কোন কার্য প্রকাশ পায় বা আমাদের কোন ওয়ারিশ আপনার ভোগ দখলে ব্যাঘাত সৃষ্টি করে তাহা হইলে আইনতঃ দায়ী হইব। হস্তান্তরিত ভূমির স্বত্ব, স্বার্থ, দখল সম্পর্কে কোন মিথ্যাচার বা সত্য গোপন করার কারনে দলিল গ্রহিতা ক্ষতিগ্রস্ত হইলে ক্ষয়ক্ষতিসহ দলিলে প্রদর্শিত মূল্য ফেরৎ প্রদানে বাধ্য থাকিব এবং কৃত অপরাধের জন্য আইনতঃ দন্ডনীয় হইব।



Syed Md Arifal  
Syed Md Rafal  
Syed Abm Humayun  
Syed FAm Shagabon  
Syed Abm Salim

প্রকাশ থাকে যে, যদি ভবিষ্যতে অত্র দলিলের গর্ভের বয়ানে, দাগ, খতিয়ান, নাম, ঠিকানা, ইত্যাদিতে কোন প্রকার ভুল ত্রুটি পরিলক্ষিত হয় তজ্জন্য অত্র দলিল পত্ত বা বাতিল হইবেনা বরং আমাদেরকে জানাইলে পর, আমরা বিনা পনে বিনা ওজরে সাব-রেজিষ্ট্রি অফিসে উপস্থিত হইয়া ভুলের শুদ্ধ বর্ণনা দিয়া আপনার বরাবরে ভ্রম সংশোধন দলিল সম্পাদনসহ রেজিষ্ট্রি কার্যাদি সম্পন্ন করিয়া দিব, যাহা অত্র দলিলের একাংশ বলিয়া গন্য হইবে।

- ৮। একাধিক ক্রেতাগণের ক্ষেত্রে ক্রয়কৃত / অর্জিত জমির হারাহারি মালিকানার বিবরণ (যদি থাকে) :

ক্রেতা / গ্রহিতার নাম	মালিকানার পরিমাণ / অংশ
মিডল্যান্ড পাওয়ার কোং লিঃ	৩৫০.৬০ শতাংশ ভূমি

- ৯। একাধিক বিক্রেতা/হস্তান্তরকারীর ক্ষেত্রে হস্তান্তরিত জমির হারাহারি মালিকানার বিবরণঃ প্রযোজ্য নহে।

বিক্রেতা / দাতাগণের নাম	মালিকানার পরিমাণ / অংশ
(ক) সৈয়দ মোহাম্মদ কায়সার	২৬.৫০ শতাংশ
(খ) সৈয়দ মোঃ ফয়সল	৮১.০২৫ শতাংশ
(গ) সৈয়দ এ.বি.এম. হুমায়ুন	৮১.০২৫ শতাংশ
(ঘ) সৈয়দ এফ.এ.এম. শাহজাহান	৮১.০২৫ শতাংশ
(ঙ) সৈয়দ কে.এম. সেলিম	৮১.০২৫ শতাংশ
মোট =	৩৫০.৬০ শতাংশ ভূমি

- ১০। সম্পাদনের তারিখ : ইংরেজী : ২৮ ডিসেম্বর ২০১৮  
বাংলা : ৫ জানুয়ারি ২০১৯



Syed md arifal  
Syed md Faridul  
Syed ABM Hamayun  
Syed FAM Shagahan  
Syed AXM Salim

১১। সম্পত্তির তফসিল :

তফসিল পরিচয়

জেলা-ব্রাহ্মনবাড়ীয়া, থানা ও সাব-রেজিষ্ট্রি অফিস-সাবেক-ব্রাহ্মনবাড়ীয়া সদর, হালে-  
আশুগঞ্জ, ব্রাহ্মনবাড়ীয়া কালেক্টরীর তৌজিভুক্ত, জে.এল. নং- সাবেক-৪৫৭ (চারশত  
সাতান্ন), হালে-০১ (এক), মৌজা-চরচারতলা।

খতিয়ান নং- সি.এস.- ১৬৮ (একশত আটষট্টি), এস.এ.- ৩৯৬ (তিনশত ছিয়ানব্বই)  
৪০০ (চারশত), ৩৮৬ (তিনশত ছিয়াশি) ও ১৫৬ (একশত ছাপ্পান্ন), বি.এস.- ১৩৭৬  
(একহাজার তিনশত ছিয়াত্তর), ৬৪৯ (ছয়শত উনপঞ্চাশ), ৬৫০ (ছয়শত পঞ্চাশ),  
৭০৪ (সাতশত চার), ১২৫১ (একহাজার দুইশত একান্ন)।

(১) দাগ- সি.এস. ও এস.এ.-১২১০ (একহাজার দুইশত দশ) এবং বি.এস.-১৬৫৬  
(একহাজার ছয়শত ছাপ্পান্ন) নং দাগের নাল ভূমি-৬৯.০০ (উনসত্তর) শতাংশ।

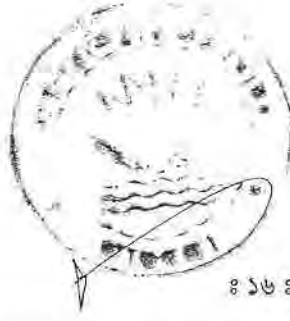
(২) দাগ- সি.এস. ও এস.এ.-১২১০ (একহাজার দুইশত দশ) এবং বি.এস.-৩৫০৩  
(তিনহাজার পাঁচশত তিন) নং দাগের নাল ভূমি-৪১.০০ (একচল্লিশ) শতাংশ।

(৩) দাগ- সি.এস. ও এস.এ.-১২১০ (একহাজার দুইশত দশ) এবং বি.এস.-৩৫০৪  
(তিনহাজার পাঁচশত চার) নং দাগের নাল ভূমি-৫৩.০০ (তিপ্পান্ন) শতাংশ।

(৪) দাগ- সি.এস. ও এস.এ.-১২১০ (একহাজার দুইশত দশ) এবং বি.এস.-৩৫২১  
(তিনহাজার পাঁচশত একুশ) নং দাগের নাল ভূমি-৪৮.০০ (আটচল্লিশ) শতাংশ।

(৫) দাগ- সি.এস. ও এস.এ.-১২১০ (একহাজার দুইশত দশ) এবং বি.এস.-১৬৬১  
(একহাজার ছয়শত একষট্টি) নং দাগের নাল ভূমি-৫৬.০০ (ছাপ্পান্ন) শতাংশ।





Syed md aulal  
Syed md Faizal  
Syed ABM Humayun  
Syed FAM Shogahon  
Syed AXM Salim

(৬) দাগ- সি.এস. ও এস.এ.-১২১০ (একহাজার দুইশত দশ) ও ১২৪০ (একহাজার দুইশত চল্লিশ) এবং বি.এস.-৩৫১৫ (তিনহাজার পাঁচশত পনের) নং দাগের নাল ভূমি- ১৫৯.০০ (একশত ঊনষাট) শতাংশ।

(৭) দাগ- সি.এস. ও এস.এ.-১২১০ (একহাজার দুইশত দশ) ও ১২৪০ (একহাজার দুইশত চল্লিশ) এবং বি.এস.-৩৫১৬ (তিনহাজার পাঁচশত ষোল) নং দাগের নাল ভূমি- ০৬.৫০ (ছয় দশমিক পাঁচ শূন্য) শতাংশ।

(৮) দাগ- সি.এস. ও এস.এ.- ১২১০ (একহাজার দুইশত দশ) ও ১২৪০ (একহাজার দুইশত চল্লিশ) এবং বি.এস.-৩৫১৮ (তিনহাজার পাঁচশত আঠার) নং দাগের নাল ভূমি- ২১.০০ (একুশ) শতাংশ।

(৯) দাগ- সি.এস. ও এস.এ.- ১২১০ (একহাজার দুইশত দশ) ও ১২৪০ (একহাজার দুইশত চল্লিশ) এবং বি.এস.-১৬৫০ (একহাজার ছয়শত পঞ্চাশ) ও ৩৫০২ (তিন হাজার পাঁচশত দুই) নং দাগের নাল ভূমি- ১২.৫০ (বার দশমিক পাঁচ শূন্য) শতাংশ।

যাহার নামজারী খতিয়ান নং- ৫০৪, মোকদ্দমা নং-২৯৯/৯৬-৯৭, তারিখ- ১০/০৫/১৯৯৭ ইং, জোত নং-১৩১৯।

একুনে মোট (৬৯ + ৪১ + ৫৩ + ৪৮ + ৫৬ + ১৫৯ + ৬.৫০ + ২১ + ১২.৫০) = ৪৬৬ (চারশত ছেষাষি) শতাংশ ভূমি ইহার কালে অত্র দলিল দ্বারা ৩৫০.৬০ (তিনশত পঞ্চাশ দশমিক ছয় শূন্য) শতাংশ ভূমি সাফ বিক্রিত সম্পত্তি বটে।

ভূমি অফিসের নাম/বিবরণ ও সহকারী কমিশনার (ভূমি) ব্রাহ্মণবাড়ীয়া সদর সার্কেল, ব্রাহ্মণবাড়ীয়া।

১২। সম্পত্তির চৌহদ্দির বিবরণ :

উত্তরে- দারু মিয়া গং	দক্ষিণে- এ.এফ.সি.সি.এল.-এর রাস্তা
পূর্বে- সৈয়দ সরকার গং	পশ্চিমে- বি.এস.- ১৬৫৫ নং, ৩৫০২ নং, ৩৫১৮ নং, ৩৫১৭ নং ও ৩৫২০ নং দাগের ভূমি

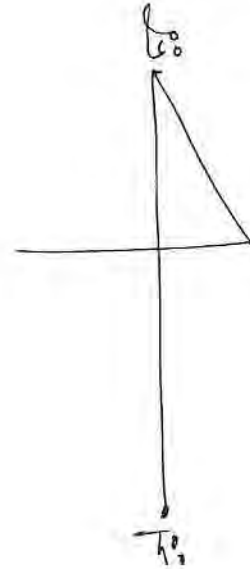


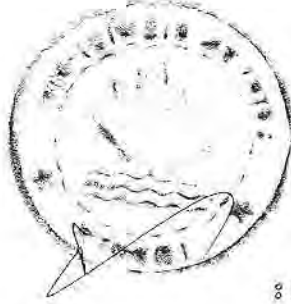
ঃ ১৭ঃ

Syed md Raishal  
Syed md Raishal  
Syed A B M Humayun  
Syed F A M Shagahan  
Syed A K M Salim

- ১৩। হস্তান্তরিত সম্পত্তির পরিমাণ (অংকে ও কথায়) : মোট ৩৫০.৬০ (তিনশত পঞ্চাশ দশমিক ছয় শূন্য) শতাংশ ভূমি।
- ১৪। হস্তান্তরিত সম্পত্তির মূল্য পরিশোধের বিবরণ (যদি থাকে) অংকে ও কথায় : সম্পত্তির মোট মূল্য = ২,৬৯,০০,০০০/- (দুই কোটি ঊনসত্তর লক্ষ) টাকা মাত্র। এককালীন ধার্যকৃত মূল্যের সাকুল্য টাকা নগদ পরিশোধ করা হইয়াছে। আমরা অত্র দলিল দাতাগণ ধার্যকৃত মূল্যের সাকুল্য টাকা নগদ বুঝিয়া পাইয়াছি।
- ১৫। হস্তান্তরিত সম্পত্তির হাত নকশা ও পরিমাপ :

২৫০০		২৫৬২
২৬৫৫		২৬৫৬
৩৫০২		৩৫০৪
		৩৫০৬
৩৫০৮	২৬	৩৫০৮
	২৭	
৩৫২১	২০	৩৫২২
৩৫৭০		





ঃ ১৯ ঃ

Syed md Qasim  
Syed md Faisal  
Syed ABM Humayun  
Syed FAM Shaghor  
Syed AXEN Salim

(২)

নাম :	SYED ISHTIAD AHMED	স্বাক্ষর ও	মোঃ জসীম
পিতা/স্বামীর নাম :	SYED MD FAISAL	তারিখ:	18/12/11
মাতার নাম:	YASMIN FAISAL		
গ্রাম/রোড নং:	136, HOUSE 34	ডাকঘর :	GULSHAN
উপজেলা/থানা:	GULSHAN	জেলা :	DHAKA

১৯। সনাক্তকারীর নাম, ঠিকানা ও স্বাক্ষর :

নাম :	Syed Sagor Ahmed	স্বাক্ষর ও	Syed Sagor
পিতা/স্বামীর নাম :	Syed ABM Humayun	তারিখ:	Ahmed
মাতার নাম:	DR. Naima muazzam		18/12/2011
গ্রাম/রোড নং:	H # 3 Rd 54 A	ডাকঘর :	Gulshan 12/12
উপজেলা/থানা:	Gulshan 2	জেলা :	Dhaka

২০। হস্তান্তরিত সম্পত্তির সঠিক পরিচয় এবং বাজার মূল্য সম্পর্কে সম্যক অবহিত হইয়া আমি নিম্ন স্বাক্ষরকারী অত্র দলিলের মুসাবিদা করিয়াছি / লিখিয়া দিয়াছি এবং পক্ষগণকে পাঠ করিয়া শুনাইয়াছি।

দলিলটি হলফনামাসহ ২০ (বিশ) ফর্দে লিখিত।

মুসাবিদা কারক বা দলিল লেখকের নাম, পূর্ণ ঠিকানা ও দলিল লেখকের সনদ নং

(অফিসের নাম সহ) : ঢাকা আইনজীবী সমিতি

সনদ নং ৮৬৮২

মুসাবিদা কারকের স্বাক্ষর :

মোঃ জসীম উদ্দীন সরকার

এডভোকেট

বাংলাদেশ সুপ্রীমকোর্ট

বায়তুল খায়ের, রুম নং-৭০১ (৮ম তলা)

৪৮/এ-বি, পুরানা পল্টন, ঢাকা-১০০০।

revenue



১৯৬৬ সালের ১১/১১/৬৬ তারিখে  
 জেলা প্রশাসক (সি.এ.ও.) মহোদয়ের  
 নিকটস্থ - ১৯৬৬ - ৬৬  
 নং: ১১৬/৬৬ (১১/১১/৬৬)  
 জেলা প্রশাসক (সি.এ.ও.) মহোদয়ের  
 নিকটস্থ - ১৯৬৬ - ৬৬  
 নং: ১১৬/৬৬ (১১/১১/৬৬)

১৯৬৬	১৯৬৬	১৯৬৬
১৯৬৬	১৯৬৬	১৯৬৬
১৯৬৬	১৯৬৬	১৯৬৬
১৯৬৬	১৯৬৬	১৯৬৬

১৯৬৬  
 সার-রেজিস্ট্রার  
 আওদাগর  
 প্রশাসনবাড়িয়া।





সি.সি.নং ১৯ (এস.সি.ডি-১)

দশ ফর্ম নং-১৫৫৬

ডায়েরী নং/অথবা ফাইল নং/কিস জমা নং/No. P

৬৫৭২ 265290

দরখাস্তের ক্রমিক নং

৩৫২০

২০২২  
২০২২  
২০২২

দরখাস্তের তারিখ

তালিমের বৎসর/বৎসরসমূহ

২০২২

যে অফিসের রেকর্ড তালিম করা অথবা দেখা হইবে উহার নাম

তালিম সাপেক্ষে ব্যক্তি বা সম্পত্তির নাম

দলিলের প্রকার

২৬২০০০০০

যে রেকর্ড দেখা হইবে তাহার বিবরণ (রোজানামা/দলিলের বেলার উহার সন, নং, বই, কালার ও পৃষ্ঠা)

১. কাহার নিকট হইতে প্রাপ্ত

২ - ৬৬২০০০

২. যে দফায় কিস জমা হইল—

৩ - ২০০

১ (১) (১)

২১ - ২০০

১ (১) (২)

৩৩ - ২০০

(২)

কিস অফিসের সূত্রসংখ্যা নং-৪৪/০৮-০৯/৩০ ১৫.৬.০৯

সি.সি.ডি—গোপনীয় শাখা—১৭১০/০৮

১৫.৬.০৯

সাব-রেজি

আই.সি.ডি

১৫.৬.০৯

১৫.৬.০৯

ক্রমিক নং ৩৫৭০ বহিঃ নং ২ দলিল নং ৩৫৭০

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার

৳২০



৳২০

বিজ্ঞপ্তি

০৪৭৯০০৬

১/১২/১১  
সাব-রেজিষ্ট্রার  
আশুগঞ্জ  
ব্রাহ্মনবাড়ীয়া

১/১২/১১

৩৫৭০

১৪৬২৫৮

Sonaly Bank Ashm

P.O. No - 3206308

সাব-রেজিষ্ট্রার

সাব-রেজিষ্ট্রার  
আশুগঞ্জ  
ব্রাহ্মনবাড়ীয়া

Syed md. faizal  
Syed ABM Humayun  
Syed FAM Shagahon  
Syed AKM Salim

২০১১

৩৫৭০

১৪৬২৫৮

P.O. No - 3206308 Sonaly

সাব-রেজিষ্ট্রার

সাব-রেজিষ্ট্রার  
আশুগঞ্জ  
ব্রাহ্মনবাড়ীয়া

সাব-রেজিষ্ট্রার  
আশুগঞ্জ  
ব্রাহ্মনবাড়ীয়া

রেজিষ্ট্রি অফিসের নাম : সাব-রেজিষ্ট্রি অফিস-আশুগঞ্জ, ব্রাহ্মনবাড়ীয়া।

২। দলিলের সার সংক্ষেপ :

২০১১

৩৫৭০

১৪৬২৫৮

Sonaly

৩২০৬৩০৭

১৪-১২-১১

সাব-রেজিষ্ট্রার

সাব-রেজিষ্ট্রার  
আশুগঞ্জ  
ব্রাহ্মনবাড়ীয়া

সাব-রেজিষ্ট্রার

দলিলের প্রকৃতি	মোজার নাম	ইউনিয়ন / ওয়ার্ড	থানা / উপজেলা	জেলা
সাফ কবলা	চরচারতলা	চরচারতলা	আশুগঞ্জ	ব্রাহ্মনবাড়ীয়া
হস্তান্তরিত সম্পত্তির পরিমাণ		জমির শ্রেণী	মূল্য (অংকে ও কথায়)	
৩৬৬.৭০ (তিনশত ছেষটি দশমিক সাত শূন্য) শতাংশ ডুমি।		নাল	সম্পত্তির মোট মূল্য = ২,৮১,০০,০০০/- (দুই কোটি একশি লক্ষ) টাকা মাত্র।	



Syed md Quisar  
 Syed md Faisal  
 Syed ABM Hamayun  
 Syed FAM Shagahon  
 Syed AKM Salim

২ঃ

সাল-রেজিস্ট্রার  
 আস্তানা  
 ২৬/১১/১১

দলিল গ্রহিতাগণের নাম ও ঠিকানা : (আদালত, সরকারী বা বেসরকারী প্রতিষ্ঠানের ক্ষেত্রে ছবি প্রযোজ্য নয়) :

নাম : মিডল্যান্ড পাওয়ার কোং লিঃ

[যাহার রেজি নং-সি-৯৭২৬৭/১১, তাং-২৭/১১/২০১১]

ইয়ুথ টাওয়ার, ৮২২/২ রোকেয়া স্মরণী, মিরপুর, ঢাকা।

এর পক্ষে- পরিচালক

নাম : রেজাকুল হায়দার

পিতার নাম : মরহুম মুন্সী আব্দুল মান্নান

মাতার নাম : জিন্নাতের নূর

জন্ম তারিখ : ০১/০২/১৯৫৪ ইং

ধর্ম : ইসলাম

পেশা : ব্যবসা

জাতীয়তা : বাংলাদেশী

জাতীয় পরিচিতি নং : ২৬৯১৬৪৯১১৩০৫৯

স্থায়ী ঠিকানা :

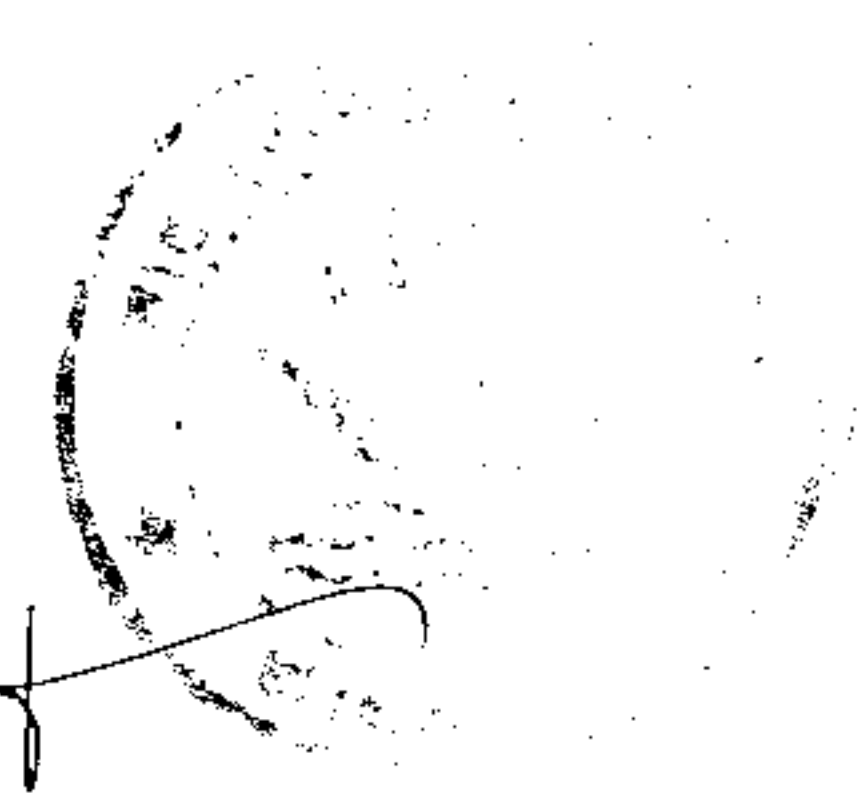
বর্তমান ঠিকানা :

ইয়ুথ টাওয়ার, ৮২২/২ রোকেয়া স্মরণী, মিরপুর, ঢাকা।	ইয়ুথ টাওয়ার, ৮২২/২ রোকেয়া স্মরণী, মিরপুর, ঢাকা।
--	--

রেজাকুল হায়দার  
 Director  
 Midland Power Co Ltd



সৈয়দ মোহাম্মদ ফয়সাল  
সৈয়দ আবু হুমায়ুন  
সৈয়দ আমর শাহগান  
সৈয়দ আমর সালিম



Syed Md Faizal  
Syed Abm Humayun  
Syed Amr Shagahan  
Syed Amr Salim

১) সৈয়দ মোহাম্মদ ফয়সাল  
১৪/০১/৮২

(স্বাক্ষর)

ঃ ৩ :

দলিল দাতাগণের নাম ও ঠিকানা : (আদালত, সরকারী বা বেসরকারী প্রতিষ্ঠানের ক্ষেত্রে ছবি প্রযোজ্য নয়)।

২) সৈয়দ মোহাম্মদ ফয়সাল  
১৪/০১/৮২

(ক) নাম : সৈয়দ মোহাম্মদ ফয়সাল  
পিতার নাম : মরহুম সৈয়দ মঈদ উদ্দিন আহাম্মদ  
মাতার নাম : বেগম হামিদা বানু  
জন্ম তারিখ : ০১/০১/১৯৮২ ইং  
ধর্ম : ইসলাম  
পেশা : ব্যবসা  
জাতীয়তা : বাংলাদেশী  
জাতীয় পরিচিতি নং : ৩৬১৭১৮৬১২৬৫০৮

স্থায়ী ঠিকানা :  
বর্তমান ঠিকানা :  
সং-ইটাখোলা (সাহেব বাড়ী), ডাকঘর-  
সায়হামনগর-৩৩৩৩, থানা-মাধবপুর,  
জেলা-হবিগঞ্জ।  
বাড়ী নং-৩৪, রোড নং-১৩৬, গুলশান,  
ঢাকা-১২১২।

৩) সৈয়দ মোহাম্মদ ফয়সাল  
১৪/০১/৮২

৪) সৈয়দ আবু হুমায়ুন  
১৪/০১/৮২

সং-ইটাখোলা (সাহেব বাড়ী), ডাকঘর-  
সায়হামনগর-৩৩৩৩, থানা-মাধবপুর,  
জেলা-হবিগঞ্জ।  
বাড়ী নং-৩৪, রোড নং-১৩৬, গুলশান,  
ঢাকা-১২১২।

৫) সৈয়দ আমর শাহগান  
১৪/০১/৮২

(খ) নাম : সৈয়দ এ.বি.এম. হুমায়ুন  
পিতার নাম : মরহুম সৈয়দ মঈদ উদ্দিন আহাম্মদ  
মাতার নাম : বেগম হামিদা বানু  
জন্ম তারিখ : ২৯/০১/১৯৮৮ ইং  
ধর্ম : ইসলাম  
পেশা : ব্যবসা  
জাতীয়তা : বাংলাদেশী  
জাতীয় পরিচিতি নং : ৩৬১৭১৮৬১২৬৫০৬

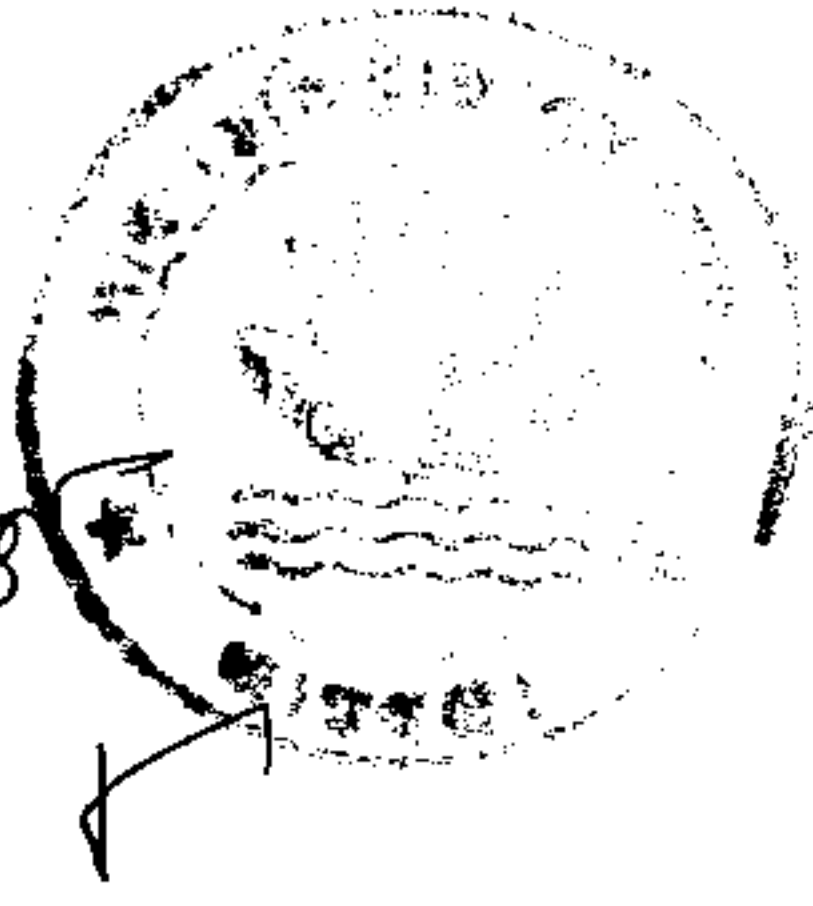
স্থায়ী ঠিকানা :  
বর্তমান ঠিকানা :  
সং-ইটাখোলা (সাহেব বাড়ী), ডাকঘর-  
সায়হামনগর-৩৩৩৩, থানা-মাধবপুর,  
জেলা-হবিগঞ্জ।  
বাড়ী নং-৩৪, রোড নং-১৩৬, গুলশান,  
ঢাকা-১২১২।

৬) সৈয়দ আমর সালিম  
১৪/০১/৮২

স্থায়ী ঠিকানা :  
বর্তমান ঠিকানা :  
সং-ইটাখোলা (সাহেব বাড়ী), ডাকঘর-  
সায়হামনগর-৩৩৩৩, থানা-মাধবপুর,  
জেলা-হবিগঞ্জ।  
বাড়ী নং-৩৪, রোড নং-১৩৬, গুলশান,  
ঢাকা-১২১২।

(স্বাক্ষর)

সৈয়দ সাজেব শাহ  
সৈয়দ সাজেব শাহ  
সৈয়দ সাজেব শাহ  
সৈয়দ সাজেব শাহ



Syed md Faizal  
Syed Abm Humayun  
Syed FAm Shagahar  
Syed AKM Salim

Syed Sazeb Ahmed

ঃ ৪ ৪

(গ) নাম : সৈয়দ এফ.এ.এম. শাহ জাহান  
পিতার নাম : মরহুম সৈয়দ মঈদ উদ্দিন আহাম্মদ  
মাতার নাম : বেগম হামিদা বানু  
জন্ম তারিখ : ০২/০২/১৯৫২ ইং  
ধর্ম : ইসলাম  
পেশা : ব্যবসা  
জাতীয়তা : বাংলাদেশী  
জাতীয় পরিচিতি নং : ৩৬১৭১৮৬১২৬৫০৮  
স্থায়ী ঠিকানা : বর্তমান ঠিকানা :

সাং-ইটাখোলা (সাহেব বাড়ী), ডাকঘর- সায়হামনগর-৩৩৩৩, থানা-মাধবপুর, জেলা-হবিগঞ্জ।	বাড়ী নং-৩৪, রোড নং-১৩৬, গুলশান, ঢাকা-১২১২।
--	--

(ঘ) নাম : সৈয়দ এ.কে.এম. সেলিম  
পিতার নাম : মরহুম সৈয়দ মঈদ উদ্দিন আহাম্মদ  
মাতার নাম : বেগম হামিদা বানু  
জন্ম তারিখ : ৩১/১২/১৯৫৬ ইং  
ধর্ম : ইসলাম  
পেশা : ব্যবসা  
জাতীয়তা : বাংলাদেশী  
জাতীয় পরিচিতি নং : ৩৬১৭১৮৬১২৬৫১০  
স্থায়ী ঠিকানা : বর্তমান ঠিকানা :

সাং-ইটাখোলা (সাহেব বাড়ী), ডাকঘর- সায়হামনগর-৩৩৩৩, থানা-মাধবপুর, জেলা-হবিগঞ্জ।	বাড়ী নং-৩৪, রোড নং-১৩৬, গুলশান, ঢাকা-১২১২।
--	--



১৫১

Syed Md Rezaul  
Syed Abm Humayun  
Syed FAm Shagahan  
Syed Akm Salim

৫। আমমোক্তার / প্রতিনিধি / অভিভাবকের মাধ্যমে দলিল সম্পাদিত হইয়া থাকিলে তাহার নাম, ঠিকানা ও বিবরণ : (আদালত / সরকারী / বেসরকারী প্রতিষ্ঠানের ক্ষেত্রে ছবি প্রযোজ্য নয়)। প্রযোজ্য নহে।

৬। আমমোক্তার নামার বিবরণ (প্রযোজ্য ক্ষেত্রে) : প্রযোজ্য নহে।

৭। হস্তান্তরাধীন জমির ন্যূনপক্ষে ২৫ বছরের মালিকানার ধারাবাহিক বিবরণ (যথাযথ ক্ষেত্রে ওয়ারিশ ও বায়া দলিল সমূহের বিস্তারিত বিবরণ এবং হস্তান্তরের উদ্দেশ্য, সম্পত্তির দখল, ইজমেন্ট স্বত্ব এবং হস্তান্তর সম্পর্কিত উল্লেখযোগ্য মন্তব্য (যদি থাকে) সম্পর্কিত বিবরণ :

পরম করুণাময় মহান আল্লাহ তায়ালার নাম স্মরণ করিয়া অত্র সাফ কবলা দলিলের আইনানুগ বর্ণনা আরম্ভ করিলাম।

যেহেতু নিম্ন তফসিল বর্ণিত কতক সম্পত্তি ব্রাহ্মণবাড়ীয়া জেলার আগুগঞ্জ থানাধীন

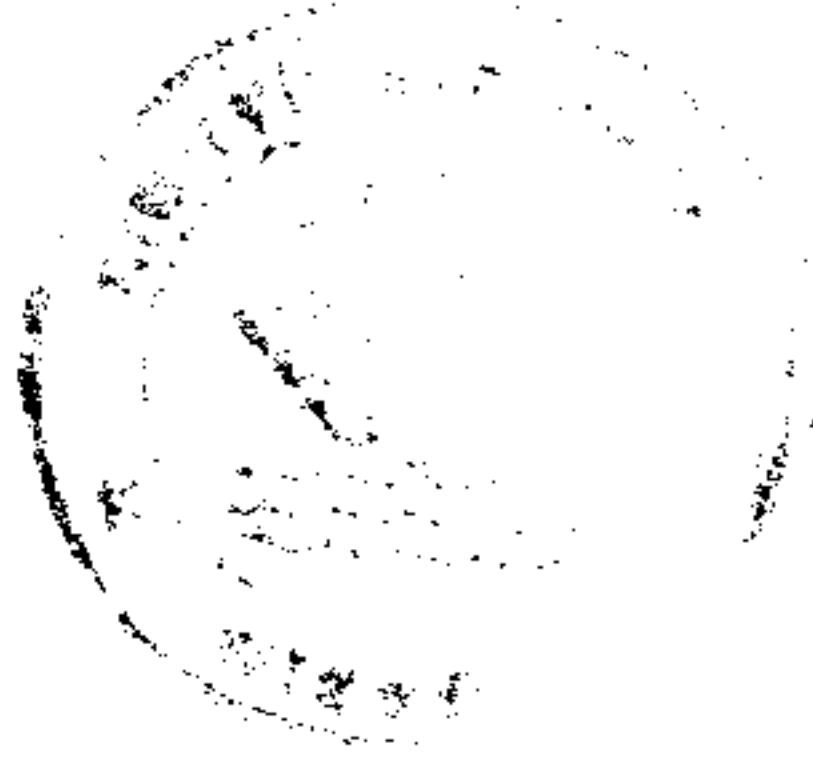
চরচারতলা মৌজার এস.এ.- ৭৪৬ নং খতিয়ানে  $\frac{১২৪০}{৩৫৪৩}$  নং দাগের ৫৯৫ শতাংশ

ভূমিতে চরচারতলা গ্রাম নিবাসী বাদশা মিয়া-এর পুত্র লাল মিয়া ও আব্দুর রহমান, চেরাগ আলীর পুত্র সুরুজ মিয়া, আলী আকবর-এর পুত্র আব্দুল গফুর রেকর্ডীয় মালিক ও ভোগদখলকার বিদ্যমান থাকেন।

অতঃপর উক্ত সুরুজ মিয়া রেকর্ডীয় মালিক ও ভোগদখলকার বিদ্যমান থাকাবস্থায় বিগত ১২/১২/১৯৫৬ ইং তারিখে ব্রাহ্মণবাড়ীয়া সদর সাব-রেজিস্ট্রি অফিসে রেজিস্ট্রিকৃত ৯৫৪ নং একখানা হেবা নামা দলিল মূলে তাহার পুত্র কলিম উদ্দিন আহাম্মদ ওরফে কালা মিয়ার বরাবরে কতক সম্পত্তি হেবা করিয়া দিলে উক্ত হেবানামা দলিল মূলে কলিম উদ্দিন আহাম্মদ ওরফে কালা মিয়া পিতার নিকট হইতে হেবাই সূত্রে প্রাপ্ত হন।

১৫১





ঃ ৬ :ঃ

এবং

Syed md faizal  
Syed ABM Humayun  
Syed FAM Shahgahar  
Syed AKM Salm

অতঃপর উক্ত কলিম উদ্দিন আহাম্মদ ওরফে কালা মিয়া পিতার ওয়ারিশ সূত্রে ও রেকর্ডীয় সূত্রে এবং পিতার নিকট হইতে হেবাই সূত্রে প্রাপ্ত হইয়া বি.এস.- ৬৪৯ নং ও ৬৫০ নং এবং বি.এস. (বুজরত)-২৫১১ নং খতিয়ানে রেকর্ডীয় মালিক ও ভোগদখলকার বিদ্যমান থাকাবস্থায় বিগত ২৩/০৪/১৯৯৫ ইং তারিখে ব্রাহ্মণবাড়ীয়া সদর সাব-রেজিষ্ট্রি অফিসে রেজিষ্ট্রিকৃত ২৬৩৮ নং দুইখানা সাফ কবলা দলিল দ্বারা (১) মজিবুর রহমান (২) শহীদুল্লাহ (৩) অহিদুল্লাহ (৪) কাউছার (৫) আফছার (৬) নাবালক কেরামত আলী (৭) নাবালক রহমত আলী (৮) নাবালক হযরত আলী (৯) নাবালিকা শেরিন আক্তার ওরফে স্বপ্না, সকলের পিতা-তারা মিয়া (১০) জোহরা খাতুন, স্বামী-তারা মিয়া, সর্বসাং-চরচারতলা-এর বরাবরে সাফ বিক্রয় করিয়া দিয়া উক্ত কলিম উদ্দিন আহাম্মদ ওরফে কালা মিয়া বিক্রিত সম্পত্তি হইতে চিরতরে নিঃস্বত্ববান ও দখলত্যাগী হন।

এবং

অতঃপর উক্ত (১) মজিবুর রহমান (২) শহীদুল্লাহ (৩) অহিদুল্লাহ (৪) কাউছার (৫) আফছার (৬) নাবালক কেরামত আলী (৭) নাবালক রহমত আলী (৮) নাবালক হযরত আলী (৯) নাবালিকা শেরিন আক্তার ওরফে স্বপ্না, সকলের পিতা-তারা মিয়া (১০) জোহরা খাতুন, স্বামী-তারা মিয়া-গণ উপরোক্ত ২৬৩৮ নং সাফ কবলা দলিল দ্বারা এবং উক্ত মজিবুর রহমান ও তাহার কতিপয় ভ্রাতা বিগত ০৮/০৪/১৯৯৫ ইং তারিখে ব্রাহ্মণবাড়ীয়া সদর সাব-রেজিষ্ট্রি অফিসে রেজিষ্ট্রিকৃত ২৩২২ নং ও ২৩২৪ নং দুইখানা সাফ কবলা দলিল দ্বারা খরিদ করিয়া খরিদা সূত্রে মালিক নিয়ত হইয়া ভোগদখলকার বিদ্যমান থাকাবস্থায় উক্ত মজিবুর রহমান গং এবং নাবালক ও নাবালিকাগণের পক্ষে তাহাদের পিতা তারা মিয়া স্বাভাবিক অভিভাবক হিসাবে বিগত ১৩/০৪/১৯৯৭ ইং তারিখে ব্রাহ্মণবাড়ীয়া সদর সাব-রেজিষ্ট্রি অফিসে রেজিষ্ট্রিকৃত ২৮৪৩ নং একখানা সাফ কবলা দলিল দ্বারা মজিবুর রহমান মজনু, পিতা-মরহুম আব্দুর রহমান, সাং-চরচারতলা, থানা-আশুগঞ্জ, জেলা-ব্রাহ্মণবাড়ীয়া-এর বরাবরে সাফ বিক্রয় করিয়া দিয়া উক্ত কলিম উদ্দিন আহাম্মদ ওরফে কালা মিয়া বিক্রিত সম্পত্তি হইতে চিরতরে নিঃস্বত্ববান ও দখলত্যাগী হন।



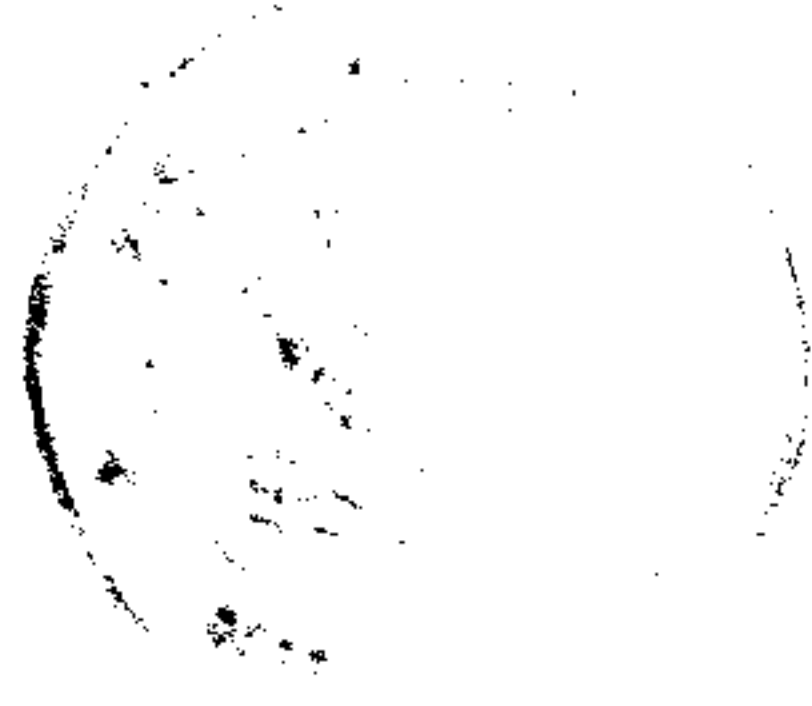
Syed M. Faizal  
Syed A. M. Humayun  
Syed R. M. Shaghor  
Syed A. M. Salim

১৭৪

এবং

উক্ত কলিম উদ্দিন আহাম্মদ ওরফে কালা মিয়া পিতার ওয়ারিশ সূত্রে ও রেকর্ডীয় সূত্রে এবং পিতার নিকট হইতে হেবাই সূত্রে প্রাপ্ত হইয়া বি.এস.- ৬৪৯ নং ও ৬৫০ নং এবং বি.এস. (বুজরত)-২৫১১ নং খতিয়ানে রেকর্ডীয় মালিক ও ভোগদখলকার বিদ্যমান থাকাবস্থায় বিগত ১০/০৪/১৯৯৭ ইং তারিখে ব্রাহ্মণবাড়ীয়া সদর সাব-রেজিষ্ট্রি অফিসে রেজিষ্ট্রিকৃত ২৭৪৭ নং একখানা সাফ কবলা দলিল দ্বারা মজিবুর রহমান মজনু, পিতা-মরহুম আব্দুর রহমান, সাং-চরচারতলা, থানা-আশুগঞ্জ, জেলা-ব্রাহ্মণবাড়ীয়া-এর বরাবরে সাফ বিক্রয় করিয়া দিয়া উক্ত কলিম উদ্দিন আহাম্মদ ওরফে কালা মিয়া বিক্রিত সম্পত্তি হইতে চিরতরে নিঃস্বত্বান ও দখলত্যাগী হন।

অতঃপর উক্ত মজিবুর রহমান মজনু উপরোক্ত বর্ণনা মতে ২৭৪৭ নং ও ২৮৪৩ নং দুইখানা সাফ কবলা দলিল মূলে মালিক ও ভোগদখলকার নিয়ত থাকাবস্থায় তাহার নগদ টাকা আবশ্যক হওয়ায় বিগত ১৩/০৪/১৯৯৭ ইং তারিখে ব্রাহ্মণবাড়ীয়া সদর সাব-রেজিষ্ট্রি অফিসে রেজিষ্ট্রিকৃত ১১৭৮ নং ও ১২১৩ নং দুইখানা সাফ কবলা দলিল দ্বারা (১) সৈয়দ মোহাম্মদ কায়সার (২) সৈয়দ মোঃ ফয়সল (৩) সৈয়দ এ.বি.এম. হুমায়ুন (৪) সৈয়দ এফ.এ.এম. শাহজাহান (৫) সৈয়দ কে.এম. সেলিম, সকলের পিতা-মরহুম সৈয়দ মঈদ উদ্দিন আহাম্মদ, সাং-ইটাখোলা, থানা-মাধবপুর, জেলা-হবিগঞ্জ-এদের বরাবরে সাফ বিক্রয় করিয়া দিয়া উক্ত মজিবুর রহমান মজনু বিক্রিত সম্পত্তি হইতে চিরতরে নিঃস্বত্বান ও দখলত্যাগী হন।



ঃ ৮ :ঃ

Syed md Faizal  
Syed ABM Humayun  
Syed FAM Shajahan  
Syed AKM Salim

এবং

যেহেতু নিম্ন তফসিল বর্ণিত কতক সম্পত্তি ব্রাহ্মণবাড়ীয়া জেলা আশুগঞ্জ থানার চরচারতলা গ্রাম নিবাসী আব্দুল গফুর মোল্লা পৈত্রিক ওয়ারিশ সূত্রে মালিক নিয়ত হইয়া

এস.এ.- ৭৪৬ নং খতিয়ানে  $\frac{১২৪০}{৩৫৪৩}$  নং দাগে নিজ নাম শুদ্ধরূপে রেকর্ডভুক্ত করাইয়া

ভোগদখলে বিদ্যমান থাকাবস্থায় মৃত্যুবরণ করিলে পর তাহার তৎতাজ্যবিস্ত সম্পত্তিতে তিন পুত্র যথাক্রমে- (১) মোঃ নুরুল ইসলাম (২) হাফেজ মোঃ মফিজুর রহমান (৩) মোঃ দীন ইসলাম পিতার ওয়ারিশ সূত্রে মালিক নিয়ত হন।

অতঃপর উক্ত (১) মোঃ নুরুল ইসলাম (২) হাফেজ মোঃ মফিজুর রহমান (৩) মোঃ দীন ইসলাম পিতার ওয়ারিশ সূত্রে মালিক নিয়ত হইয়া ভোগদখলে বিদ্যমান থাকাবস্থায় বিগত ১৯/০৫/১৯৯৭ ইং তারিখে ব্রাহ্মণবাড়ীয়া সদর সাব-রেজিষ্ট্রি অফিসে রেজিষ্ট্রিকৃত ১৫৬৪ নং একখানা সাফ কবলা দলিল দ্বারা (১) সৈয়দ মোহাম্মদ কায়সার (২) সৈয়দ মোঃ ফয়সল (৩) সৈয়দ এ.বি.এম. হুমায়ুন (৪) সৈয়দ এফ.এ.এম. শাহ জাহান (৫) সৈয়দ কে.এম. সেলিম, সকলের পিতা-মরহুম সৈয়দ মঈদ উদ্দিন আহাম্মদ, সাং-ইটাখোলা, থানা-মাধবপুর, জেলা-হবিগঞ্জ-এদের বরাবরে ১৮০ শতাংশ ভূমি বিক্রয় করিয়া দিয়া উক্ত মোঃ নুরুল ইসলাম গং বিক্রিত সম্পত্তি হইতে চিরতরে নিঃস্বত্বান ও দখলত্যাগী হন।

অতঃপর আমরা অত্র দলিল দাতাগণ যথাক্রমে- (১) সৈয়দ মোঃ ফয়সল (২) সৈয়দ এ.বি.এম. হুমায়ুন (৩) সৈয়দ এফ.এ.এম. শাহজাহান (৪) সৈয়দ কে.এম. সেলিম, সকলের পিতা-মরহুম সৈয়দ মঈদ উদ্দিন আহাম্মদ উপরোক্ত বর্ণনা মতে মালিক নিয়ত থাকাবস্থায় বি.এস.- ১৩৭৬ নং ও ২১০১ নং খতিয়ানে নিজেদের নাম শুদ্ধরূপে রেকর্ডভুক্ত করাইয়া এবং বিগত ১০/০৫/১৯৯৭ ইং তারিখে সহকারী কমিশনার (ভূমি) ব্রাহ্মণবাড়ীয়া সদর সার্কেলের ২৯৯/৯৬-৯৭ নং নামজারী মোকদ্দমায় ৫০৪ নং নামজারী খতিয়ানে আশুগঞ্জ সদর ইউনিয়ন ভূমি অফিসে ১৩১৯ নং জোতে নিজেদের নামে নামজারী করাইয়া সরকারের ধার্যকৃত বার্ষিক খাজনাদী পরিশোধক্রমে ভোগদখলে বিদ্যমান আছি।





ঃ ৯ ঃ

Syed md Faizal  
Syed ABM. Humayun  
Syed FAM Shabgirahom  
Syed AKM Salim

অতঃপর, আমরা অত্র দলিলের দাতাগণের ব্যবসায়িক প্রয়োজনে নগদ টাকার আবশ্যক হওয়ায় নিম্ন তফসিলভুক্ত সম্পত্তি বিক্রয়ের জন্য প্রস্তাব ঘোষণা করিলে পর আপনি অত্র দলিল গ্রহিতা তাহা খরিদ করিতে ইচ্ছা প্রকাশ করেন।

অতঃপর আমরা উভয় পক্ষ আলাপ আলোচনার পর উহার বর্তমান বাজার যাচাই পূর্বক নিম্ন তফসিল বর্ণিত সম্পত্তির আপনি সর্বোচ্চ দরদাতা সাব্যস্ত হওয়ায় আপনার নিকট নিম্ন তফসিল বর্ণিত সম্পত্তি বিক্রয়ের মনস্থির করতঃ অদ্য রোজ হাজিরান মজলিসে স্বাক্ষীগণের মোকাবেলায় আপনার নিকট হইতে নিম্ন তফসিল বর্ণিত সম্পত্তির ধার্যকৃত মূল্যের সাকুল্য টাকা বুঝিয়া পাইয়া ও নিয়া নিম্ন তফসিল বর্ণিত সম্পত্তি আপনি অত্র দলিল গ্রহিতার নিকট সাফ বিক্রয় করিলাম এবং বিক্রীত সম্পত্তির সর্বস্বত্ব ও দখল প্রয়োজনীয় দলিলপত্র সহ আপনার বরাবরে বুঝাইয়া দিয়া বিক্রীত সম্পত্তি হইতে চিরতরে ওয়ারিশানক্রমে নিঃস্বত্ববান ও দখলত্যাগী হইলাম।

অদ্য হইতে আপনি দলিল গ্রহিতা অত্র সাফ কবলা দলিল মূলে তফসিল বর্ণিত সম্পত্তির স্বত্ববান মালিক নিয়ত হইলেন, সিটি কর্পোরেশন, গ্যাস, ওয়াসা, বিদ্যুৎ, ভূমি ও রাজস্ব অফিস সহ সংশ্লিষ্ট অন্যান্য সকল অফিসে আমাদের নামের স্থলে মিডল্যান্ড পাওয়ার কোং লিঃ-এর নামে নামজারী করাওয়া সরকারী ধার্যকৃত খাজনা, বিল ইত্যাদি পরিশোধ করতঃ উহার চেক দাখিলা গ্রহণ পূর্বক গ্রহিতার প্রয়োজনে দান, বিক্রয়, হেবা, মর্টগেজ, বিনিময় ইত্যাদি সর্ব প্রকার হস্তান্তরের ক্ষমতা ধরনে ও পরিচালনে স্থলবর্তী ও পরবর্তীগনক্রমে ভোগ দখল করিতে রহেন ও রহুক।

ইহাতে আমরা অত্র দলিল দাতাগণ কিংবা আমাদের স্থলবর্তী ও পরবর্তী ওয়ারিশগণের কোন প্রকার দাবী দাওয়া নাই বা রহিল না। করিলেও তাহা সর্ব আইন আদালতে অগ্রাহ্য ও বাতিল বলিয়া গণ্য হইবে।



Syed md Fayal  
Syed ADM Humayun  
Syed FAM Shagahon  
Syed AKM Salim

১০৪

উল্লেখ্য যে, নিম্ন তফসিল বর্ণিত সম্পত্তি আমরা অন্যত্র কাহারো নিকট বিক্রয় করি নাই বা বিক্রয়ের চুক্তিতে আবদ্ধ হই নাই, কিংবা কোন সরকারী, আধাসরকারী বা বেসরকারী প্রতিষ্ঠানের নিকট দায়বদ্ধ রাখি নাই, যদি ভবিষ্যতে তদ্রূপ কোন কার্য প্রকাশ পায় বা আমাদের কোন ওয়ারিশ আপনার ভোগ দখলে ব্যাঘাত সৃষ্টি করে তাহা হইলে আইনতঃ দায়ী হইব। হস্তান্তরিত ভূমির স্বত্ব, স্বার্থ, দখল সম্পর্কে কোন মিথ্যাচার বা সত্য গোপন করার কারনে দলিল গ্রহিতা ক্ষতিগ্রস্ত হইলে ক্ষয়ক্ষতিসহ দলিলে প্রদর্শিত মূল্য ফেরৎ প্রদানে বাধ্য থাকিব এবং কৃত অপরাধের জন্য আইনতঃ দণ্ডনীয় হইব।

প্রকাশ থাকে যে, যদি ভবিষ্যতে অত্র দলিলের গর্ভের বয়ানে, দাগ, খতিয়ান, নাম, ঠিকানা, ইত্যাদিতে কোন প্রকার ভুল ত্রুটি পরিলক্ষিত হয় তজ্জন্য অত্র দলিল পণ্ড বা বাতিল হইবেনা বরং আমাদেরকে জানাইলে পর, আমরা বিনা পনে বিনা ওজরে সাব-রেজিষ্ট্রি অফিসে উপস্থিত হইয়া ভুলের শুদ্ধ বর্ণনা দিয়া আপনার বরাবরে ভ্রম সংশোধন দলিল সম্পাদনসহ রেজিষ্ট্রি কার্যাদি সম্পন্ন করিয়া দিব, যাহা অত্র দলিলের একাংশ বলিয়া গন্য হইবে।

- ৮। একাধিক ক্রেতাগণের ক্ষেত্রে ক্রয়কৃত / অর্জিত জমির হারাহারি মালিকানার বিবরণ (যদি থাকে) :

ক্রেতা / গ্রহিতার নাম	মালিকানার পরিমাণ / অংশ
মিডল্যান্ড পাওয়ার কোং লিঃ	৩৬৬.৭০ শতাংশ ভূমি

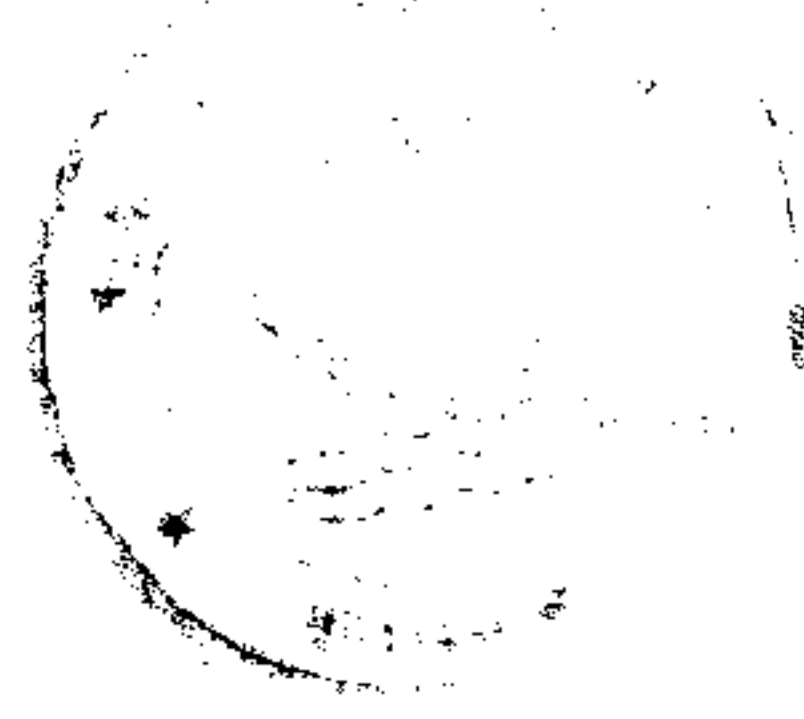
- ৯। একাধিক বিক্রেতা/হস্তান্তরকারীর ক্ষেত্রে হস্তান্তরিত জমির হারাহারি মালিকানার বিবরণঃ প্রযোজ্য নহে।

বিক্রেতা / দাতাগণের নাম	মালিকানার পরিমাণ / অংশ
(ক) সৈয়দ মোঃ ফয়সল	৯১.৬৭৫ শতাংশ
(খ) সৈয়দ এ.বি.এম. হুমায়ুন	৯১.৬৭৫ শতাংশ
(গ) সৈয়দ এফ.এ.এম. শাহজাহান	৯১.৬৭৫ শতাংশ
(ঘ) সৈয়দ কে.এম. সেলিম	৯১.৬৭৫ শতাংশ
মোট =	৩৬৬.৭০ শতাংশ ভূমি

১০। সম্পাদনের তারিখ : ইংরেজী : ২৬-ডিসেম্বর/২০১১  
বাংলা : ৪-শ্রাবণ-১৪৩৬

০





Syed md Faisal  
Syed ADM Humayun  
Syed RAM Shagahom  
Syed AKM Salim

১১১ঃ

১১। সম্পত্তির তফসিল :

তফসিল পরিচয়

জেলা-ব্রাহ্মনবাড়ীয়া, থানা ও সাব-রেজিষ্ট্রি অফিস-সাবেক-ব্রাহ্মনবাড়ীয়া সদর, হালে-  
আশুগঞ্জ, ব্রাহ্মনবাড়ীয়া কালেক্টরীর তৌজিভুক্ত, জে.এল. নং- সাবেক-৪৫৭ (চারশত  
সাতান্ন), হালে-০১ (এক), মৌজা-চরচারতলা।

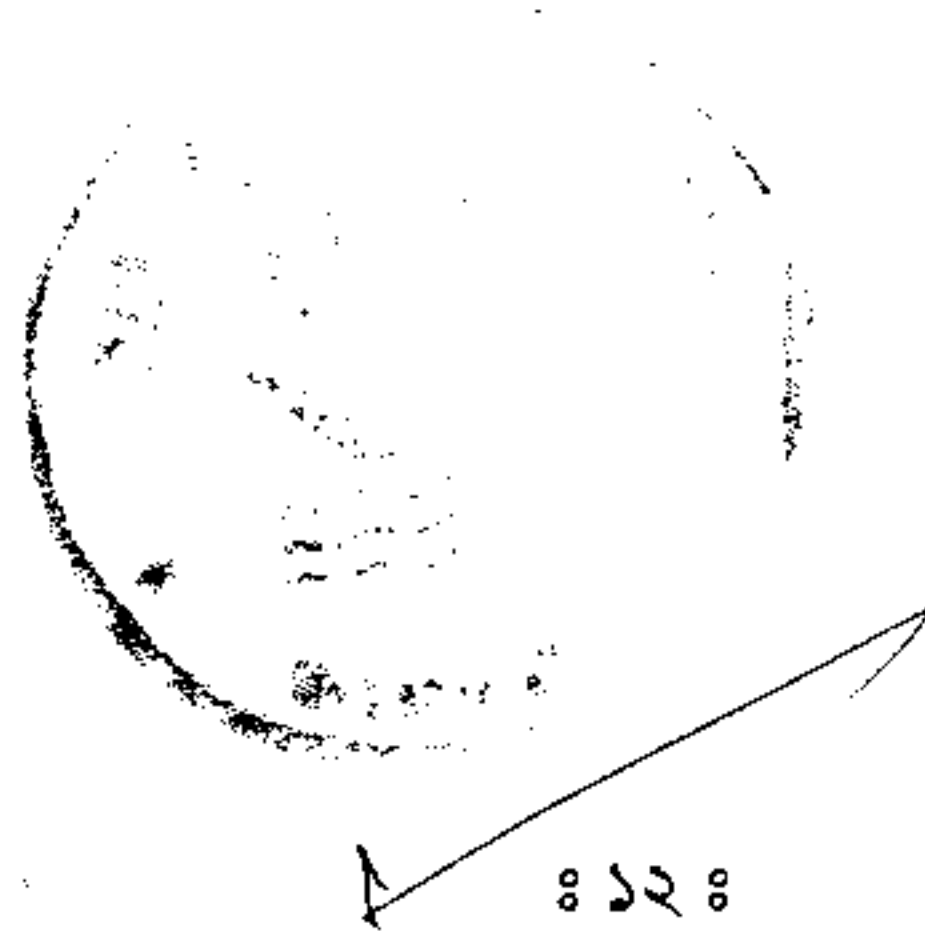
খতিয়ান নং- এস.এ.- ৭৪৬ (সাতশত ছেতাল্লিশ), বি.এস.- ২১০১ (দুইহাজার একশত  
এক), ১৩৭৬ (একহাজার তিনশত ছিয়াত্তর), ৬৪৯ (ছয়শত ঊনপঞ্চাশ), ৬৫০ (ছয়শত  
পঞ্চাশ) ও ১২৫১ (একহাজার দুইশত একান্ন) এবং বি.এস. (বুজরত)- ২৫১১  
(দুইহাজার পাঁচশত এগার)।

(১) দাগ- সি.এস. ও এস.এ.-  $\frac{১২৪০}{৩৫৪৩}$  (একহাজার দুইশত চল্লিশ বাট্টা তিনহাজার  
পাঁচশত তেতাল্লিশ) এবং বি.এস.-৩৫১৬ (তিনহাজার পাঁচশত ষোল) নং দাগের নাল  
ভূমি- ২১.০০ (একুশ) শতাংশ।

(২) দাগ- সি.এস. ও এস.এ.-  $\frac{১২৪০}{৩৫৪৩}$  (একহাজার দুইশত চল্লিশ বাট্টা তিনহাজার  
পাঁচশত তেতাল্লিশ) এবং বি.এস.-৩৫১৭ (তিনহাজার পাঁচশত সতের) নং দাগের নাল  
ভূমি- ১২.০০ (বার) শতাংশ।

(৩) দাগ- সি.এস. ও এস.এ.-  $\frac{১২৪০}{৩৫৪৩}$  (একহাজার দুইশত চল্লিশ বাট্টা তিনহাজার  
পাঁচশত তেতাল্লিশ) এবং বি.এস.-৩৫১৮ (তিনহাজার পাঁচশত আঠার) নং দাগের নাল  
ভূমি- ২১৬.০০ (দুইশত ষোল) শতাংশ।

(৪) দাগ- সি.এস. ও এস.এ.-  $\frac{১২৪০}{৩৫৪৩}$  (একহাজার দুইশত চল্লিশ বাট্টা তিনহাজার  
পাঁচশত তেতাল্লিশ) এবং বি.এস.- ৩৫০২ (তিনহাজার পাঁচশত দুই) নং দাগের নাল  
ভূমি- ১৮০.০০ (একশত আশি) শতাংশ।



Syed md Faizal  
Syed ABM Humayun  
Syed FAM Shagahan  
Syed AKM Salim

(৫) দাগ- সি.এস. ও এস.এ.-  $\frac{১২৪০}{৩৫৪৩}$  (একহাজার দুইশত চল্লিশ বাট্টা তিনহাজার পাঁচশত তেতাল্লিশ) এবং বি.এস.-১৬৫০ (একহাজার ছয়শত পঞ্চাশ) নং দাগের নাল ভূমি- ৪৫.০০ (পঁয়তাল্লিশ) শতাংশ।

(৬) দাগ- সি.এস. ও এস.এ.-  $\frac{১২৪০}{৩৫৪৩}$  (একহাজার দুইশত চল্লিশ বাট্টা তিনহাজার পাঁচশত তেতাল্লিশ) এবং বি.এস.-১৬৫৫ (একহাজার ছয়শত পঞ্চাশ) নং দাগের নাল ভূমি- ৩৩.০০ (তেত্রিশ) শতাংশ।

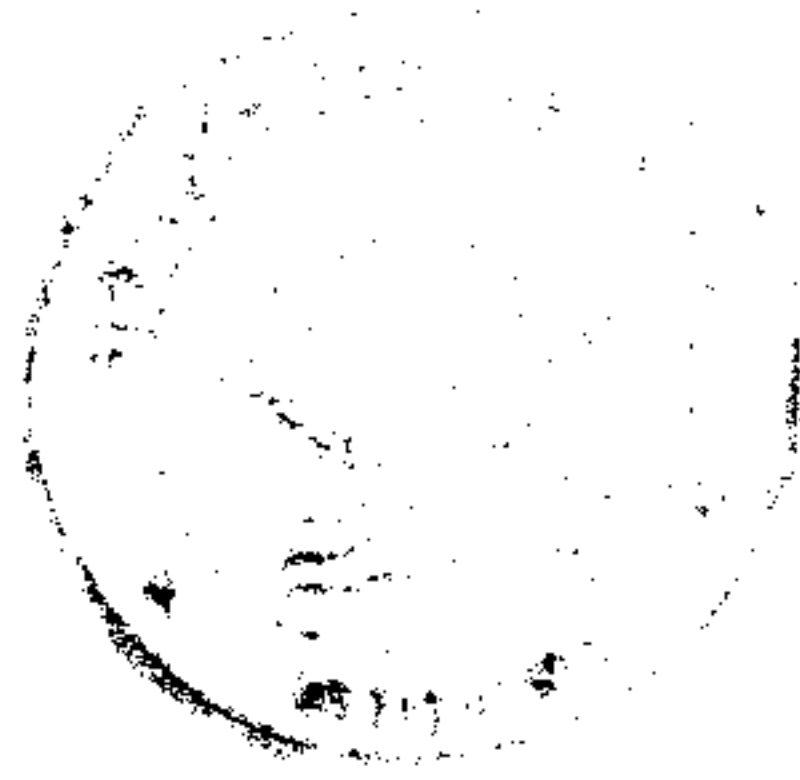
যাহার নামজারী খতিয়ান নং- ৫০৪, মোকদ্দমা নং-২৯৯/৯৬-৯৭, তারিখ- ১০/০৫/১৯৯৭ ইং, জোত নং-১৩১৯।

একুনে মোট (২১ + ১২ + ২১৬ + ১৮০ + ৪৫ + ৩৩) = ৫০৭ (পাঁচশত সাত) শতাংশ ভূমি ইহার কাতে অত্র দলিল দ্বারা ৩৬৬.৭০ (তিনশত ছেষাট্টি দশমিক সাত শূন্য) শতাংশ ভূমি সাক্ষ বিক্রিত সম্পত্তি বটে।

ভূমি অফিসের নাম/বিবরণ : সহকারী কমিশনার (ভূমি) ব্রাহ্মণবাড়ীয়া সদর সার্কেল, ব্রাহ্মণবাড়ীয়া।

১২। সম্পত্তির চৌহদ্দির বিবরণ :

উত্তরে- দারু মিয়া গং	দক্ষিণে- বি.এস.-৩৫১৯ নং দাগের ভূমি
পূর্বে- গ্রহিতা নিজ	পশ্চিমে- মেঘনা নদী।



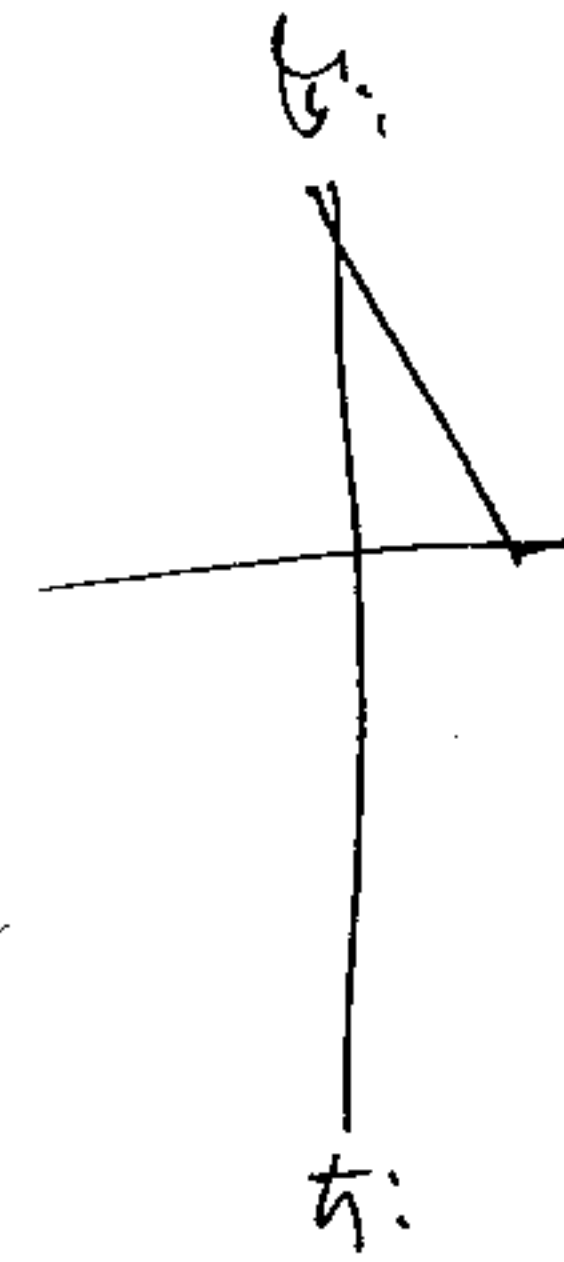
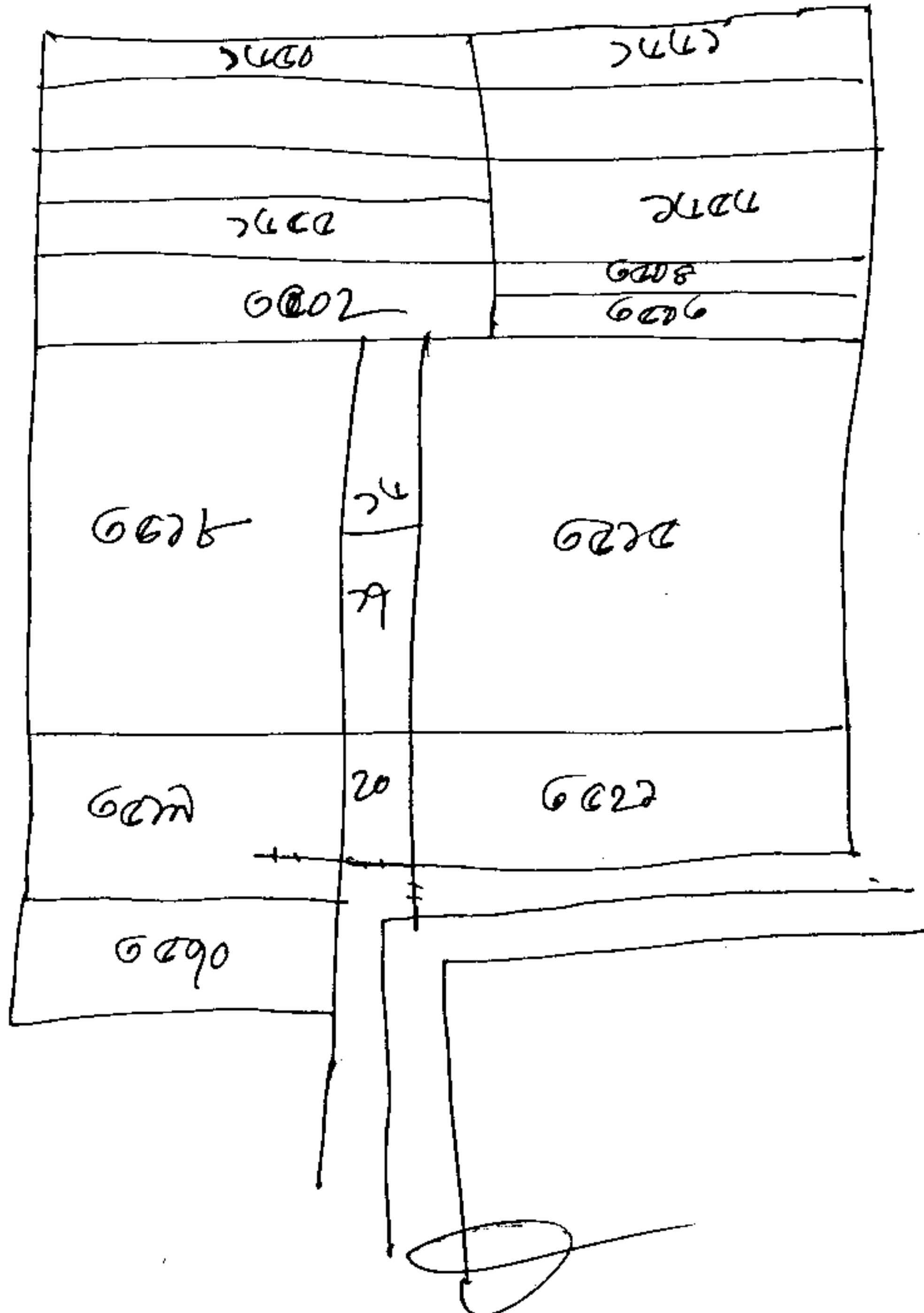
১৩ :

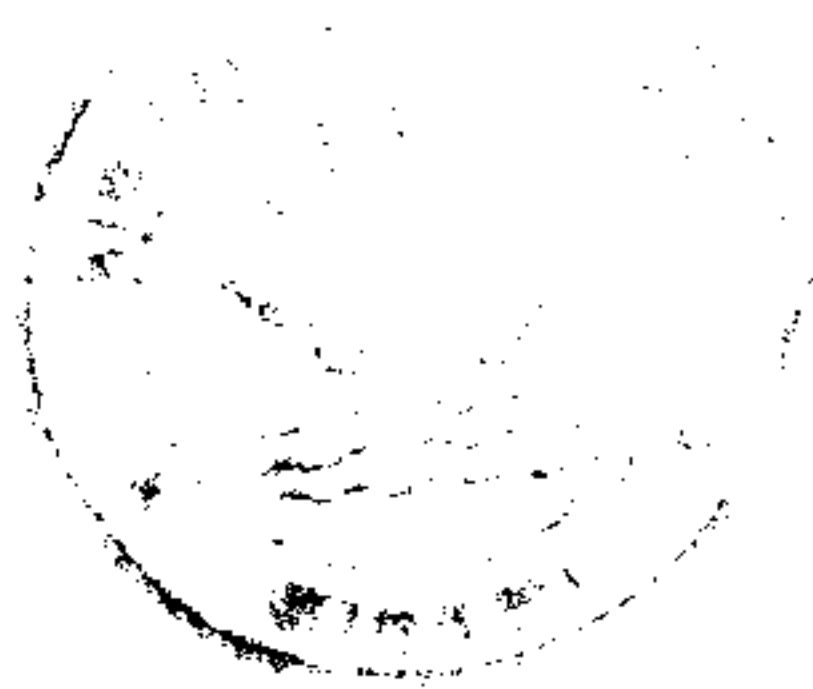
Syed md Raiful  
Syed ABM Humayun  
Syed AM Shauhan  
Syed AKM Salim

১৩। হস্তান্তরিত সম্পত্তির পরিমান (অংকে ও কথায়) : মোট ৩৬৬.৭০ (তিনশত ছিষটি দশমিক সাত শূন্য) শতাংশ ভূমি।

১৪। হস্তান্তরিত সম্পত্তির মূল্য পরিশোধের বিবরণ (যদি থাকে) অংকে ও কথায় : সম্পত্তির মোট মূল্য = ২,৮১,০০,০০০/- (দুই কোটি একাশি লক্ষ) টাকা মাত্র। এককালীন ধার্যকৃত মূল্যের সাকুল্য টাকা নগদ পরিশোধ করা হইয়াছে। আমরা অত্র দলিল দাতাগণ ধার্যকৃত মূল্যের সাকুল্য টাকা নগদ বুঝিয়া পাইয়াছি।

১৫। হস্তান্তরিত সম্পত্তির হাত নকশা ও পরিমাপ :





: ১৪ :

Syed md Raifal  
Syed ABM Humayun  
Syed FAM Shagahan  
Syed AKM Salim

১৬। কৈফিয়ত যদি থাকে : X

১৭। দলিল পাঠ করিয়া / করাইয়া আমি উহার মর্ম অবগত ও সম্মত হইয়া স্বাক্ষর করিলামঃ

দাতাগণের স্বাক্ষর :

(ক) Syed md Raifal

(খ) Syed ABM Humayun

(গ) Syed FAM Shagahan

(ঘ) Syed AKM Salim

গ্রহিতার স্বাক্ষর :

Rezaul Haider  
Rezakur Haider  
Director  
midland power co Ltd,

১৮। সাক্ষী/সাক্ষীগণের নাম, ঠিকানা ও স্বাক্ষর :

(১)

নাম :	Syed Raib Ahmed	স্বাক্ষর ও	তারিখঃ
পিতা/স্বামীর নাম :	Sm Raisar		18/12/2011
মাতার নামঃ	Nazma Begum		
গ্রাম/রোড নংঃ	H. 34 Rd-136	ডাকঘর :	
উপজেলা/থানাঃ	Bulshan	জেলা :	Dhaka

Syed md Faizal  
Syed ABM Humayun  
Syed FAm Shagahan  
Syed Axm Salem

১৫৪

(২)

নাম :	SYED ISHTIAD AHMED	স্বাক্ষর ও তারিখ :	১৮/১২/১১
পিতা/স্বামীর নাম :	SYED MD FAISAL		
মাতার নাম :	YASMIN FAISAL		
গ্রাম/রোড নং :	136, HOUSE 34	ডাকঘর :	GULSHAN
উপজেলা/থানা :	GULSHAN	জেলা :	DHAKA

১৯। সনাক্তকারীর নাম, ঠিকানা ও স্বাক্ষর :

নাম :	Syed Sageb Ahmed	স্বাক্ষর ও তারিখ :	Syed Sageb Ahmed
পিতা/স্বামীর নাম :	Syed ABM Humayun		
মাতার নাম :	Dr. Naima muazzam		
গ্রাম/রোড নং :	H#3 Rd 54A	ডাকঘর :	Gulshan 12/2
উপজেলা/থানা :	GULSHAN	জেলা :	Dhaka

২০। হস্তান্তরিত সম্পত্তির সঠিক পরিচয় এবং বাজার মূল্য সম্পর্কে সম্যক অবহিত হইয়া আমি নিম্ন স্বাক্ষরকারী অত্র দলিলের মুসাবিদা করিয়াছি / লিখিয়া দিয়াছি এবং পক্ষগনকে পাঠ করিয়া শুনাইয়াছি।

দলিলটি হলফনামাসহ ১৬ (ষোল) ফর্দে লিখিত।

মুসাবিদা কারক বা দলিল লেখকের নাম, পূর্ণ ঠিকানা ও দলিল লেখকের সনদ নং (অফিসের নাম সহ) :

ঢাকা আইনজীবী সমিতি

সনদ নং ৮৬৮২

মুসাবিদা কারকের স্বাক্ষর :

মোঃ জসীম উদ্দীন সরকার  
এডভোকেট  
বাংলাদেশ সুপ্রীমকোর্ট  
বায়তুল খায়ের, রুম নং-৭০১ (৮ম তলা)  
৪৮/এ-বি, পুরানা পল্টন, ঢাকা-১০০০।



২১। দলিল দাতাগণের হলফনামা :

বরাবর

সাব-রেজিষ্টার

আশুগঞ্জ সাব-রেজিষ্ট্রি অফিস, ব্রাহ্মণবাড়ীয়া।

আমরা (১) সৈয়দ মোঃ ফয়সল (জন্ম তারিখ- ০১/০১/১৯৪২ ইং) (২) সৈয়দ এ.বি.এম. হুমায়ুন (জন্ম তারিখ- ২৯/০১/১৯৪৮ ইং) (৩) সৈয়দ এফ.এ.এম. শাহজাহান (জন্ম তারিখ- ০২/০২/১৯৫২ ইং) (৪) সৈয়দ কে.এম. সেলিম (জন্ম তারিখ- ০১/১২/১৯৫৬ ইং), সকলের পিতা-মরহুম সৈয়দ মঈদ উদ্দিন আহাম্মদ, মাতা- বেগম হামিদা বানু, সাং-ইটাখোলা (সাহেব বাড়ী), ডাকঘর-সায়হামনগর-৩৩৩৩, থানা-মাধবপুর, জেলা-হবিগঞ্জ, বর্তমান ঠিকানা- বাড়ী নং-৩৪, রোড নং-১৩৬, গুলশান, ঢাকা-১২১২, জাতীয়তা-বাংলাদেশী, ধর্ম-ইসলাম, পেশা-ব্যবসা।

এই মর্মে হলফনামা প্রদান করিতেছি যে, আমি / আমরা হস্তান্তরাধীন জমির নিরংকুশ মালিক, অন্য কোন পক্ষের সহিত বায়না চুক্তি করি নাই বা অন্য কোথাও বিক্রয় করি নাই বা অন্য কোন পক্ষের নিকট বন্ধক রাখি নাই। এই সম্পত্তি সরকারী খাস / অর্পিত বা পরিত্যক্ত সম্পত্তি নয় বা অন্য কোন ভাবে সরকারের উপর বর্তায় নাই। আরও হলফ করিতেছি যে, উপরিউক্ত কোন তথ্য ভুলভাবে লিপিবদ্ধ হইয়া থাকিলে তজ্জন্য আমি / আমরা দায়ী হইব এবং আমার বিরুদ্ধে দেওয়ানী ও ফৌজদারী মামলা করা যাইবে। হস্তান্তরিত জমি সম্পর্কে কোন ভুল, অসত্য, বিভ্রান্তিকর তথ্য প্রদান করিয়া থাকিলে প্রয়োজনে নিজ খরচায় ভুল শুদ্ধ করিয়া ক্ষতিপূরণসহ নতুন দলিল প্রস্তুত ও রেজিষ্ট্রি করিয়া দিতে বাধ্য থাকিব।

উল্লেখ্য, দলিলে হস্তান্তরিত সম্পত্তির মূল্য কম দেখানো হয় নাই।

Syed Saged Ahmed  
S/O Syed ABM Humayan  
A # 3 Rd 54A - Gulshan  
Dhaka

Syed md Raisul  
Syed ABM Humayan  
Syed AAM shagahan  
Syed Akm salim

সনাক্তকারীর স্বাক্ষর ও তারিখ- ১৮/৭/২০১১

হলফকারীর স্বাক্ষর ও তারিখ- ১৮/৭/২০১১

২২। সাব-রেজিষ্ট্রারের নাম ও পদবীসহ স্বাক্ষর ও তারিখ :

সাব-রেজিষ্ট্রার  
আশুগঞ্জ  
ব্রাহ্মণবাড়ীয়া।

১-২৫ ৬৪ (১/১১/৭২) নং বিজ্ঞপ্তি প্রাপ্তি  
 মোঃ জিঃ এমঃ হোসেন প্রমুখের উপস্থিতিতে  
 মিয়ানমার সরকারের ২০০/২০০১ সালের  
 ১-২৫ ৬৪ নং বিজ্ঞপ্তি ১/১১/৭২ নং  
 প্রজ্ঞাপন মোতাবেক প্রাপ্তি প্রাপ্তি  
 প্রাপ্তি প্রাপ্তি প্রাপ্তি প্রাপ্তি

মোঃ জিঃ এমঃ হোসেন  
 (১/১১/৭২)

মোঃ জিঃ এমঃ হোসেন  
 (১/১১/৭২)

মোঃ জিঃ এমঃ হোসেন  
 (১/১১/৭২)

মোঃ জিঃ এমঃ হোসেন  
 (১/১১/৭২)

---

## ANNEX VII- PHOTO OF BASELINE MONITORING AND CONSULTATION

---



**Surface water sample collection**



**Ground water sample collection**



**Noise level monitoring (Inside the plant boundary)**



**Noise level monitoring (Adjacent to the Boundary)**



**Noise level monitoring at closest settlement**



**Ambient air quality monitoring inside the power plant boundary**

---





**Ambient air quality monitoring at Midland Power Company's staff quarter**



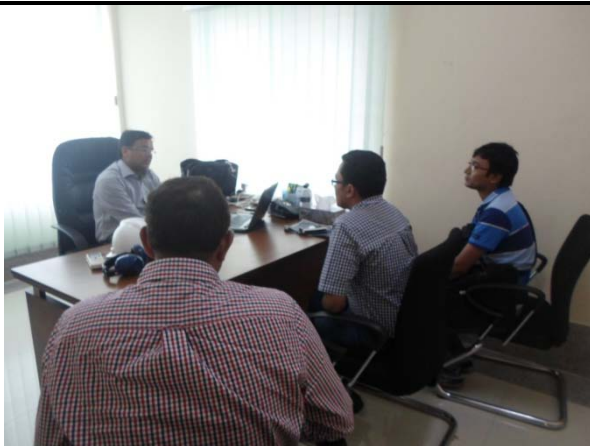
**Ambient air quality monitoring in front of Wheat Silo Gate**



**Socio-economic Survey**



**Consultation with local people**



**Consultation with Midland Power Company Limited Authority**



**Consultation at Char Chartala Union Parishad**



**Consultation at Ashuganj Upazila Agriculture Office**



**Consultation at Ashuganj Upazila Fisheries Office**





**Consultation with Ashuganj upazila Woman Vice-Chairman**

## ANNEX VIII- FOCUS GROUP DISCUSSION MEETING ATTENDANCE SHEET

### Focus Group Discussion Meeting Attendance Sheet

Date: 28.09. 14      Time: 2:20 AM  
Venue: Char Chartala Village (Close to  
Plant), Ashuganj

Focus Group Discussion-1			
Sl.	Name	Address	Occupation
1.	Halima Begum	Char Chartala, Ashuganj	Housewife
2.	Jahana Begum	Char Chartala, Ashuganj	Housewife
3.	Sharmin Akter	Char Chartala, Ashuganj	Housewife
4.	Joshna Begum	Char Chartala, Ashuganj	Housewife
5.	Bilkis Begum	Char Chartala, Ashuganj	Housewife
6.	Yeasmin Akter	Char Chartala, Ashuganj	Housewife
7.	Moriom Khatun	Char Chartala, Ashuganj	Housewife
8.	Nazma Akter	Char Chartala, Ashuganj	Housewife
9.	Farida Begum	Char Chartala, Ashuganj	Housewife
10.	Suma Khatun	Char Chartala, Ashuganj	Housewife
			



## Focus Group Discussion Meeting

### Attendance Sheet

Date: 30.09. 14      Time: 10:20 AM  
Venue: Rail Station Bazar, Char Chartala,  
Ashuganj

Focus Group Discussion-2			
Sl.	Name	Address	Occupation
1.	Mukta Mia	Char Chartala, Ashuganj	Jobless
2.	Md. Jalil Mia	Char Chartala, Ashuganj	Daylabour
3.	Mojibar Ahmed	Bhabanipur, Ashuganj	Private Job
4.	Kutub Mia	Char Chartala, Ashuganj	Driver
5.	Delawar Molla	Char Chartala, Ashuganj	Mason
6.	Shajahal	Araisidha, Ashuganj	Shopkepper
7.	Gias uddin	Char Chartala, Ashuganj	Business
8.	Azizur Rahman	Dagarisar, Ashuganj	CNG Driver
9.	Mosle Uddin	Araisidha, Ashuganj	Business
10.	Ruhul Amin	Char Chartala, Ashuganj	Private Job
11.	Wazkuruni	Char Chartala, Ashuganj	Mason
12.	Saddam	Char Chartala, Ashuganj	Business
13.	Dhanu Sarkar	Char Chartala, Ashuganj	Business



## ANNEX IX

### LIST OF ESIA TEAM

#### **A. Environmental Assessment Team**

1. Team Leader

Mr. Delawar Bakht

2. Environmental Engineer

Mr. Md. Nurul Alam Siddique

3. Sociologist

Mr. Humayun Kabir

4. GIS Specialist

Mr. Md. Mizanur Rahman

5. Field Engineer

Mr. Samiul Islam

#### **B. Baseline Survey Team**

1. Mr. Kazi Farhed Iqubal, Executive Director EQMS and his Survey Team

# ANNEX X

## Chance Find Procedures for Protection of Cultural Property

### **Chance Find Procedures for Protection of Cultural Property (Ref: The World Bank Operational Manual, 1999 OP4.11)**

Works could impact sites of social, sacred, religious, or heritage value. “Chance find” procedures would apply when those sites are identified during the design phase or during the actual construction period and the related activity will not be eligible for financing under the project.

1. Cultural property include monuments, structures, works of art, or sites of significance points of view, and are defined as sites and structures having archaeological, historical, architectural, or religious significance, and natural sites with cultural values. This includes cemeteries, graveyards and graves.

2. The list of negative subproject attributes which would make a subproject ineligible for support includes any activity that would adversely impact cultural property.

3. In the event of finding of finding properties of cultural value during construction, the following procedures for identification, protection from theft, and treatment of discovered artifacts should be followed and included in standard bidding documents.

- (a) Stop the construction activities in the area of the chance find;
- (b) Delineate the discovered site or area;
- (c) Secure the site to prevent any damage or loss of removable objects.
- (d) Notify the supervisory Engineer who in turn will notify the responsible local authorities;
- (e) Responsible local authorities and the relevant Ministry would be in charge of protecting and preserving the site before deciding on subsequent appropriate procedures.
- (f) Decisions on how to handle the finding shall be taken by the responsible authorities and the relevant Ministry. This could include changes in the layout (such as when finding an irremovable remain of cultural or archeological importance), conservation, restoration and salvage.
- (g) Implementation for the authority decision concerning the management of the finding shall be communicated in writing by the relevant Ministry.
- (h) Construction work could resume only after permission is given from the responsible local authorities and the relevant Ministry concerning safeguard of the heritage.

4. These procedures must be referred to as standard provisions in construction contracts. During project supervision, the Site Engineer shall monitor the above regulations relating to the treatment of any chance find encountered are observed.

5. Relevant findings will be recorded in World Bank Supervision Reports and Implementation Completion Reports will assess the overall effectiveness of the project’s cultural property mitigation, management, and activities, as appropriate.

ANNEX XI  
GADGET OF ENVIRONMENT AND FOREST MINISTRY ON ECA

রেজিস্টার্ড নং ডি এ-১



অতিরিক্ত সংখ্যা  
কর্তৃপক্ষ কর্তৃক প্রকাশিত

রবিবার, অক্টোবর ৪, ২০০৯

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার  
পরিবেশ ও বন মন্ত্রণালয়  
পরিবেশ শাখা-৩  
প্রজ্ঞাপন  
তারিখ, ০১ সেপ্টেম্বর, ২০০৯

নং পবম/পরিবেশ-৩/৫/মামলা-০৪/২০০৯/৩৮৫—সরকার এ মর্মে সন্তুষ্ট হয়েছে যে, মানুষের অপরিণামদর্শী এবং অপরিবর্তিত কার্যকলাপের কারণে রাজধানী ঢাকার চতুর্পার্শে প্রবাহিত বুড়িগঙ্গা, তুরাগ, বালু ও শীতলক্ষ্যাসহ সংশ্লিষ্ট নদীসমূহের প্রতিবেশ ব্যবস্থা (Ecosystem) সংকটাপন্ন অবস্থায় উপনীত হয়েছে, যার ভবিষ্যতে আরও অবনতি হবার আশংকা রয়েছে।

এ বিষয়ে দায়েরকৃত একটি রীট পিটিশনের (নং ৩৫০৩/২০০৯) রায়ে মহামান্য সুপ্রীম কোর্টের হাইকোর্ট বিভাগ উপরোক্ত নদীসমূহকে প্রতিবেশগত সংকটাপন্ন এলাকা (Ecologically Critical Area) হিসেবে ঘোষণা করার নির্দেশ প্রদান করেছেন।

এমতাবস্থায়, প্রাকৃতিক পরিবেশ সংরক্ষণ, পরিবেশগত মান উন্নয়ন এবং পরিবেশ দূষণ নিয়ন্ত্রণ ও প্রশমন এবং টেকসই পরিবেশ ব্যবস্থাপনার লক্ষ্যে “বাংলাদেশ পরিবেশ সংরক্ষণ আইন, ১৯৯৫” (১৯৯৫ সনের ১নং আইন) এর ৫নং ধারার উপ-ধারা (১) এ প্রদত্ত ক্ষমতাবলে এবং পরিবেশ সংরক্ষণ বিধিমালা, ১৯৯৭-এর ৩ নং বিধি অনুসারে এবং সর্বোপরি মহামান্য সুপ্রীম কোর্টের হাইকোর্ট বিভাগের নির্দেশনা অনুযায়ী বুড়িগঙ্গা, তুরাগ, বালু ও শীতলক্ষ্যাসহ সংশ্লিষ্ট নদীসমূহের এবং উভয় তীরস্থ ফোরশোর এলাকাসমূহকে প্রতিবেশগত সংকটাপন্ন এলাকা (Ecologically Critical Area) হিসেবে ঘোষণা করা হলো।

( ৬৬৫৭ )  
মূল্য ৪ টাকা ২.০০



অতএব, বুড়িগঙ্গা, তুরাগ, বালু ও শীতলক্ষ্যাসহ সংশ্লিষ্ট নদীসমূহের এবং নদীগুলোর ফোরশোরে নিম্নলিখিত কার্যাবলী এতদ্বারা নিষিদ্ধ করা হলো, যা বাংলাদেশ সরকারের গেজেটে প্রকাশনার দিন হতে কার্যকর হবে ঃ—

- \* সকল প্রকার শিকার।
- \* নদীতে বসবাসকারী জলজ প্রাণী ধরা বা সংগ্রহ।
- \* প্রাণী ও উদ্ভিদের আবাসস্থল ধ্বংস বা সৃষ্টিকারী সকল প্রকার কার্যকলাপ।
- \* ভূমি ও পানির প্রাকৃতিক বৈশিষ্ট্য নষ্ট/পরিবর্তন করতে পারে এমন সকল কাজ।
- \* মাটি, পানি, বায়ু এবং শব্দ দূষণকারী শিল্পপ্রতিষ্ঠান স্থাপন।
- \* মাছ এবং অন্যান্য জলজ প্রাণীর ক্ষতিকারক যে কোন প্রকার কার্যাবলী।
- \* নদীসমূহের চারপাশের বাসাবাড়ী, শিল্পপ্রতিষ্ঠান এবং অন্যান্য প্রতিষ্ঠানের পরঃপ্রণালী স্ট্র বর্জ্য ও তরল বর্জ্য নির্গমন।

উন্নততর পরিবেশগত ব্যবস্থাপনার লক্ষ্যে এ এলাকার পরিসীমা এবং বিধি-নিষেধ পরিবর্তন/পরিবর্তন করার ক্ষমতা পরিবেশ অধিদপ্তরের মহাপরিচালক সংরক্ষণ করেন।

রাষ্ট্রপতির আদেশক্রমে

ড. মিহির কান্তি মজুমদার

সচিব।

মোঃ মাছুম খান (উপ-সচিব), উপ-নিয়ন্ত্রক, বাংলাদেশ সরকারি মুদ্রণালয়, ঢাকা কর্তৃক মুদ্রিত।

মোঃ মজিবুর রহমান (উপ-সচিব), উপ-নিয়ন্ত্রক, বাংলাদেশ ফরম ও প্রকাশনা অফিস,  
তেজগাঁও, ঢাকা কর্তৃক প্রকাশিত। [www.bgpress.gov.bd](http://www.bgpress.gov.bd)



---

**Assessment of Impact of Air Pollution due to Operation of  
51 MW Gas Engine based Power Plant**

---

**ANNEX-XII**

---

**December 2014**

## 1. INTRODUCTION

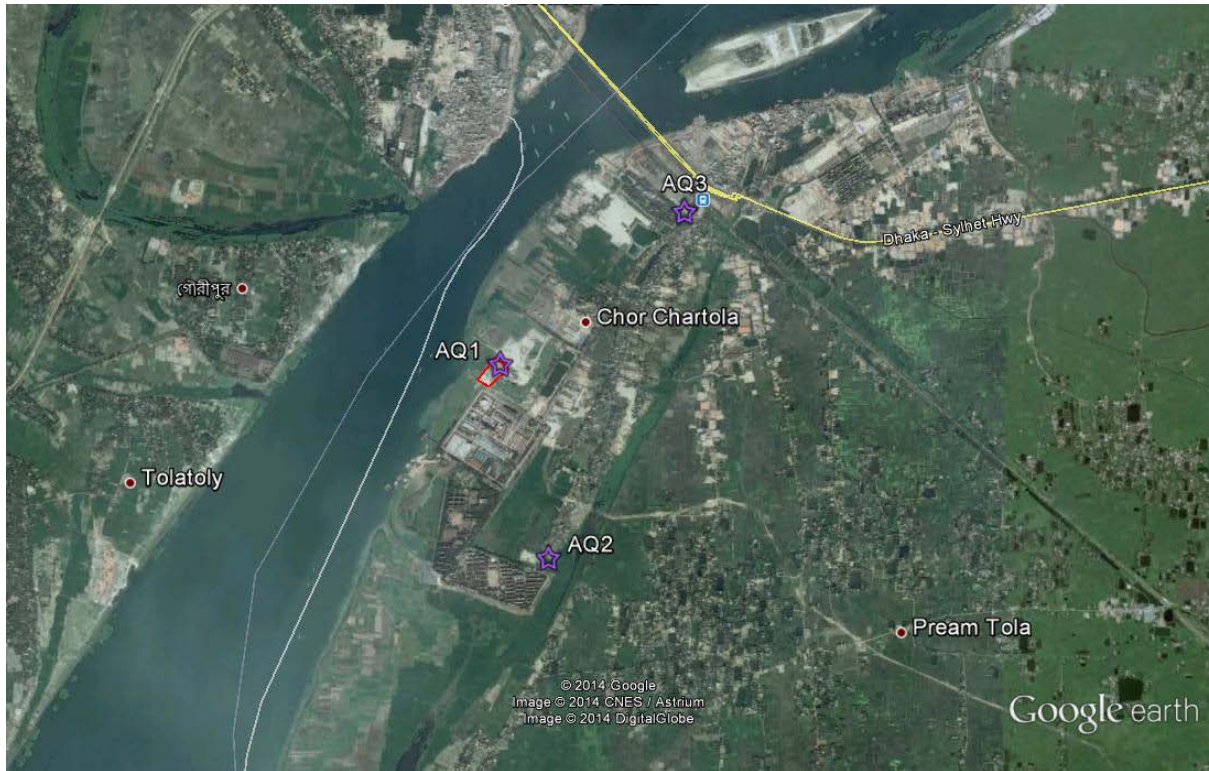
### *Scope of the Study*

Scope of the study is to assess the impacts due to air emissions from operational 51 MW natural gas fuel fired engines of Midland Power Company Limited at Ashugonj, Brahmanbaria in Bangladesh. The major objectives of the study are as follows:

- Assessment of meteorological conditions
- Estimation of emissions of nitrogen oxides (NO<sub>x</sub>) from the gas-engine based power plant
- Prediction of incremental NO<sub>x</sub> emission impacts using suitable mathematical models
- Quantification of impacts

### *Study Area*

The 51 MW power plant of Midland Power Company Limited is located at Ashugonj in Brahmanbaria District of Bangladesh. The project site is nearly 5-6 km away from Brahmanbaria District city centre. The site of the project is on the south side of Dhaka-Sylhet highway and very close to the Ashugonj Fertilizer and Chemical Complex Ltd. (AFCCCL). Northern side of the project there are Govt. SILO and after that Dhaka-Sylhet highway and Bhairab Meghna Bridge exist. Eastern side of the project there is Govt. establishment (GTCL), approach road to AFCCCL and after that vacant land exists. Meghna River flows to the western side of the project. Bhairab Railway Station is about 1.5-2 KM away towards northwest from the project site. Location Map of the Project and surrounding features including the monitoring locations for ambient air quality monitoring have been shown in Figure 1:



**Figure 1: Location Map and Air Quality Monitoring Locations**

The co-ordinates of the site centre are as follows:

- Latitude :  $24^{\circ} 01' 39.29''\text{N}$
- Longitude :  $90^{\circ} 59' 16.75''\text{E}$

For the purpose of air dispersion modeling, a 5 km radial zone has been selected around the site.

## **2. PREDICTION OF IMPACTS DUE TO AIR POLLUTION**

### ***General***

Prediction of impacts is the most important component in environmental impact assessment process for deriving quantitative contribution of pollutants from the proposed project in the surrounding region. Several mathematical/statistical techniques and methodologies are available for predicting impacts due to developmental activities on physico-chemical, ecological and socio-economic components of environment. The quantitative impacts derived from prediction are also essential to delineate pragmatic environmental management plan (Pollution control measures) for implementation during construction and operation phases of proposed activities for minimizing the adverse impacts on environmental quality.

Mathematical models are the best tools to quantitatively describe cause-condition-effect-relationship between source of pollution and different components of environment. In case, mathematical models are either not available or it is not possible to identify/validate models for a particular situation, predictions are arrived at through available scientific knowledge and judgments.

The mathematical models used for carrying out predictions in the present study included, steady state Gaussian Plume Dispersion model designed for multiple point sources for air quality. In case of water, land, biological and socio-economic environments, the predictions have been made based on the available scientific expertise and judgments.

### ***Air Environment***

The air pollution impacts from the operation of power plant on neighborhood air quality would depend upon various factors, viz. capacity, quality of fuel used for combustion, operation & maintenance of generator sets and air pollution control equipment installed with the individual generator sets. The impacts on air environment are also governed by terrain conditions around the project site and the prevailing micro-meteorological conditions in the project region.

The major air pollutant expected from natural gas fuel fired engine based power plant is NO<sub>x</sub>, which will be emitted from the stacks (point sources) associated with the generator sets.

There are several air quality simulation models available for prediction of air pollution impacts at ground level. They deal with different types of sources, variety of topographic (terrain) conditions and cater to different needs of predictions, viz. short term, long term, local as well as regional impacts. In the present case multiple point source Gaussian Dispersion Model, applicable to industrial sources located on flat as well as undulated terrain, Industrial Source Complex (ISC) model

has been applied for prediction of impacts on air environment due to stack emissions. This model has been widely recognized as predictive tool in impact assessment for air environment.

### ***Air Quality Dispersion Model***

Computer aided mathematical models are being used to predict the increase in air pollutants concentration on ambient air quality due to any increase in the emission load in the atmosphere. For the proposed project, computations of 24-hour average ground level concentrations were carried out using ISC-AERMOD View model, which is a recommended model by USEPA for prediction of air quality from point, area and line sources. It is based on Gaussian dispersion which incorporates the Pasquile-Gifford (P-G) dispersion parameters for estimating horizontal cross wind and vertical dispersion.

ISCST-3 model has been developed to simulate the effect of emissions from continuous point sources on neighborhood air quality. The ISCST-3 model was adopted from the USEPA guideline models and routinely used as a regulatory tool to predict air pollution impact from as high as 500 point sources simultaneously and at 10,000 receptors. The ISCST-3 is an hour-by-hour steady state Gaussian model which takes into account the following special features:

- Terrain adjustments.
- Stack-tip downwash.
- Gradual plume rise.
- Buoyancy-induced dispersion, Complex terrain treatment
- Consideration of partial reflection.
- Plume reflection off elevated terrain.
- Building downwash.
- Partial penetration of elevated inversions is accounted for.
- Hourly source emission rate, exit velocity and stack gas temperature.

The impacts of primary air pollutant are predicted using ISC-AERMOD View model, which has been selected keeping in view the terrain around the project site. This model is widely recognized as predictive tool in impact assessment for air environment. The model has been applied with flat terrain, gradual plume rise and buoyancy induced dispersion options in the present study.

The model with the following options has been employed to predict the cumulative ground level concentrations due to the proposed emissions from stacks of boilers and incinerators.

- Predictions have been carried out to estimate concentration values over radial distance of 5 km around the sources.

- Terrain data for the entire study area has been calculated by using SRTM data. This was further processed to generate the study specific terrain data in AERMAP.
- Cartesian receptor network with elevated terrain was considered.
- Emission rates from the point sources were considered as constant during the entire period.
- The ground level concentrations computed are as basis without any consideration of decay coefficient.
- Calm winds recorded during the study period were also taken into consideration.
- 24-hour mean meteorological data extracted from the meteorological data of September 1, 2014 to October 31, 2014 has been employed to compute the mean ground level concentrations to study the impact on study area.
- Average ground level concentrations have been superimposed with the help of ISC-AERMOD View Model in Google Earth.

## ***Emissions***

The project under study is for the use of natural gas based engine sets for power production. The 51 MW power project is having six (6) B35:40V20 gas engines of Rolls-Royce. Each engine is having dry low NO<sub>x</sub> control and connected with a stack of 20 m height for better dispersion of air pollutants in the atmosphere. The stack emission data of the operational plant was not available for the modelling study and hence it is assumed that the NO<sub>x</sub> emissions are meeting with the emission guidelines for reciprocating engines (as specified in the WB/IFC EHS guidelines for thermal power plants) and will be 200 mg/Nm<sup>3</sup> (maximum).

The emission data used in the model has been calculated based on the contribution of the generator sets. The stack emission details are given in **Table 1**:

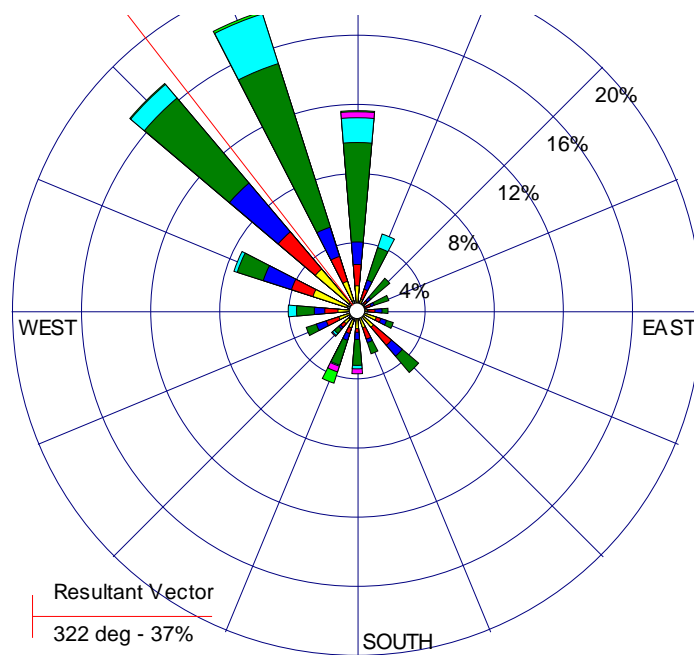
**Table 1: Stack Emission Details**

Stack	UTM Co-ordinates*			Stack Height (m)	Diameter (m)	Exit Velocity (m/s)	Exit Temp. (K)	NO <sub>x</sub> Emission Rate (g/s)
	X (m)	Y (m)	Z (m)					
Stack 1	295324	2658761	6.5	20	1	20	633	2.71
Stack 2	295332	2658767	6.6	20	1	20	633	2.71
Stack 3	295337	2658774	6.6	20	1	20	633	2.71
Stack 4	295342	2658780	6.6	20	1	20	633	2.71
Stack 5	295346	2658785	6.6	20	1	20	633	2.71
Stack 6	295352	2658791	6.6	20	1	20	633	2.71

\* UTM Zone – 46R

## ***Meteorological Data***

The meteorological data from September 1, 2014 to October 31, 2014 collected from a nearby meteorological station on hourly basis has been used for predicting the impacts of air pollutants from the Project. The wind rose diagram of the study period has been presented in **Figure 2**. The predominant wind direction was observed from NNW followed by NW during that period and the average wind speed was recorded 3.4 m/s.



**Figure 1: Windrose Diagram**

The wind speed, solar insolation and cloudiness during the day whereas in the night, wind speed and cloudiness parameters were used to determine the hourly atmospheric stability Class A to F (Pasquill and Gifford). The hourly stabilities were determined based on the technique suggested by Turner.

## ***Receptors***

A total of 10201 receptor grids have been considered over a 5 km radial zone around the location of generators in a grid size of 100 m x 100 m. Further to this three (3) discrete Cartesian receptors were also considered in the study, where ambient air quality monitoring was conducted during the study period (refer **Figure 1**)

## Predicted GLC due to the Generators

The contribution to GLCs (Ground Level Concentrations) due to the NO<sub>x</sub> emissions, were predicted over the study area due to the continuous emissions from the gas-engine sets and considering the worst case scenario. The emission loads from each stack are given in **Table 1**. The prediction of maximum GLC is based on the expected total emission rate from each stack. The contribution to maximum GLC due to the operation of generator sets has been presented in **Table 2**. The isopleths of NO<sub>x</sub> for 1-hourly, 24-hourly and seasonal average have been presented in Figure 2, Figure 3, and Figure 4, respectively.

**Table 3: Contribution to GLCs (maximum) due to Stacks**

Receptor	Maximum Baseline NO <sub>x</sub> Concentration (µg/m <sup>3</sup> )			Incremental NO <sub>x</sub> Concentration (µg/m <sup>3</sup> )			Total NO <sub>x</sub> Concentration (µg/m <sup>3</sup> )		
	1-hourly	24-hourly	Seasonal*	1-hourly	24-hourly	Seasonal*	1-hourly	24-hourly	Seasonal*
AQ1	-	42.61	34.5	0.10	0.00	0.00	0.1	42.61	34.6
AQ2	-	25.48	20.4	60.41	5.75	0.52	60.41	31.23	80.81
AQ3	-	20.51	15.6	70.49	11.30	0.54	70.49	31.81	86.09
Maximum GLC	-	42.61	34.5	159.7	40.7	7.47	159.7	83.31	194.2
<b>Bangladesh Standard</b>	-	-	<b>100**</b>	-	-	<b>100**</b>	-	-	<b>100**</b>
<b>WHO Guideline</b>	<b>200</b>		<b>40**</b>	<b>200</b>		<b>40**</b>	<b>200</b>		<b>40**</b>

\* Seasonal data is based on 2 months of meteorological data and cannot be directly compared with the annual average ground level concentrations.

\*\* Represents annual average.

The above results clearly indicate that the baseline concentrations of NO<sub>x</sub> as well as predicted concentrations are well within the limits specified in Bangladeshi standards.



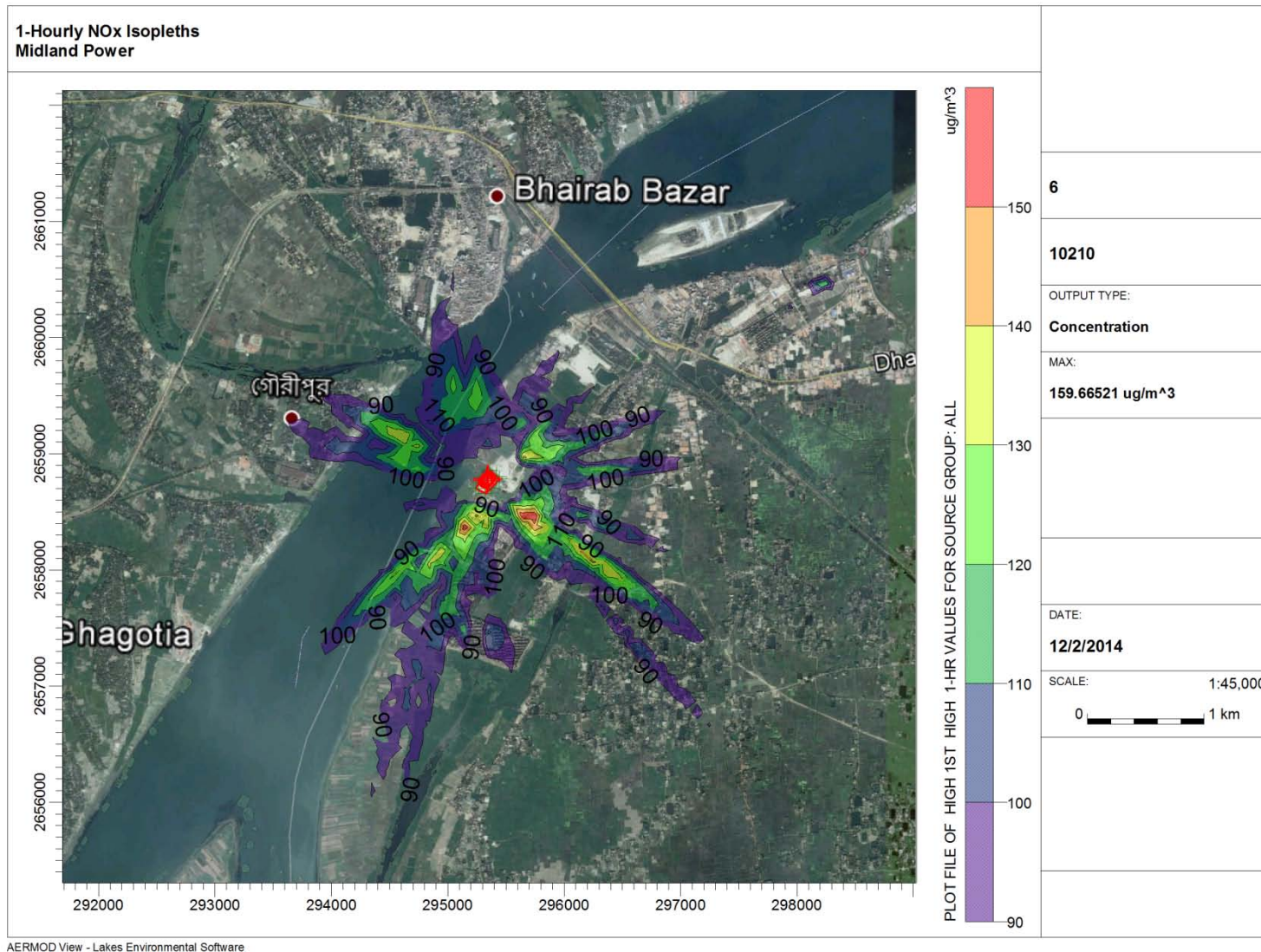
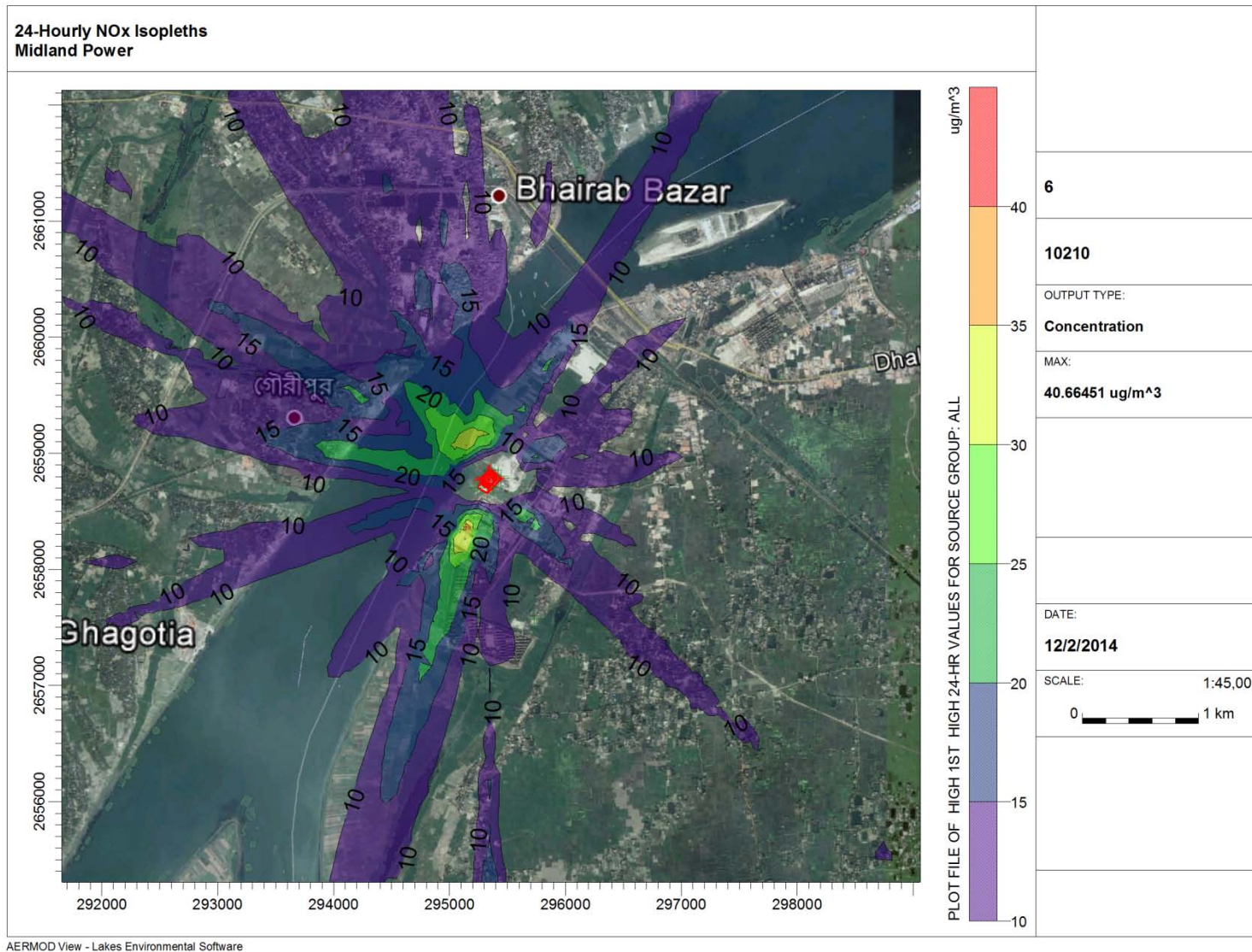


Figure 2: Isopleths of 1-hourly NOx Concentrations



**Figure 3: Isopleths of 24-hourly NOx Concentration**



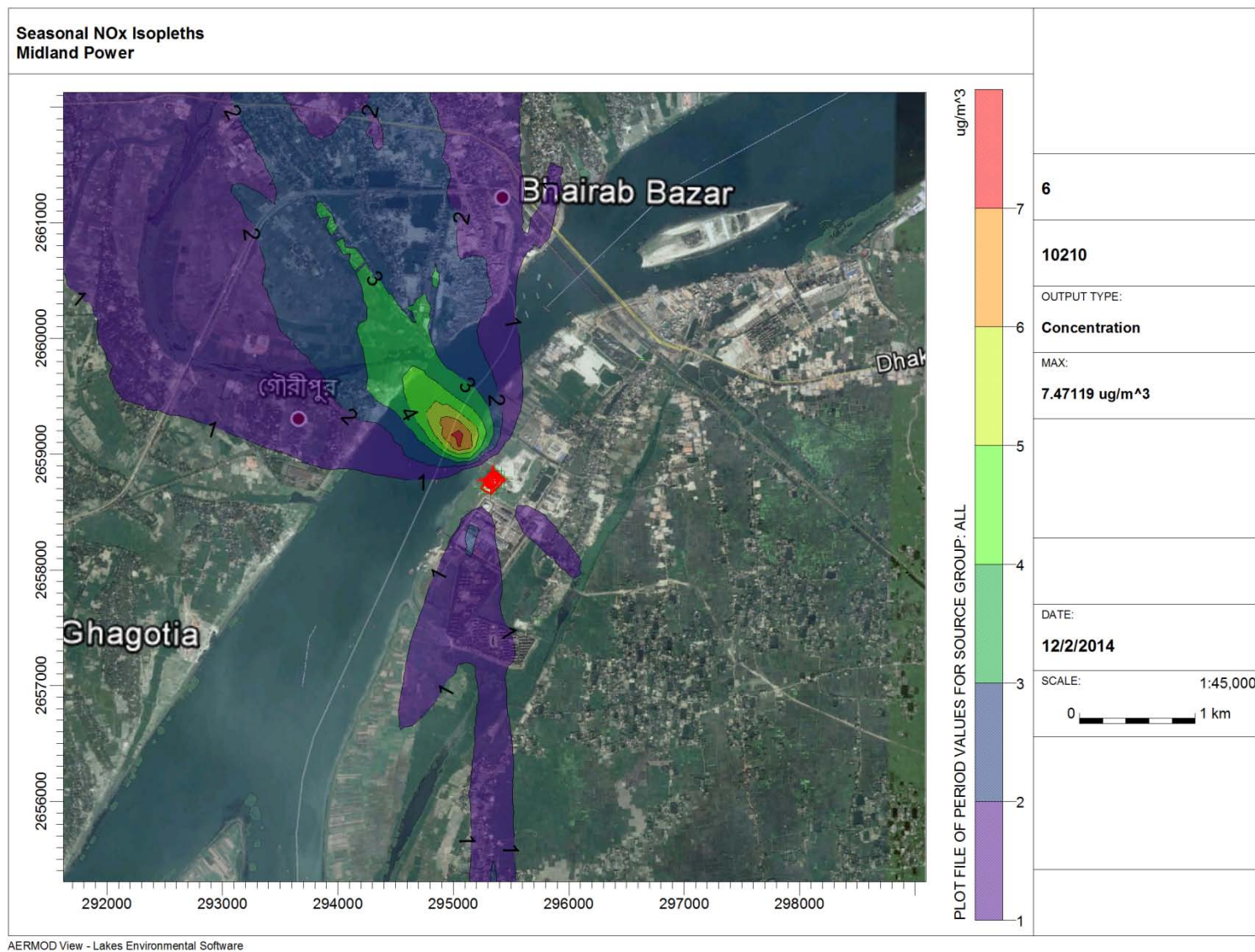


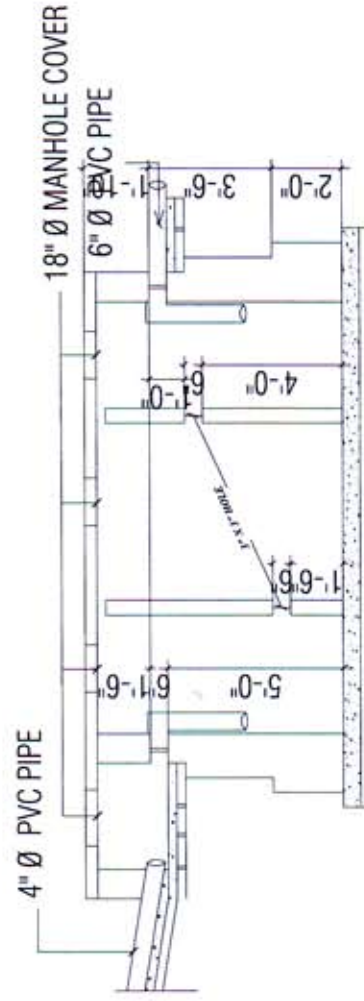
Figure 4: Isopleths of Seasonal NOx Concentration



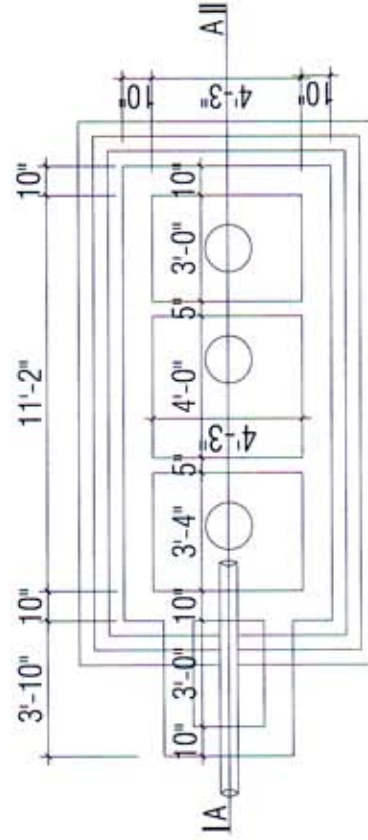


# DETAIL OF SEPTIC TANK: 100 USERS

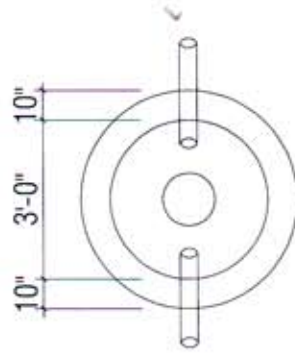
Size of the Septic Tank : 332 Cft. (9.40 Cubic Meter)



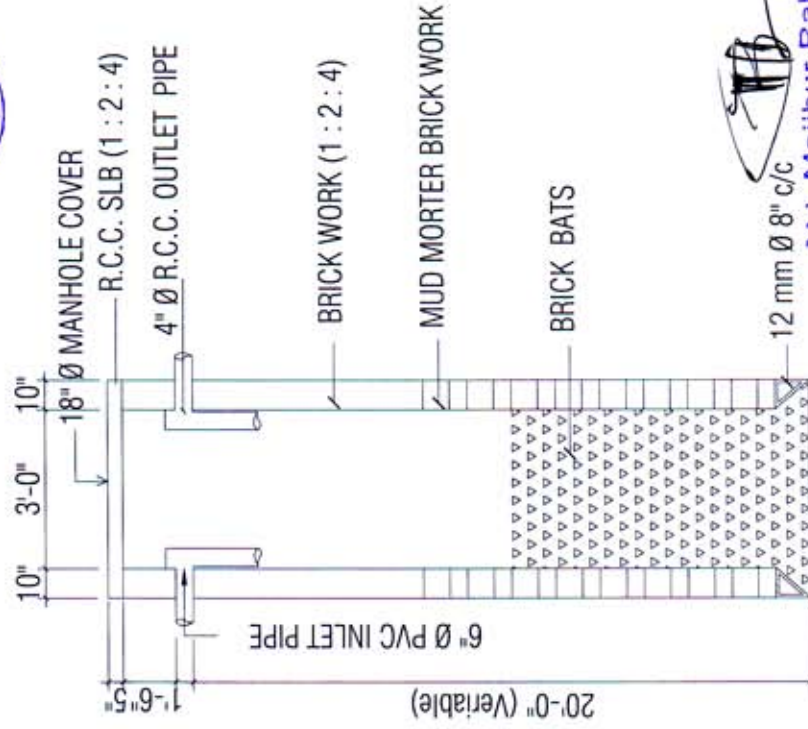
SECTION ON A-A



PLAN FOR SEPTIC TANK



PLAN FOR SOAK WELL



SECTION FOR SOAK WELL

*[Signature]*

**Md. Majibur Rahman**  
Principal Architect  
Integrated Design  
27/A, Monipurpara,  
Sangsad Avenue, 4th. Floor  
Tejgaon, Dhaka-1215,

51MW POWER PLANT FOR MIDLAND POWER CO. LTD. AT ASHGUNJ, BRAHMAN BARIA		OWNERS:-		DRAWING TITLE :-		DESIGN TEAM :-		SIGNATURE		CONSULTANT :-		ORG. NO		SW. 02		DATE :-		SEP. 2012	
		OWNERS SIGNATURE		WORKING DRAWING		ARCHITECT : MD. MAJIBUR RAHMAN		STR. ENGINEER : Shariful Alam		ELEC. ENGR. : Afjal Ahmed		INTEGRATED DESIGN							

6-28, ZAKIR HOSSAIN ROAD  
BLOCK - E - MOHAMMADPUR  
DHAKA - 1207 TEL : 9111483

---

## **Noise Pollution Modeling of Operational Phase of the 51 MW Gas Based Power Plant**

---

### **ANNEX-XIV**

---

## Noise Modeling

According to information provided by the manufacturer, the source noise from the proposed gas engine to be used in Midland Power Plant is 110 dBA. And 6 engines will be used.

The noise modeling is based upon the method documented by the International Energy Agency. It is a simple model which assumes spherical spreading from a point source either in free space (spherical) or over a reflective plane (hemi-spherical). For this case, spherical spreading has been used because sound wave is propagating uniformly in all directions and the crests and troughs of the sound waves can be pictured as spheres centered on the source location. The total noise from each turbine is logarithmically added according to the formulae given below:

$$L_{all} = 10\log_{10} (10^{1/10} + 10^{2/10} + 10^{3/10} + 10^{4/10} + 10^{5/10} + 10^{6/10}) \text{ dBA}$$

Where:

$L_1 - L_6$  = Sound Source of each turbine.

The model presents a 'worst-case scenario' as it does not take into account factors which would reduce noise propagation, such as:

- Uneven topography
- Large obstructions in the propagation path, e.g. barriers etc.
- Refraction of noise, e.g. due to atmospheric effects such as temperature inversion
- Wind speed or direction effects
- Any change in the propagation with changing frequency

The mathematical formula for the noise model is shown below:

$$L_p = L_w - 10\log_{10}(2m^2) - ar$$

Where:

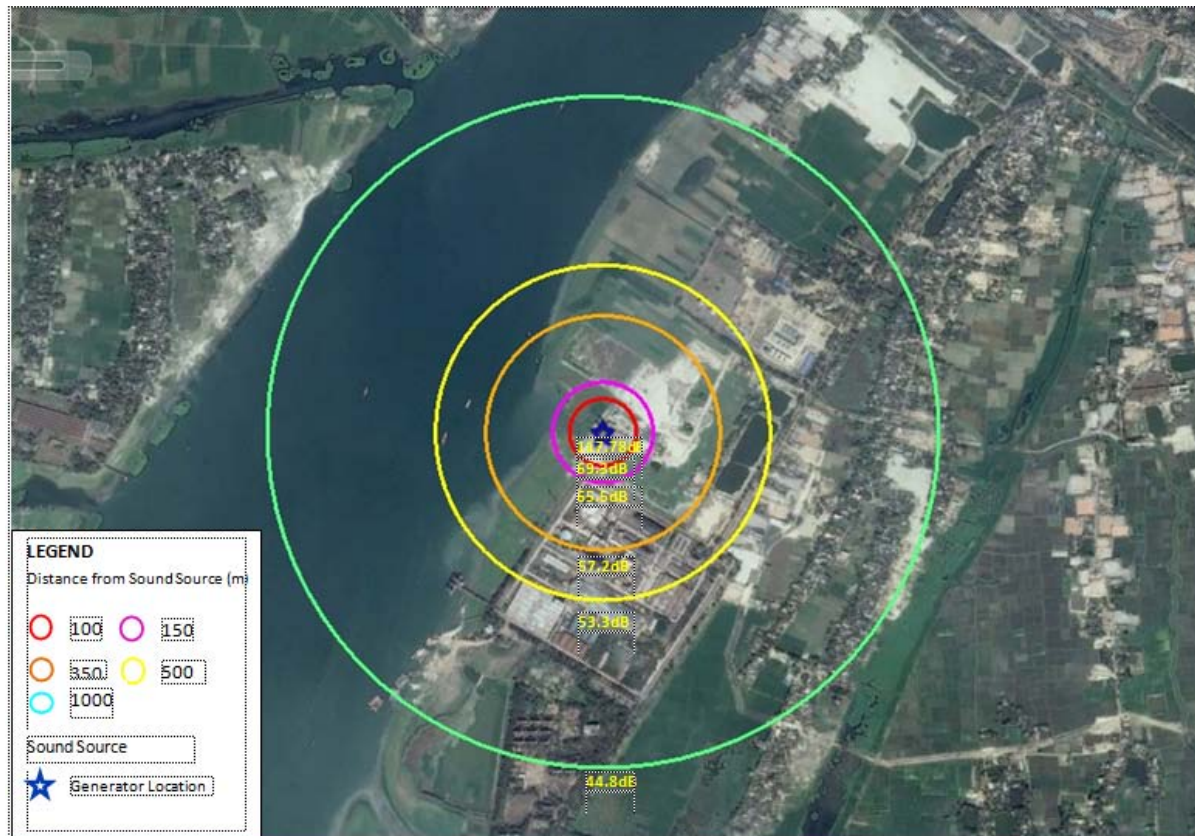
- |       |   |
|-------|---|
| r     | is the distance from source to receiver;  |
| a     | is the absorption due to the atmosphere (dB/m), which is most commonly used as 0.005dB/m; |
| $L_w$ | the sound power level of the turbine; and   |
| $L_p$ | the output sound power level of the turbine at different radius away from the source.     |

## Noise Modeling Results

At 117.78 dB noise input (for cumulative 6 engines), the predicted noise output is as follows:

Distance (m)	Noise Level (dBA)
0	117.78
1	109.79
10	89.74
100	69.29
150	65.52
200	62.77
250	60.58
300	58.75
350	57.16
400	55.75
450	54.48
500	53.31
600	51.23
700	49.39
800	47.73
900	46.21
1000	44.79
1500	38.77
2000	33.77
2500	29.33





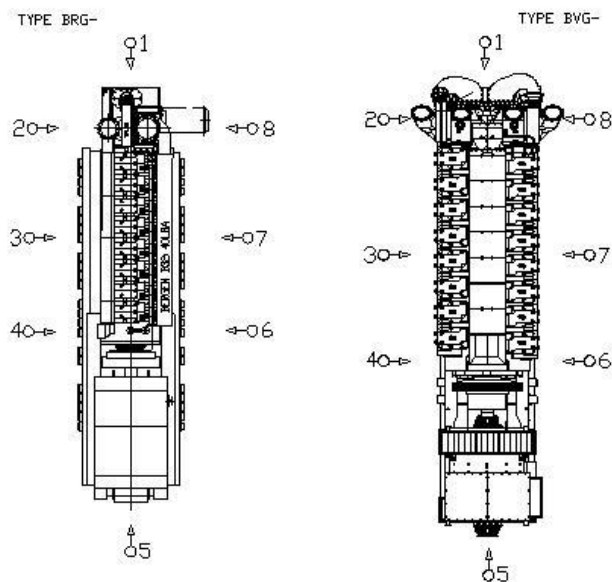
Figure; Noise Dispersion



# Rolls-Royce

## Engines - Bergen Noise Level Measurement

**Engine type:** B35:40V-20AG2  
**Engine no.:** 17181  
**Speed (rpm):** 750  
**B.M.E.P. (bar):** 20 bar  
**Location-object:** Stand 7  
**Period:** Sept. 2012  
**Instruments** -B&K 2250 /  
**Certificate no.:** SN 2505944  
**Carried out by:** RKleiv



Reading RMS $L_{eq}$ (dB)	Load 100% / point no.							
	1	2	3	4	5	6	7	8
<b>Linear level</b>								
<b>W. network-A</b>	103,9	109,5	107,2	108,7	108,2	107,5	106,2	113,5
<b>W. network-C</b>	110,1	114,2	114,4	114,3	115,6	112,0	114,0	115,3
<b>Reading lin. lev. RMS <math>L_{eq}</math> (dB)</b>								
<b>Centre freq.</b>								
<b>31.5 Hz</b>	91,5	103,2	101,8	97,0	98,8	98,4	98,7	101,6
<b>63 Hz</b>	103,1	110,0	109,6	108,8	107,7	103,2	110,6	111,2
<b>125 Hz</b>	105,5	107,8	106,7	106,9	111,9	105,1	108,0	104,5
<b>250 Hz</b>	104,6	105,6	109,8	108,9	109,6	106,6	107,3	106,1
<b>500 Hz</b>	99,2	102,5	104,5	104,5	105,3	104,0	102,6	101,8
<b>1000 Hz</b>	96,6	100,2	101,9	104,8	102,8	103,3	100,8	98,8
<b>2000 Hz</b>	93,9	97,1	97,5	99,8	99,0	99,1	96,8	95,5
<b>4000 Hz</b>	95,0	106,3	93,8	96,3	94,7	95,8	94,7	105,3
<b>8000 Hz</b>	96,6	97,1	87,8	88,1	87,2	88,7	92,3	112,7
<b>16000 Hz</b>	88,3	91,0	78,7	78,5	76,5	77,5	84,4	97,3

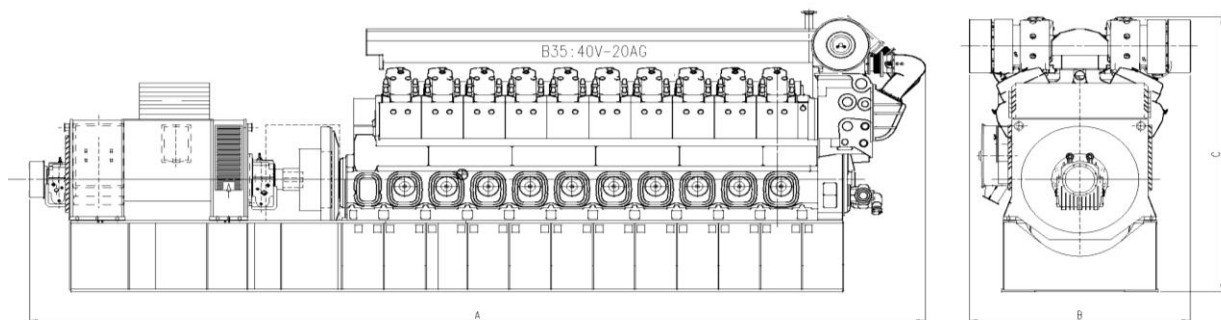
Noise level measurements were taken at the specified points, all located on the same level as the cylinder heads, and at 1 meter distance from the engine.



# Rolls-Royce

## Bergen Gas engine, type B35:40 V20AG2

### PERFORMANCE DATA



Engine type	A	B	C	Weight (dry) [kg]
B35:40 V20G2	13400	3306	4540	133000

Exhaust gas emissions (mg/nm<sup>3</sup>, 5% O<sub>2</sub>)

NOx	CO	NMHC
250	850	250

Load	%	100
Electrical output	kW	9387
Mechanical output	kW	9620
Specific energy consumption	kJ/kWh	7570
Fuel gas consumption	kW	20225
Charge air cooler LT/HT	kW	650 1850
Lub.oil cooler	kW	1135
Jacket water cooler	kW	1395
Exhaust mass	kg/h	56300
Exhaust gas temperature	°C	355
Lub.oil consumption	g/kWh	0,4
Nom. el. efficiency	%	46,4

The performance data is given with the following presumptions:

- All technical data are valid at 100% load, including two engine driven pumps (lub. oil and jacket water).
- Engine power definition and fuel gas consumption are according to ISO 3046-1(ICFN).
- Generator standard IEC-34.
- Reference site conditions:
  - Altitude above sea level :.....max. 100 m
  - Air temperature :..... 5-35°C
  - Two stage charge air cooler, max. temp / min. flow :..... 45°C / 150 m<sup>3</sup>/h
  - Relative humidity :..... max. 60%
  - Exhaust gas back pressure :..... max. 400 mmWG
- Reference fuel is natural gas with a lower heating value of 36 MJ/Nm<sup>3</sup>, min methane no. 70.
- Data for heat dissipation and exhaust gas are based on a tolerance of ± 5%, turbocharger air suction temp. 25°C.
- Minimum fuel gas pressure to the fuel gas module: 4,8 bar<sub>g</sub>.
- Power factor, cosφ=0,9
- Due to continuous development, some data may change.

**ANNEX-XVI**

**EMERGENCY PREPAREDNESS AND RESPONSE PLAN**

Of

**Midland Power Co. Limited**

# EMERGENCY PREPAREDNESS AND RESPONSE PLAN

## 1. Purpose of the Emergency preparedness and response plan

An emergency is an unplanned event when a project operation loses control, or could lose control, of a situation that may result in risks to human health, property, or the environment, either within the waste disposal site or in the local community. Emergencies do not normally include safe work practices for frequent upsets or events that are covered by occupational health and safety. Proper emergency planning and response are important elements of the site Environmental, Health and Safety Plan of a Hazardous Waste Handling, Storage and Disposal facility, and that help minimize employee exposure and injury.

There are a number of regulations, guidelines, standards which requires that the employer develop and implement a written emergency response plan to handle possible emergencies before performing hazardous waste site operations. The permit Holder for the waste disposal site in this case, Eskom Health and Safety officer must, develop an emergency preparedness and response or action plan complying to ensure the safe evacuation of personnel.

## 2. Content of the Emergency preparedness and response plan

The Emergency Preparedness and Response Plan must be commensurate with the risks of the waste disposal site and at the minimum include the following elements:

- Administration
- Emergency medical and first-aid treatment,
- Methods or procedures for alerting on-site employees,
- Safe distances and places of refuge,
- Site security and control,
- Personal protective and emergency equipment,
- Evacuation routes and procedures. and
- Training and Awareness

In addition to the above requirements, the plan must include site topography, layout, prevailing weather conditions, and procedures for reporting incidents to local authorities, the South Africa Police Services (SAPS), and regulating agent i.e. DEA and Department of Labour etc.

## 3. Use of the Emergency preparedness and response plan

The procedures must be compatible with and integrated into the operational management plan of the site. The plan requirements also must be rehearsed regularly, reviewed periodically, and amended, as necessary, to keep them current with new or changing site conditions or information.

## 4. Administration of the EP&RP

### 4.1 Policy

The emergency response plan should be implemented in line with Midland's Safety, Health and Environment Policy.

### 4.2 Distribution

This Plan and procedures contemplated in this plan must be distributed to all personnel working on the site and the following designated responsible persons:

Designation	Name	Contact No.
General Manager, Midland Power Co. Ltd.	Engr.Md.Shariful Islam	+8801715-151926
Plant Manager	Engr.Md. Imrose Islam	+8801711100873

Midland Power Co. Ltd.		
Manager, O&M (Mech.), Midland Power Co. Ltd.	Engr.Md.Azharul Islam	+8801712339714
Manager, O&M (Elect.), Midland Power Co. Ltd.	Enrg.Md.Obaidur Rahman	+8801911067371
Manager, Admin & HR (Elect.), Midland Power Co. Ltd.	Md.Shamiur Rahman	+8801711988534
Construction Site Engineer (Civil), Midland Power Co. Ltd.	Engr.Jashim Uddin	+8801711145920
Security In-charge Midland Power Co. Ltd.	Md.Khairul Islam	+88001779947963
Contractor's Site Manager (Civil), Monico Limited	Engr.Md. Ishrafil	+8801716275851
Contractor's Site Manager(Mechanical), Sigma Construction Ltd.	Engr.Zahid Hossain	+8801713439853
Contractor's Site Manager(Electrical), Energypac Engineering Ltd.	Engr. Md. Belal Hossain	+8801822889418
Contractor's Site Manager (Transmission Line), Bangladesh Erector's Ltd.	Engr.Md.Shariful Alam	+8801920732598

### 4.3 Organogram

The organogram described in the EMP shall apply to the emergency response plan.

### 4.4 Personnel roles and responsibilities

The Roles and Responsibilities described in the EMP shall apply to the emergency response plan.

### 4.5 Communication procedures









The communication lines established in the EMP shall apply to the emergency response plan.

### 4.6 First-Aid Calls

Midland's Safety Health and Environment officers must ascertain that all emergency contact numbers (first aid officers, ambulances, fire brigade, police, hospital etc) are conveniently posted at several site notice boards in order to assist in the event of an emergency.

## 5. Personal Protective Equipment and Emergency Actions

This section presents a summary of recommended practices for various substances. These recommendations supplement general work practices (e.g., no eating, drinking, or smoking where chemicals are used) and should be followed if additional controls are needed after using all feasible process, equipment, and task controls. Table 2 (page xviii) explains the codes used. Each category is described as follows:

Symbolic Sign of Equipment										
Description	Gas Mask	Dust Mask	Ear Muff/ Ear Plug	Gum Boots	Rain Jacket	Safety shoes	Bib Apron	Gloves	Safety Glasses	Safety Helmet
Area/Task										√
Site Construction		√				√		√		√
Hot works						√	√	√	√	√
First Aiders								√		
RMS/Gas Area	√					√				√
Plant Operators/Engine Room			√			√				√
Substation/GIS/High Voltage area						√		√		√
MV Room										
Control Room										
Rain/Middy area				√	√					

## 6. Training and Awareness

- Before implementing the EP&RP, the EHS Coordinator and waste disposal managers/ Supervisors shall designate and train a sufficient number of persons to assist in the safe and orderly emergency evacuation of employees.
- The EP&RP must be reviewed with all employees at the following times:
  - o Initially when the plan is developed,
  - o whenever the employee's responsibilities or designated action under the plan change,
  - o and whenever the plan is changed.
- At least annually employee meetings are to be held to train employees of the contents of the EP&RP and revise the plan as appropriate.
- Drills will be conducted and full participation encouraged.
- All training must be documented in writing and copies sent to Safety, Health and Environmental Manager of the Power Station.

# Roles and Responsibilities

## 2.1 Design Phase

The key role players during the design phase of the project are:

- **Rolls Royce** is responsible for design and engineering of their scope of supply: Main Equipment-Engine & Generator and related BOP Equipment.
- **Energypac Engineering Ltd.** is responsible for design and engineering of their scope of supply: 230 kV Out door Substation, 11kv Indoor Switchgear.
- **Power Grid Co. of Bangladesh** is responsible for design and engineering of 4.2km Overhead Transmission Line for evacuation of Power from MPCL substation to 230kV Grid Substation.
- **Integrated Design**, Consultant of MPCL, responsible for Architectural Drawings and all civil Structural design of the Main Engine Hall, Engine foundations, BOP equipment foundation and all others design related works.
- **Sarker Steel Limited** is responsible for detail design and engineering for Steel Structural Building of Engine Hall and Control Room.
- **MPCL Technical Team** is responsible for detail engineering of other BOPs and Electro-mechanical works like pipe lines, ducting etc.
- Environment and Engineering Associate will develop IEE & EIA for this project is responsible implement the Environmental Management measures.

Their roles and responsibilities during the detailed design phase with respect to the implementation of the EMP are outlined below.

## 2.2 Construction Phase

Monico Limited, specialized contractor, appointed directly by MPCL, by MPCL, will execute all civil construction activities and will be responsible for implementing environmental management measures during construction.

Monico Limited and its subcontractors will enhance environmental performance during the construction phase through the following activities:

- ☐ Implementation and management of a program of environmental inspection, monitoring and reporting;
- ☐ Ensuring that all staff undergo environmental awareness training, focusing on the key environmental and socio-economic issues concerning this project; and
- ☐ Implementation of a program for follow-up and analysis of all environmental incidents or accidents.

MPCL's technical team and Integrated Design will retain responsible for ensuring that Rolls Royce, Monico, Sarker Steel and their Subcontractors fully implement the provisions of the EMP. In order to facilitate this, and to demonstrate commitment to the EMP, MPCL's environmental staff will monitor and evaluate the activities and performance of the contractor and its Subcontractors and report to MPCL Management. These



inspections/audits will be carried out in conjunction with the management teams of Rolls Royce and its Subcontractors and MPCL jointly. In order to ensure that areas of concern are rapidly addressed and the results of all inspections/audits are documented.

It should be noted that only roles and responsibilities that directly relate to environmental management are described here.

## **2.3 Operations Phase**

Environmental Engineering Associate (EEA) and Rolls Royce will have accountability and responsibility for the environmental performance of the operation of the Power Plant. It is assumed that there will be no significant role for contractors during operations. EEA will enhance environmental performance during the operations phase through the following activities:

- ☐Implementation and management of a program of environmental inspection, monitoring and reporting; and
- ☐Implementation of a program for follow-up and analysis of all environmental incidents or accidents.

It should be noted that only roles and responsibilities that directly relate to environmental management are described here. The general roles and responsibilities of various parties are outlined in the sections below.

# **3 Environmental Procedures**

## **3.1 Method Statements**

A Method Statement is a detailed description by the Contractor of the way in which they will carry out a particular activity. It is an extremely useful tool as it provides a clear and documented statement of the approaches that the Contractor will pursue to undertake an activity, particularly one that may have adverse environmental impacts. It also provides assurance to MPCL and a reference point to detect deviations from the agreed approach to each planned activity.

Each Method Statement will address HSE aspects relevant to the activity and will typically provide detailed descriptions of items including, but not necessarily limited to:

- ☐Nature, timing and location of activities;
- ☐Procedural requirements and steps;
- ☐Management responsibilities;
- ☐Material and equipment requirements;
- ☐Transportation of equipment to and from site;
- ☐Method for moving equipment/material while on site;
- ☐How and where material will be stored;
- ☐Emergency response approaches, particularly related to spill containment and clean-up;
- ☐Response to compliance/non-conformance with the requirements of the EMP; and
- ☐Any other information deemed necessary by the HSE Manager.

## 3.2 Corrective Action

Corrective action is a critical component of the implementation–review–corrective action–implementation cycle and it is through corrective action that continuous improvement can be achieved. Where repeated non-compliance is recorded, procedures may need to be altered accordingly to avoid the need for repeated corrective action.

Corrective action will be required during the construction and operations phases and the recommended channels to manage such action are described below.

If, during the **construction** phase, environmental monitoring data or other information demonstrates or indicates non-conformance with set standards and targets, the HSE Manager will formally notify the MPCL Project Director in a Corrective Action Request. This procedure will be used in respect of all sub-standard HSE conditions or actions. The Corrective Action Request will document:

- ☐The nature of the sub-standard conditions or actions;
- ☐The actions requested to correct the situation; and
- ☐The date by which each corrective or preventative action must be completed.

## 3.3 Community Liaison

The role of the Public Relations (PR) Department applies to both construction and operations phases of the project and is to oversee interactions with stakeholders and communities.

The PR Department will inform potentially affected parties at least one month in advance of the commencement of construction and operations activities that may potentially impact on them. The PR Department will ensure that the Contractors and subcontractors have a transparent and appropriate complaint mechanism in place, whereby local communities can communicate incidents resulting from construction and operations activities. The PR Department will ensure that potentially affected parties are aware of the complaint mechanism and of the person to whom complaints should be directed.

## 3.4 Emergency Response Plan

MPCL has existing emergency response plans that address all of its operations and activities. The approach to emergency response planning for each operation can be summarized as follows:

- ☐A list of potential or foreseeable emergency scenarios are identified;
- ☐Planned responses are developed to address each identified emergency scenario;
- ☐The services required to deliver an effective response to each scenario are identified and documented;
- ☐Training in emergency responses is undertaken, including specific skills training required for individual response scenarios; and
- ☐Emergency response drills and exercises are scheduled and conducted regularly, including liaison with and involvement of external response organizations and other stakeholders as appropriate.

## 4. Implementation of EMP

This section details how the EMP will be implemented and used to guide activities during the construction and operations phases.

### 4.1 Incorporation into Contract Documentation

MPCL will contractually engage Rolls Royce, Monico, Sigma, Sarker Steel, Energypac to construct the Midland Power Co. Ltd. expanded power plant. The contracts will stipulate the requirement to implement the EMP.

During operations, activities will be managed and undertaken by MPCL. If compliance with the EMP is not achieved in any area, HSE Manager can suspend part or all of the works, as required.

If any contractor is notified of sub-standard or non-compliant environmental conditions by Environmental Engineering Associates (EEA) HSE Manager, and if that contractor fails to correct those conditions and re-establish compliance with the EMP, this will constitute a breach of the contract between that party and MPCL. If advised of such a situation by the MPCL Project Director (PD) or the HSE Manager, PD will have the power to remove the contractor or any employee of sub-contractors from site.

### 4.2 Monitoring and Performance Evaluation

During construction activities managed by the respective Contractors, HSE Manager or his appointed delegate will monitor and review the environmental performance of the Contractors against the commitments of the EMP.

Similarly, during operations, the HSE Manager or his appointed delegate will monitor the day-to-day performance of MPCL/Rolls Royce (to some extent) staff against the commitments of the EMP.

During both the construction and operations phases the following principal items will be monitored:

- ☐ Correct and full implementation of EMP procedures;
- ☐ Compliance with contract commitments and approved Method Statements; and
- ☐ Compliance with project standards/guidelines.

#### 4.2.1 Monitoring

The objective of implementing an inspection and monitoring program is to ensure complete compliance with mitigation measures, approved plans and permit conditions. The monitoring program also provides transparent assurance to MPCL (and external parties) that specified standards are being set so as to reduce (negative) impacts to tolerable levels, and that target performance levels are being met.

The inspection and monitoring program is designed to measure environmental performance against applicable standards, guidelines and expectations, and to provide early detection of undesirable impacts to the environment. Such information is used to ensure that project standards are being met, and to demonstrate compliance with regulatory requirements. The monitoring program is amended as and when necessary in order to ensure safe operation and optimal environmental protection.

HSE Manager will be responsible for the collection and monitoring of environmental data during both the construction and the operations phases respectively.

Monitoring will begin at the commencement of construction activities. Monitoring will continue throughout the construction and operations phases, and the duration and frequency of monitoring may be modified to

best characterize any affected environmental aspect.

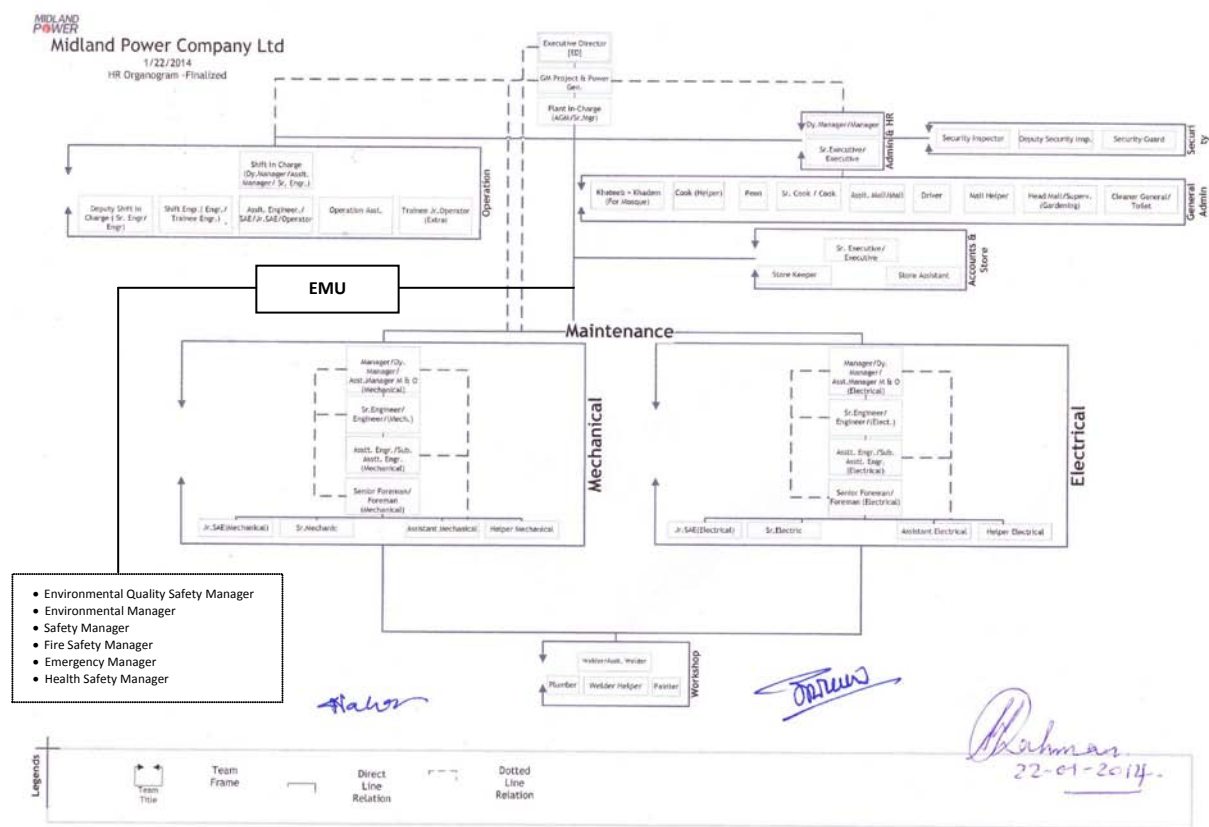
4.2.2 Reporting

The frequency and nature of reporting of environmental management performance will depend upon the nature of the activity and aspect that is being managed. Reporting may take several forms:

- Reports on critical issues, as required;
- Formal reports and contributions to weekly and monthly project management meetings;
- Monthly reports on environmental performance and compliance;
- Quarterly performance reports on key indicators; and
- Summary reports to external interested party.

4.2.3 Environmental Management Unit (EMU)

An EMU shall be established to properly implement the EMP in the power plant. Proposed EMU in the MPCL organogram is proposed and shown in Figure-4.2-1.



The environmental manager will be responsible for monitoring of the implemented EMP. The safety manager will be responsible for occupational health and safety and implementation of hazard management plan while the emergency manager will be responsible for emergency plan implementation. However, this is an indicative organogram; the project authority may change the hierarchy of the team and make necessary addition if required for smooth implementation of the monitoring works.

MIDLAND POWER COMPANY LTD.  
HOT WORK PERMIT

JOB REQUISITION DEPT:								
Requested by: (Name/Designation/signature)								
OPERATION TYPE:		TIK the type applicable in the right side box:			<div>√</div>			
El. Welding	<input type="checkbox"/>	Gas welding	<input type="checkbox"/>	Soldering	<input type="checkbox"/>	Open Fire	<input type="checkbox"/>	
Grinding	<input type="checkbox"/>	Chiseling	<input type="checkbox"/>	Hammering	<input type="checkbox"/>	Concrete Braking	<input type="checkbox"/>	
Gas Cutting	<input type="checkbox"/>	Hacksaw Cutting	<input type="checkbox"/>	Other:..... ...	<input type="checkbox"/>	Sand Blasting	<input type="checkbox"/>	
Technical Person to supervise the Job:								
Safety Personnel to attend the Job:								
Firefighting equipment to keep ready with firefighters :				Aerosol Extinguisher		<input type="checkbox"/>	Fire Blanket	<input type="checkbox"/>
				Powder Extinguisher		<input type="checkbox"/>	Water Hose/Bucket	<input type="checkbox"/>
Date to perform the Job:		..... ...		Time Period to do the job:		From.....to... .....		
Job Location with Drawing/sketch:				Job Description and reason to do:				
Attach separate sheet				Write here/or in attached sheet				
Plant Head's approval (subjected to fulfilling following conditions): Signature/Name/Date => (CONDITIONAL ONLY)								
Equipment/ Area isolated by positive blind			<input type="checkbox"/>	System & area made DRY & free from Oil/HC/H2			<input type="checkbox"/>	
System purged by N2/H2O/ Air			<input type="checkbox"/>	Oily surfaces cleaned, dried/ isolated properly			<input type="checkbox"/>	
Qualified/Experienced Personnel engaged			<input type="checkbox"/>					
Area Authority: Name/Desig/Signature=>								
Approved		<input type="checkbox"/>	Not Approved:		<input type="checkbox"/>			
Copy for:		Executor	<input type="checkbox"/>	Control Room	<input type="checkbox"/>	Hot-work File	<input type="checkbox"/>	
Signature from:		Executor (after completion)			CCR (for acknowledgement & clearance)			

# **Annex-XVII**

## **ENVIRONMENTAL COMPLIANCE REPORT**

**Power Plant Site: Ashuganj**  
**Capacity: 51MW**

**Plant Type: Natural Gas Internal Combustion Engine**

**ENVIRONMENTAL COMPLIANCE REPORT**

**51 MW Gas Fired Power Plant of  
Midland Power Co. Ltd.**

**Period: February**

**COMPANY: BETS Consulting Services Ltd.**

**2015**

## 1. INTRODUCTION

This report has been prepared in compliance with the EMS document for the Midland Power Co. Ltd. Power Plant at Ashuganj.

Period covered by this report: From September, 2014 to February, 2015

Contact Person for Environmental Issues: Engr. Akram Ali (Convener of Environment/Safety Cell/Committee)

Summary of Compliance Evaluation:

Item	Status	Comments
1. EIA Validity	Valid	Renew of the Environmental Clearance Certificate (ECC) required immediately after 30/03/2015 as because the ECC is issued for the period 31/03/2014 to 30/03/2015
2. Compliance with Bangladesh environmental requirement:	Yes	
3. Compliance with World Bank environmental policies and guidelines	Yes	
4. Meetings of Environment/Safety Cell/Committee)	Monthly	Minutes are attached as annex

## 2. PROJECT INFORMATION

Parameter	Data	Comments
Generation Type: Internal Combustion Engine	Manufacturer	Rolls-Royce
Generation Capacity (MW)		Six Engines 51.00MW
Project Completion Date:	September 2012	
Commercial Operation Date:	06/12/2013	
Environmental Clearance Date:	13/02/2013	
Environmental Clearance current validity	Yes	Valid till 30/03/2015
EIA/EMP Report available at the Plant	Yes	

## 3. PROJECTS ACTIVITIES RELEVANT TO ENVIRONMENTAL/SAFETY PERFORMANCE:

Parameter	Data	Comments
Environment Management/Safety Cell/Committee meetings (Numbers)	Monthly	
Drills (Numbers)	Monthly	<b>Snaps on Drills are Shown in Annex</b>
Training sessions (number)	24nos.	Twice in a month
Electricity Generated (MW-H)	379887.23	Dated: 22/02/2015
Capacity Factor (%)	72.85%	Dated: 22/02/2015
Availability (%)	91.00%	Dated: 07/12/2014
Fuel Consumed (MCF)	31430758.02	
Net Heat Rate (HHV) (KJ/KWH)	8987.0	
Stack Height (Meter)	20m	



#### 4. HEALTH AND SAFETY REPORT

##### 4.1 Unscheduled Events

Sl.	Events	Information / Comments
1.	Incidents (Near Miss):	No incident
2.	First Aid Cases:	No first Aid case
3.	Lost Time Accidents (LTA's)	No LTA
4.	Injury/fatality:	No injury/Fatality

##### 4.2 Resource availability

Items	Availability / Comments
1.Plant Layout	Available
2.Fire Water System	Not Available
3.Portable Fire Extinguishers	Available
4.Hazardous Area Information	Available
5.Lubricant /Chemical Storage Area information	Available
6.Fuel Gas Pipeline Isolation	Available
7.CO <sub>2</sub> Deluge System	Not Available
8Automatic Water Spray/Sprinkler System	Not Available
9.First aid kit	Available
10.Emergency Rescue Equipment	Not Available
11.Self-contained Breathing Apparatus (SCBA)	Not Available
12.Gas Meter (LEL-Combustible Gas, CO, CO <sub>2</sub> )	Not Available
13.Sound level meter (ANSI Type-2)	Available
14.Emergency Call List	Available <b>(sample attached in the Annex)</b>
15.Budget for Environment/Safety activities	Available

##### 4.3 Scheduled Activities

Activity	Dates	Description
1.Firedrills	Monthly	<b>Mock drills information is attached in the Annex</b>
2.Safety Review	Monthly	
3.Trainings	Twice in a month	
4.Fuel and gas leak checks	Regularly thrice in a day	

#### 5. Public Complaints and Response

##### 5.1 Public Complaints Management Status

Sl.	Item	Availability	Description
1.	Disclosure /availability of EMP document	Yes	Copy of EMP at the plant
2.	Grievance Registration	Yes	Complaint register at the plant gate

##### 5.2 Public Complaints/ Response

No complaints were made by the local people about the power plant during the construction to its one year operation period.

## 6. MONITORED DATA

### 6. 1 Stack Emissions

**Table-1 Stack Monitoring Results\***

Sl.	Parameter	Values				Bangladesh Standards (Power plant <200MW)	World Bank Standards
		21/01/15	31/01/15	08/02/15	12/02/15		
1.	SPM	20	18	21	22	250mg/m <sup>3</sup>	N/A
2.	NOx	110	115	112	114	-	200 mg/m3

\* As natural gas in Bangladesh does not have any sulfur. SO<sub>2</sub>, measurements was skipped.

### 6.2 Ambient Air Quality Monitoring data

**Table 2- Average values for Criteria Pollutants Measured at the gate of the plant**

Pollutant	Averaging Time	Unit	Bangladesh Standards	21/01/15	22/01/15	31/01/15	04/02/15	08/02/15	12/02/15
CO	1hour	mg/m <sup>3</sup>	-	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13
NO <sub>x</sub>	1hour	µg/m <sup>3</sup>	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
PM <sub>10</sub>	24 hour	µg/m <sup>3</sup>	150	127	162	215	255	224	164
PM <sub>2.5</sub>	24 hour	µg/m <sup>3</sup>	65	103	130	159	194	175	116

### 6.3 Noise Monitoring Data



**Table 3- Monitored noise levels\***

Location	Day time	Night time	Bangladesh Standard	
	dB	dB	Day (dB)	Night (dB)
NL1	63.0±3.0	60.0±2.82	75	70
NL2	69.0±3.2	65.8±3.09	75	70
NL3	51.2±2.4	50.3±2.37	75	70
NL4	61.3±2.9	58.0±2.73	75	70
NL5	63.6±3.0	62.0±2.91	75	70
NL6	61.8±2.9	59.0±2.77	75	70
NL7	53.2±2.5	52.6±2.47	75	70
NL8	55.6±2.6	53.3±2.50	75	70
NL9	64.9±3.1	63.7±2.99	75	70
NL10	59.0±2.8	58.6±2.75	75	70
NL11	60.5±2.8	60.1±2.82	75	70
NL12	60.9±2.9	60.4±2.84	75	70
NL13	66.3±3.1	64.9±3.05	75	70
NL14	67.0±3.1	66.3±3.12	75	70
NL15	65.2±3.1	62.7±2.95	75	70
NL16	56.3±2.6	53.4±2.51	75	70
NL17	59.6±2.8	58.6±2.75	75	70
NL18	57.9±2.7	56.9±2.68	75	70
NL19	62.5±2.9	61.9±2.91	75	70

## 6.4 Lubricant Management

The produced lubricant is stored in a 208liter capacity drum container and disposed through DOE Authorized Agent: Akota Traders, Madarganj, Ferighat, Bandar, Narayanganj. It is recorded that last November'2014 MPCL disposed off 1248liters to the Akota Traders. The monthly lubricant management data area listed below in Table-4.

**Table 4: Monthly Lubricant Management Data**

Period	Quantity Used (liter)	Stock (New)	Spillage
August 2014	2496	4992	No Spillage
September 2014	3120	11024	No Spillage
October 2014	3328	7696	No Spillage
November 2014	2912	4784	No Spillage
December 2014	2288	11648	No Spillage
January 2015	1248	10400	No Spillage
February 2015	2080	8320	No Spillage

## 7. REVIEW AND CONCLUSION

### 7.1 Project Performance

Project performance is good in respect of the power production and contribution to the national power grid.

### 7.3. Health and safety

Health and safety issues are maintained as per scheduled and reported upright as because there were no unscheduled events recorded in the power plant during the compliance period.

### 7.4 Public Relations / Complaints handling

A good understanding between the public and the power plant people is already established as reported from public discussion during the compliance period. There were no complaints found

yet to be resolved. On the contrary, 6-7 local peoples are directly employed in the power plant.

### **7.5 Emissions Monitoring**

Ambient Air emission data exceeds the national standards value as reported from the analysis. It should be noted here that the ambient air quality data represents the Ashuganj Air shade cumulative air quality information where the contribution of the Midland Power Plant is around 5% of the total air emission to the airshed. So, it can be concluded that the MPCL emission level is within the limit of the National and WB standards/guidelines.

### **7.6 Noise Monitoring**

Noise level data complied with the national standards. The control room noise level recorded data is max-76dB and min-71dB which exceeds the WB and National guidelines. The workers have to wear the earmuff to protect them from the hazards of noise pollution.

### **7.7 Wastewater Management**

The power plant has no discharge to the River Meghna and the generated waste water is disposed of to the well designed 100users capacity septic tank.

### **7.8 Lubricant Management**

The power plant has a good management of lubricant dispose of system. There was no lubricant spillage found during the monitoring period. MPCL disposed of the Spent Lubricant to the DOE Authorized Agent. The detail of the Authorized Agent is listed below:

**Name of the Agent:** Akota Traders

**Office Address:** Madarganj, Ferighat, Bandar, Narayanganj.

Snaps on Fire Drills:Emergency Call List:

জরুরী টেলিফোন নম্বর সমূহ		
নং	বিবরণ	ফোন নম্বর
১	মুলিশ সুদার, ব্রাহ্মণবাড়িয়া	মোবা: ০১৭১৩-৩৭৩৭২৪
২	অতিরিক্ত মুলিশ সুদার, ব্রাহ্মণবাড়িয়া	মোবা: ০১৭১৩-৩৭৩৭২৫
৩	ফায়ার পার্টিজ, আশুগঞ্জ	ফোন: ০৮৫২৮ ৭৪২২০ মোবা: ০১৭৩০-০০২৪৮০ ০১৮১৪-২৩২৫৫৪
৪	র‍্যাং, ব্রাহ্মণবাড়িয়া	মোবা: ০১৭১৩-১৪২৯৫১
৫	র‍্যাং, ভৈরব	ফোন: ০৯৪২৪ ৭১৮০১
৬	আশুগঞ্জ থানা ভারপ্রাপ্ত কর্মকর্তা	মোবা: ০১৭১৩-৩৭৩৭৩২
৭	নূর মেডিকেল সেন্টার, আশুগঞ্জ	মোবা: ০১১৯৯-১৫১১৩১ ০১৮১৭-০৮৩৫১৩
৮	মেডিকেল অফিসার, আশুগঞ্জ শ্রম কল্যাণ	মোবা: ০১৬৭৪-৮৩৯১৮১
৯	ডে-নাইট হাসপাতাল, আশুগঞ্জ ডে-নাইট প্রস্ট্রুলেজ সেবা, আশুগঞ্জ	মোবা: ০১৭৩১-৩১৩১৩০
১০	জেলা সদর হাসপাতাল, ব্রাহ্মণবাড়িয়া	ফোন: ০৮৫১-৫২০৯০
১১	গ্রামীণ জেনারেল হাসপাতাল, ব্রাহ্মণবাড়িয়া	মোবা: ০১৭৩৪-৬১৯২২৫

# Attendance List of Mock Drills:

## Midland Power Co. Limited

Charchartola, Ashuganj, Brahmanbaria

### MOCK Drills for Fire & Environment

#### Attendance sheet

Name of Venue: ইকিট কম, সিটি লব্জ হাউসিং সোসাইটি Date: 05.01.2015

Sl	Name	Designation	Department	Sign	Comments
০১	শ্রী. কাজীমার খান(মহ)	মহ: ইকিট	ইলেক্ট্রিশিয়ান		
০২	স্বাধীন - মাসুদুল	"	প্লেম্বার/ক্যান		
০৩	শ্রী. হুসেইন - হুসেইন	"	ইলেক্ট্রিশিয়ান		
০৪	শ্রী. আলমাসরাফ	মাস্টার	মেকানিকিয়ান		
০৫	শ্রী. মাসুদুল বরমান	হকার্ড মঃ	মডার্ন		
০৬	শ্রী. মাসুদুল - হুসেইন	মাস্টার/ইকিট	মডার্ন		
০৭	" কুতুব আলম	"	"		
০৮	শ্রী. মাসুদুল মিস্ত্রী	মঃ, মঃ	ইলেক্ট্রিশিয়ান		
০৯	শ্রী. স্বাধীন	ইলেক্ট্রিশিয়ান	"		
১০	মাসুদুল হুসেইন	মাস্টার	মাস্টার অফ ওয়ার		
১১	শ্রী. হুসেইন মিয়া	ইকিট	ইলেক্ট্রিশিয়ান		
১২	" আলমাসরাফ	মাস্টার/ইকিট	মডার্ন		
১৩	" মাসুদুল হুসেইন	মাস্টার	মাস্টার		
১৪	" আলমাসরাফ	মাস্টার	মাস্টার		
১৫	" স্বাধীন মিয়া	"	মাস্টার		
১৬	" মাসুদুল হুসেইন	মঃ, মঃ	মডার্ন		
১৭	মাসুদুল হুসেইন	"	ইলেক্ট্রিশিয়ান		

Sign of  
05.01.15  
Engr. Md. Akram Ali  
Deputy Manager  
Plant Incharge  
Midland Power Co. Ltd.  
Ashuganj, Brahmanbaria



# মিডল্যান্ড পাওয়ার কোং লিমিটেড

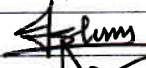

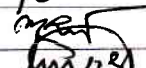
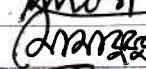
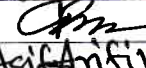
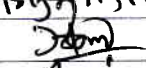
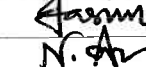
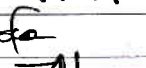


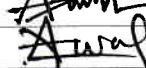
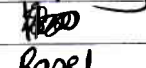
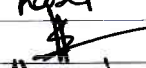
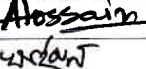
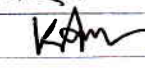

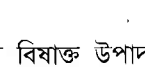
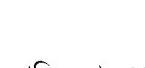





চরচারতলা, আশুগঞ্জ, ব্রাহ্মণবাড়ীয়া - ৩৪০২।

তাং : ৬ই এপ্রিল ২০১৪ ইং

## পরিবেশগত নীতি সচেতনতামূলক বিষয়ক সাধারণ সভার কার্যবিবরণী

অদ্য তারিখে চরচারতলা, আশুগঞ্জ, ব্রাহ্মণবাড়ীয়াস্থ মিডল্যান্ড পাওয়ার কোং লিমিটেড এর প্লান্ট অফিসের সভা কক্ষে রোজ রবিবার, বেলা ১১:০০ মিনিটে এমপিসিএলের কর্মকর্তাদের উপস্থিতিতে কোম্পানীর ইএইচএস নীতি অনুসরণে পরিবেশগত সচেতনতামূলক বিষয়ে সাধারণ সভা অনুষ্ঠিত হয়। উক্ত সভায় সভাপতিত্ব করেন কোম্পানীর মহা ব্যবস্থাপক মহোদয় ইঞ্জিনিয়ার মোঃ শরিফুল ইসলাম।

### অংশগ্রহনকারীর নামের তালিকা

ক্রমিক	নাম	পদবী	স্বাক্ষর
১	মোঃ ইমরোজ ইসলাম	প্লান্ট ম্যানেজার	
২	মোঃ আজহারুল ইসলাম	ব্যবস্থাপক - অপারেশন এন্ড মেইনটেনেন্স (মেকানিক্যাল)	
৩	মোঃ ওবায়দুর রহমান	ব্যবস্থাপক - অপারেশন এন্ড মেইনটেনেন্স (ইলেকট্রিক্যাল)	
৪	মোঃ শামিউর রহমান	সহঃ ব্যবস্থাপক (এডমিন এন্ড এইচআর)	
৫	মোঃ মসিউর রহমান	সিনিয়র ইঞ্জিনিয়ার(অপারেশন এন্ড মেইনটেনেন্স)	
৬	মাহবুবুল হাসান গালিব	সিনিয়র ইঞ্জিনিয়ার(অপারেশন এন্ড মেইনটেনেন্স)	
৭	মোঃ আবুল কালাম	ইঞ্জিনিয়ার(মেইনটেনেন্স)	
৮	মোঃ আসিফ আরিফিন রহমান	ইঞ্জিনিয়ার(অপারেশন এন্ড মেইনটেনেন্স)	
৯	মোঃ উজ্জ্বল মিয়া	ইঞ্জিনিয়ার(অপারেশন এন্ড মেইনটেনেন্স)	
১০	মোঃ জসিম উদ্দিন	ইঞ্জিনিয়ার(অপারেশন এন্ড মেইনটেনেন্স)	
১১	মোঃ নূরুল আমিন	ইঞ্জিনিয়ার(অপারেশন এন্ড মেইনটেনেন্স)	
১২	মোঃ ফরহাদ হোসাইন	ইঞ্জিনিয়ার(অপারেশন এন্ড মেইনটেনেন্স)	
১৩	মোঃ জাইদুর রহমান	ইঞ্জিনিয়ার(অপারেশন )	
১৪	মোঃ মহিদুল মওলা	ইঞ্জিনিয়ার(অপারেশন এন্ড মেইনটেনেন্স)	
১৫	মোঃ নজরুল ইসলাম	ইঞ্জিনিয়ার(অপারেশন এন্ড মেইনটেনেন্স)	
১৬	মোঃ আমজাদ হোসাইন ভূইয়া	ইঞ্জিনিয়ার(অপারেশন এন্ড মেইনটেনেন্স)	
১৭	মোঃ আব্দুল আওয়াল	সহঃ ইঞ্জিনিয়ার(অপারেশন এন্ড মেইনটেনেন্স)	
১৮	মোঃ কাওসার আহমেদ	সহঃ ইঞ্জিনিয়ার(অপারেশন এন্ড মেইনটেনেন্স)	
১৯	মোঃ রাসেল পারভেজ	সহঃ ইঞ্জিনিয়ার(অপারেশন)	
২০	মোঃ শাহ আলম	নির্বাহী (হিসাব ও স্টোর)	
২১	মোঃ আরিফ হোসাইন	নির্বাহী (এডমিন এন্ড এইচআর)	
২২	মোঃ খাইরুল ইসলাম	সিকিউরিটি ইন্সপেক্টর	
২৩	মোঃ খাইরুল আনাম	সাবঃ এসিঃ ইঞ্জিঃ	

### : আলোচ্য বিষয় ও গৃহিত সিদ্ধান্ত সমূহ :

১. উক্ত সভায় কোম্পানীর ইএইচএস এর পরিবেশ নীতি অনুসারে বিশদ আলোচনা করা হয়।
২. উক্ত প্রতিষ্ঠানের টেকসই ড্রেনেজ ব্যবস্থার ব্যাপারে আলোচনা করা হয় এবং কোন রূপ বর্জ্য বা বিষাক্ত উপাদান পরিবেশ বিনষ্ট করছে কিনা সেই বিষয়ে আলোচনা করা হয়।
৩. আমরা ৩০ মিটারে উপরের যে গ্যাস নিঃসরণ করি তা পরিবেশ অধিদপ্তর কর্তৃক পরিক্ষিত যেখানে পরিবেশের জন্য ক্ষতিকারক বা হুমকিস্বরূপ কোন উপদান নাই উক্ত বিষয়ে আলোচনা করা হয়।
৪. প্রতিষ্ঠানে ব্যবহৃত যানবাহনের চলাচল, রক্ষনাবেক্ষন ও সংরক্ষন অবশ্যই পরিবেশবান্ধব হতে হবে সেই বিষয়ে আলোচনা করা হয়।
৫. প্লান্ট থেকে সৃষ্ট শব্দ ও অন্যান্য যান্ত্রিক ব্যবহার প্লান্ট চত্বরের চারপাশের প্রতিবেশী বাসিন্দাদের সাধারণ জীবনযাপনের জন্য সহনশীল সেই বিষয়ে আলোচনায় উঠে আসে।

# মিডল্যান্ড পাওয়ার কোং লিমিটেড

চরচারতলা, আশুগঞ্জ, ব্রাহ্মণবাড়ীয়া - ৩৪০২।

তাং ৪ ৩০ জুন ২০১৪ ইং

## নিরাপত্তা সচেতনতা বিষয়ক সাধারণ সভার কার্যবিবরণী

অদ্য তারিখে চরচারতলা, আশুগঞ্জ, ব্রাহ্মণবাড়ীয়াস্থ মিডল্যান্ড পাওয়ার কোং লিমিটেড এর প্লান্ট অফিসের সভা কক্ষে রোজ সোমবার, বেলা ১:৩০ মিনিটে এমপিসিএলের কর্মকর্তাদের উপস্থিতিতে কর্মস্থলে সকল প্রকার কর্ম সম্পাদনের প্রারম্ভে আরো কিভাবে বেশি ব্যক্তিগত নিরাপত্তা ও সামগ্রিক নিরাপত্তা জোরদার করা যায় সেই আলোকে সচেতনতামূলক সাধারণ সভা অনুষ্ঠিত হয়। কোম্পানীর ইএইচএস নীতি অনুসরণে ও এতদাসংক্রান্ত গুরুত্ব নিয়ে আলোচনা করা হয়। উক্ত সভায় সভাপতিত্ব করেন কোম্পানীর মহা ব্যবস্থাপক মহোদয়।

### অংশগ্রহনকারীর নামের তালিকা

ক্রমিক	নাম	পদবী	স্বাক্ষর
১	মোঃ ইমরোজ ইসলাম	প্লান্ট ম্যানেজার	
২	মোঃ আজাহারুল ইসলাম	ব্যবস্থাপক - অপারেশন এন্ড মেইনটেনেন্স (মেকানিক্যাল)	
৩	মোঃ ওবায়দুর রহমান	ব্যবস্থাপক - অপারেশন এন্ড মেইনটেনেন্স (ইলেকট্রিক্যাল)	
৪	মোঃ শামিউর রহমান	সহঃ ব্যবস্থাপক (এডমিন এন্ড এইচআর)	
৫	মোঃ মসিউর রহমান	সিনিয়র ইঞ্জিনিয়ার (অপারেশন এন্ড মেইনটেনেন্স)	
৬	মোঃ হাবিবুল হাসান গালিব	সিনিয়র ইঞ্জিনিয়ার (অপারেশন এন্ড মেইনটেনেন্স)	
৭	মোঃ আবুল কালাম	ইঞ্জিনিয়ার (মেইনটেনেন্স)	
৮	মোঃ আসিফ আরেফিন রহমান	ইঞ্জিনিয়ার (অপারেশন এন্ড মেইনটেনেন্স)	
৯	মোঃ উজ্জল মিয়া	ইঞ্জিনিয়ার (অপারেশন এন্ড মেইনটেনেন্স)	
১০	মোঃ জসিম উদ্দিন	ইঞ্জিনিয়ার (অপারেশন এন্ড মেইনটেনেন্স)	
১১	মোঃ নূরুল আমিন	ইঞ্জিনিয়ার (অপারেশন এন্ড মেইনটেনেন্স)	
১২	মোঃ ফরহাদ হোসাইন	ইঞ্জিনিয়ার (অপারেশন এন্ড মেইনটেনেন্স)	
১৩	মোঃ জাইদুর রহমান	ইঞ্জিনিয়ার (অপারেশন )	
১৪	মোঃ মহিদুল মওলা	ইঞ্জিনিয়ার (অপারেশন এন্ড মেইনটেনেন্স)	
১৫	মোঃ নজরুল ইসলাম	ইঞ্জিনিয়ার (অপারেশন এন্ড মেইনটেনেন্স)	
১৬	মোঃ আমজাদ হোসাইন ভূইয়া	ইঞ্জিনিয়ার (অপারেশন এন্ড মেইনটেনেন্স)	
১৭	মোঃ আব্দুল আউয়াল	সেফটি অফিসার	
১৮	মোঃ কাওসার আহমেদ	সহঃ ইঞ্জিনিয়ার (অপারেশন এন্ড মেইনটেনেন্স)	
১৯	মোঃ রাসেল পারভেজ	সহঃ ইঞ্জিনিয়ার (অপারেশন)	
২০	মোঃ শাহ আলম	নির্বাহী (হিসাব ও স্টোর)	
২১	মোঃ আরিফ হোসাইন	নির্বাহী (এডমিন এন্ড এইচআর)	
২২	মোঃ খাইরুল ইসলাম	সিকিউরিটি ইনসপেক্টর	
২৩	মোঃ মাসুদ মীর	সাবঃ এঃ ইঞ্জিঃ	
২৪	মোঃ খাইরুল আনাম	সাবঃ এসিঃ ইঞ্জিঃ	
২৫	মোঃ সুলিমান	ফোরম্যান	
২৬	মোঃ সজীব আলী	জুঃ সাবঃ এসিঃ ইঞ্জিঃ	
২৭	মোঃ আসাদুজ্জামান	জুঃ সাবঃ এসিঃ ইঞ্জিঃ	

### ঃ আলোচ্য বিষয় ও গৃহিত সিদ্ধান্ত সমূহ :

১. সকলকে স্ব স্ব কর্ম ক্ষেত্রে অবশ্যই সচেতন ভাবে জেনে বুঝে কাজে অংশগ্রহনের ব্যাপারে বলা হয়।
২. যে কোন জরুরী অবস্থাতে প্লান্টের বিভিন্ন স্থানে জরুরী টেলিফোন বোর্ডের নম্বর অনুযায়ী যোগাযোগের জন্য বলা হয়।
৩. সকল প্রকার বিড়ি, সিগারেট ও তাহার পরিশিষ্ট প্যাকেট বা ফিল্টার সমূহ, দেয়াশলাই, লাইটার বা ম্যাচ ও তাহার পরিশিষ্ট প্যাকেট ইত্যাদি প্লান্ট এর প্রবেশের বিষয়ে বিধিনিষেধ আরোপ করা হয়।
৪. ব্যক্তিগত সুরক্ষা সিস্টেম সম্বন্ধে আলোচনা করা হয়।



# মিডল্যান্ড পাওয়ার কোং লিমিটেড


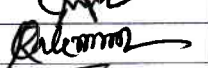
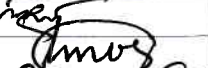
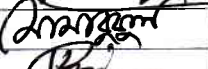
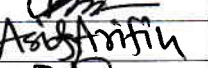
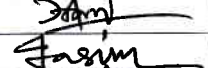
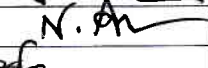


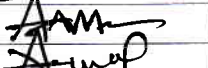
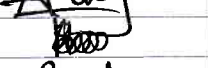
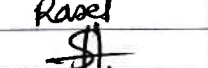
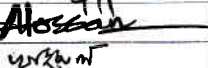
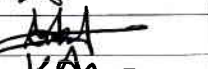

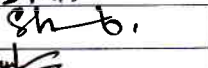
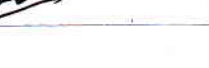








চরচারতলা, আশুগঞ্জ, ব্রাহ্মণবাড়ীয়া - ৩৪০২।

তাং : ৩০ আগস্ট ২০১৪ ইং

## পরিবেশগত নীতি সচেতনতামূলক বিষয়ক সাধারণ সভার কার্যবিবরণী

অদ্য তারিখে চরচারতলা, আশুগঞ্জ, ব্রাহ্মণবাড়ীয়াস্থ মিডল্যান্ড পাওয়ার কোং লিমিটেড এর প্লান্ট অফিসের সভা কক্ষে রোজ শনিবার, বেলা ১০:৩০ মিনিটে এমপিসিএলের কর্মকর্তাদের উপস্থিতিতে কোম্পানীর ইএইচএস নীতি অনুসরণে পরিবেশগত সচেতনতামূলক বিষয়ে সাধারণ সভা অনুষ্ঠিত হয়। উক্ত সভায় সভাপতিত্ব করেন কোম্পানীর মহা ব্যবস্থাপক মহোদয় ইঞ্জিনিয়ার মোঃ শরিফুল ইসলাম।

### অংশগ্রহনকারীর নামের তালিকা

ক্রমিক	নাম	পদবী	স্বাক্ষর
১	মোঃ ইমরোজ ইসলাম	প্লান্ট ম্যানেজার	
২	মোঃ আজাহারুল ইসলাম	ব্যবস্থাপক - অপারেশন এন্ড মেইনটেনেন্স (মেকানিক্যাল)	
৩	মোঃ ওবায়দুর রহমান	ব্যবস্থাপক - অপারেশন এন্ড মেইনটেনেন্স (ইলেক্ট্রিক্যাল)	
৪	মোঃ শামিউর রহমান	সহঃ ব্যবস্থাপক (এডমিন এন্ড এইচআর)	
৫	মোঃ মসিউর রহমান	সিনিয়র ইঞ্জিনিয়ার(অপারেশন এন্ড মেইনটেনেন্স)	
৬	মাহবুবুল হাসান গালিব	সিনিয়র ইঞ্জিনিয়ার(অপারেশন এন্ড মেইনটেনেন্স)	
৭	মোঃ আবুল কালাম	ইঞ্জিনিয়ার(মেইনটেনেন্স)	
৮	মোঃ আসিফ আরিফিন রহমান	ইঞ্জিনিয়ার(অপারেশন এন্ড মেইনটেনেন্স)	
৯	মোঃ উজ্জল মিয়া	ইঞ্জিনিয়ার(অপারেশন এন্ড মেইনটেনেন্স)	
১০	মোঃ জসিম উদ্দিন	ইঞ্জিনিয়ার(অপারেশন এন্ড মেইনটেনেন্স)	
১১	মোঃ নূরুল আমিন	ইঞ্জিনিয়ার(অপারেশন এন্ড মেইনটেনেন্স)	
১২	মোঃ ফরহাদ হোসাইন	ইঞ্জিনিয়ার(অপারেশন এন্ড মেইনটেনেন্স)	
১৩	মোঃ জাইদুর রহমান	ইঞ্জিনিয়ার(অপারেশন )	
১৪	মোঃ মহিদুল মওলা	ইঞ্জিনিয়ার(অপারেশন এন্ড মেইনটেনেন্স)	
১৫	মোঃ নজরুল ইসলাম	ইঞ্জিনিয়ার(অপারেশন এন্ড মেইনটেনেন্স)	
১৬	মোঃ আমজাদ হোসাইন ভূইয়া	ইঞ্জিনিয়ার(অপারেশন এন্ড মেইনটেনেন্স)	
১৭	মোঃ আব্দুল আওয়াল	সহঃ ইঞ্জিনিয়ার(অপারেশন এন্ড মেইনটেনেন্স)	
১৮	মোঃ কাওসার আহমেদ	সহঃ ইঞ্জিনিয়ার(অপারেশন এন্ড মেইনটেনেন্স)	
১৯	মোঃ রাসেল পারভেজ	সহঃ ইঞ্জিনিয়ার(অপারেশন)	
২০	মোঃ শাহ আলম	নির্বাহী (হিসাব ও স্টোর)	
২১	মোঃ আরিফ হোসাইন	নির্বাহী (এডমিন এন্ড এইচআর)	
২২	মোঃ খাইরুল ইসলাম	সিকিউরিটি ইন্সপেক্টর	
২৪	মোঃ মাসুদ মীর	সাবঃ এঃ ইঞ্জিঃ	
২৫	মোঃ খাইরুল আনাম	সাবঃ এসিঃ ইঞ্জিঃ	
২৬	মোঃ সুলিমান	ফোরম্যান	
২৭	মোঃ সজীব আলী	জুঃ সাবঃ এসিঃ ইঞ্জিঃ	
২৮	মোঃ আসাদুজ্জামান	জুঃ সাবঃ এসিঃ ইঞ্জিঃ	

### ঃ আলোচ্য বিষয় ও গৃহিত সিদ্ধান্ত সমূহ :

১. উক্ত সভায় কোম্পানীর ইএইচএস এর পরিবেশ নীতি অনুসারে বিশদ আলোচনা করা হয়।
২. প্রতিষ্ঠানের বনায়ন এবং সবুজায়ন এর ব্যাপারে আলোচনা করা হয়।
৩. প্লান্টের মনোরম পরিবেশ সৃষ্টি করে কিভাবে আরো সৃষ্ট ও সুন্দর করার ব্যাপারে আলোকপাত করা হয়।
৪. প্লান্ট কে ধূমপান মুক্ত এলাকা হিসেবে ঘোষণা করা হয়।
৫. পচনশীল অপচনশীল দ্রব্যাদি সঠিক সংরক্ষণ এর বিষয়ে আলোচনা করা হয়।
৬. অব্যাহত কাঠ ব্যবহার করে আসবাবপত্র তৈরির ব্যাপারে আরোচনা করা হয়।
৭. ময়লা কালির ছোপ দেয়ালে বা কোথাও না লাগাবার নির্দেশনা প্রদান করা হয়।
৮. বুট বা অন্যান্য উৎছিষ্ট নিদিষ্ট বিনে রাখার জন্য বলা হয়।

# মিডল্যান্ড পাওয়ার কোং লিমিটেড

চরচারতলা, আশুগঞ্জ, ব্রাহ্মণবাড়ীয়া - ৩৪০২।

তাং : ২৪ই সেপ্টেম্বর ২০১৪ ইং

## নিরাপত্তা সচেতনতা বিষয়ক সাধারণ সভার কার্যবিবরণী

অদ্য তারিখে চরচারতলা, আশুগঞ্জ, ব্রাহ্মণবাড়ীয়াস্থ মিডল্যান্ড পাওয়ার কোং লিমিটেড এর প্লান্ট অফিসের সভা কক্ষে রোজ বুধবার, বেলা ১০:৩০ মিনেটে এমপিসিএলের কর্মকর্তাদের উপস্থিতিতে কর্মস্থলে সকল প্রকার কর্ম সম্পাদনের প্রারম্ভে আরো কিভাবে বেশি ব্যক্তিগত নিরাপত্তা ও সামগ্রিক নিরাপত্তা জোরদার করা যায় সেই আলোকে সচেতনতামূলক সাধারণ সভা অনুষ্ঠিত হয়। কোম্পানীর ইএইচএস নীতি অনুসরণে ও এতদাসংক্রান্ত গুরুত্ব নিয়ে আলোচনা করা হয়। উক্ত সভায় সভাপতিত্ব করেন কোম্পানীর মহা ব্যবস্থাপক মহোদয়।

### অংশগ্রহনকারীর নামের তালিকা

ক্রমিক	নাম	পদবী	স্বাক্ষর
১	মোঃ ইমরোজ ইসলাম	প্লান্ট ম্যানেজার	
২	মোঃ আজাহারুল ইসলাম	ব্যবস্থাপক - অপারেশন এন্ড মেইনটেনেন্স (মেকানিক্যাল)	
৩	মোঃ ওবায়দুর রহমান	ব্যবস্থাপক - অপারেশন এন্ড মেইনটেনেন্স (ইলেকট্রিক্যাল)	
৪	মোঃ শামিউর রহমান	সহঃ ব্যবস্থাপক (এডমিন এন্ড এইচআর)	
৫	মোঃ মসিউর রহমান	সিনিয়র ইঞ্জিনিয়ার (অপারেশন এন্ড মেইনটেনেন্স)	
৬	মোঃ আবুল কালাম	ইঞ্জিনিয়ার (মেইনটেনেন্স)	
৭	মোঃ আসিফ আরেফিন রহমান	ইঞ্জিনিয়ার (অপারেশন এন্ড মেইনটেনেন্স)	
৮	মোঃ উজ্জল মিয়া	ইঞ্জিনিয়ার (অপারেশন এন্ড মেইনটেনেন্স)	
৯	মোঃ জসিম উদ্দিন	ইঞ্জিনিয়ার (অপারেশন এন্ড মেইনটেনেন্স)	
১০	মোঃ নূরুল আমিন	ইঞ্জিনিয়ার (অপারেশন এন্ড মেইনটেনেন্স)	
১১	মোঃ ফরহাদ হোসাইন	ইঞ্জিনিয়ার (অপারেশন এন্ড মেইনটেনেন্স)	
১২	মোঃ জাইদুর রহমান	ইঞ্জিনিয়ার (অপারেশন )	
১৩	মোঃ মহিদুল মওলা	ইঞ্জিনিয়ার (অপারেশন এন্ড মেইনটেনেন্স)	
১৪	মোঃ নজরুল ইসলাম	ইঞ্জিনিয়ার (অপারেশন এন্ড মেইনটেনেন্স)	
১৫	মোঃ আমজাদ হোসাইন ভূইয়া	ইঞ্জিনিয়ার (অপারেশন এন্ড মেইনটেনেন্স)	
১৬	মোঃ আব্দুল আউয়াল	সেফটি অফিসার	
১৭	মোঃ কাওসার আহমেদ	সহঃ ইঞ্জিনিয়ার (অপারেশন এন্ড মেইনটেনেন্স)	
১৮	মোঃ রাসেল পারভেজ	সহঃ ইঞ্জিনিয়ার (অপারেশন)	
১৯	মোঃ শাহ আলম	নির্বাহী (হিসাব ও স্টোর)	
২০	মোঃ আরিফ হোসাইন	নির্বাহী (এডমিন এন্ড এইচআর)	
২১	মোঃ খাইরুল ইসলাম	সিকিউরিটি ইনসপেক্টর	
২২	মোঃ মাসুদ মীর	সাবঃ এঃ ইঞ্জিঃ	
২৩	মোঃ খাইরুল আনাম	সাবঃ এসিঃ ইঞ্জিঃ	
২৪	মোঃ সুলিমান	ফোরম্যান	
২৫	মোঃ সজীব আলী	জুঃ সাবঃ এসিঃ ইঞ্জিঃ	

### ঃ আলোচ্য বিষয় ও গৃহিত সিদ্ধান্ত সমূহ :

১. সব পরিস্থিতিতেই দুর্ঘটনার সম্ভবনা বিদ্যমান, বিধায় সচেতন ভাবে কর্মে অংশগ্রহনের ব্যাপারে বলা হয়।
২. ফার্স্ট এইড ও যথাযথ পথের ব্যাপারে এডমিন এন্ড এইচআর বিভাগ কে কার্যকর নির্দেশনা প্রদান করা হয়।
৩. যে কোন কাজ সম্পাদনের সময় অবশ্যই লক্ষ্য রাখতে হবে যে কোন অবস্থাতে অন্য কেউ অবচেতন ভাবে কর্মসম্পাদনের কাছাকাছি অনিরাপদ ভাবে চলে আসছে কিনা।
৪. নিরাপত্তা বিষয়ে হট ওয়ার্কের ক্ষেত্রে কিছু বিষয় খেয়াল রাখতে হবে যেমন- জরুরী প্রস্থান, নিরাপদ পানির ব্যবস্থা, বৈদ্যুতিক নিরাপদ প্যানেল, অগ্নি নির্বাপন, যথাযথ পিপিই নিশ্চিত করণে সেফটি অফিসার কে নির্দেশনা দেওয়া হয়।
৫. যথাযথ অগ্নি নিরাপত্তা ব্যবস্থার ব্যাপারে যথা সময়ে প্রশিক্ষণ, মহড়া, ফায়ার ফাইটিং সরঞ্জামাদির সঠিক মেয়াদ অনুসরণ এর বিষয়ে আলোকপাত করা হয়।



# মিডল্যান্ড পাওয়ার কোং লিমিটেড


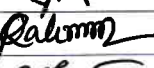

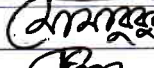
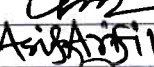
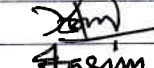
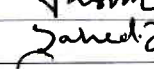

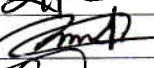
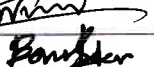
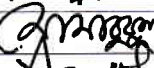
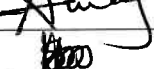
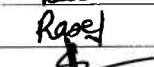
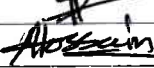
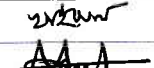
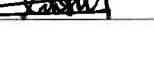

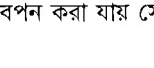
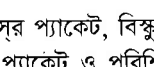
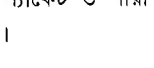
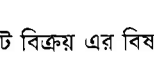



চরচারতলা, আশুগঞ্জ, ব্রাহ্মণবাড়ীয়া - ৩৪০২।

তাং ৪ ১৩ই ডিসেম্বর ২০১৪ ইং

## পরিবেশগত নীতি সচেতনতামূলক বিষয়ক সাধারণ সভার কার্যবিবরণী

অদ্য তারিখে চরচারতলা, আশুগঞ্জ, ব্রাহ্মণবাড়ীয়াস্থ মিডল্যান্ড পাওয়ার কোং লিমিটেড এর প্লান্ট অফিসের সভা কক্ষে রোজ শনিবার, বেলা ১০:৩০ মিনিটে এমপিসিএলের কর্মকর্তাদের উপস্থিতিতে কোম্পানীর ইএইচএস নীতি অনুসরণে পরিবেশগত সচেতনতামূলক বিষয়ে সাধারণ সভা অনুষ্ঠিত হয়। উক্ত সভায় সভাপতিত্ব করেন কোম্পানীর মহা ব্যবস্থাপক মহোদয় ইঞ্জিনিয়ার মোঃ শরিফুল ইসলাম।

### অংশগ্রহনকারী নামের তালিকা

ক্রমিক	নাম	পদবী	স্বাক্ষর
১	মোঃ আকরাম আলী	প্লান্ট ইনচার্জ	
২	মোঃ আজাহারুল ইসলাম	ব্যবস্থাপক - অপারেশন এন্ড মেইনটেনেন্স (মেকানিক্যাল)	
৩	মোঃ ওবায়দুর রহমান	ব্যবস্থাপক - অপারেশন এন্ড মেইনটেনেন্স (ইলেকট্রিক্যাল)	
৪	মোঃ শামিউর রহমান	সহঃ ব্যবস্থাপক (এডমিন এন্ড এইচআর)	
৫	মোঃ মসিউর রহমান	সিনিয়র ইঞ্জিনিয়ার(অপারেশন এন্ড মেইনটেনেন্স)	
৬	মাহবুবুল হাসান গালিব	সিনিয়র ইঞ্জিনিয়ার(অপারেশন এন্ড মেইনটেনেন্স)	
৭	মোঃ আবুল কালাম	ইঞ্জিনিয়ার(মেইনটেনেন্স)	
৮	মোঃ আসিফ আরিফিন রহমান	ইঞ্জিনিয়ার(অপারেশন এন্ড মেইনটেনেন্স)	
৯	মোঃ উজ্জ্বল মিয়া	ইঞ্জিনিয়ার(অপারেশন এন্ড মেইনটেনেন্স)	
১০	মোঃ জাসিম উদ্দিন	ইঞ্জিনিয়ার(অপারেশন এন্ড মেইনটেনেন্স)	
১১	মোঃ শাহেদুজ্জামান	ইঞ্জিনিয়ার(অপারেশন এন্ড মেইনটেনেন্স)	
১২	মোঃ ফরহাদ হোসাইন	ইঞ্জিনিয়ার(অপারেশন এন্ড মেইনটেনেন্স)	
১৩	মোঃ জাইদুর রহমান	ইঞ্জিনিয়ার(অপারেশন )	
১৪	মোঃ মহিদুল মওলা	ইঞ্জিনিয়ার(অপারেশন এন্ড মেইনটেনেন্স)	
১৫	মোঃ নজরুল ইসলাম	ইঞ্জিনিয়ার(অপারেশন এন্ড মেইনটেনেন্স)	
১৬	শেখ মোহাঃ বনি সদর	ইঞ্জিনিয়ার(অপারেশন এন্ড মেইনটেনেন্স)	
১৭	মাহবুবুল হাসান গালিব	সিনিয়র ইঞ্জিনিয়ার(অপারেশন এন্ড মেইনটেনেন্স)	
১৮	মোঃ আব্দুল আওয়াল	সহঃ ইঞ্জিনিয়ার(অপারেশন এন্ড মেইনটেনেন্স)	
১৯	মোঃ কাওসার আহমেদ	সহঃ ইঞ্জিনিয়ার(অপারেশন এন্ড মেইনটেনেন্স)	
২০	মোঃ রাসেল পারভেজ	সহঃ ইঞ্জিনিয়ার(অপারেশন)	
২১	মোঃ শাহ আলম	নির্বাহী (হিসাব ও স্টোর)	
২২	মোঃ আরিফ হোসাইন	নির্বাহী (এডমিন এন্ড এইচআর)	
২৩	মোঃ খাইরুল ইসলাম	সিকিউরিটি ইন্সপেক্টর	
২৪	মোঃ মাসুদ মীর	সাবঃ এঃ ইঞ্জিঃ	

### ঃ আলোচ্য বিষয় ও গৃহীত সিদ্ধান্ত সমূহ :

১. উক্ত সভায় কোম্পানীর ইএইচএস নীতি অনুসারে ফলপ্রসূতা নিয়ে মতবিনিময় আলোচনা করা হয়।
২. প্রতিষ্ঠানের বনায়ন এবং সবুজায়ন এর ব্যাপারে আলোচনা করা হয়, আরো কি কি ধরনে গাছ গাছালি প্লান্টে বপন করা যায় সেই বিষয়ে সবার মতামত জানতে চাওয়া হয়।
৩. সকল ব্যবহৃত জিনিসপত্র নিদিষ্ট ডাস্টবিনে ফেলতে হবে যেমন - খাবারের মোড়ক বা খোলা প্যাকেট, চিপসের প্যাকেট, বিস্কুট, চানাচুরের প্যাকেট কোমলপানীয়ের বোতল, পরিত্যক্ত পানির বোতল, জুসের প্যাকেট, চকলেট, চুয়ংগামের প্যাকেট ও পরিশিষ্ট অংশ, টিস্যু পেপারের ব্যবহৃত অংশ বিশেষ, মোবাইলের রিচার্জ কার্ড ইত্যাদি বিষয়ে বিশদ আলোচনা করা হয়।
৪. প্লান্টে ব্যবহারিত লুবওয়েল বা অন্যান্য লোহার খন্ডিত অংশ পরিবেশগত ছাড়পত্র আছে এমন ভেভারদের নিকট বিক্রয় এর বিষয়ে নির্দেশনা দেওয়া হয়।
৫. পাশে নদী অবস্থিত হওয়ায় কোন কিছু নদীর পানিতে নিক্ষেপ করা যাবে না বলে নির্দেশ দেওয়া হয়।

## **Annex-XVIII**

### **Technical Comparison with Investment Analysis of Technologies**

Sheet-1

S/N	Parameters	Unit	GE-Jenbacher	MWM-Deutz	Rolls Royce	Wartsila
1	Engine Model		JGS 620 GS-N.L (F)	TCG 2032 V16	B35:40V20	20V34SG
2	Genset Weight	Ton	29.700	56	135	132.930
3	Engine RPM		1500	1000	750	750
4	No of Engine	Nos	16	13	6	6
5	Guaranteed Capacity of Each Genset at Alt Terminal at site condition	MW	3.338	4.274	9.340	9.286
6	Guaranteed Gross Plant Capacity of all Genset at Alt Terminal at site condition	MW	53.408	55.562	56.040	55.716
7	Engine Auxiliary Load+Ventilation+Lighting & A/C	MW	1.730	1.799	1.066	0.836
8	Gross Pant Output after auxiliary load deduction	MW	51.678	53.763	54.974	54.880
9	Transformer Loss 0.7%	0.70%	0.362	0.376	0.385	0.384
10	Total Parasitic Load	MW	2.092	2.176	1.451	1.220
11	Total Paracitic Load	%	3.92%	3.92%	2.59%	2.19%
12	Guaranteed Plant Capacity at Grid at site condition	MW	51.316	53.386	54.589	54.496
13	Declared Guaranteed Plant Capacity at Grid at site condition	MW	51.000	51.000	51.000	51.000
14	Guaranteed Heat rate at Alt Terminal at +5% tolerance on LHV	kJ/kWh	8358	8322	7533	7982
15	Guaranteed Heat rate at Alt Terminal at +0% tolerance on LHV	kJ/kWh	8776	8738	7910	8381
16	Guaranteed Heat rate at Alt Terminal at Grid at +0% tolerance on HHV	kJ/kWh	9742	9699	8780	9303
17	Guaranteed Heat rate at Grid at site condition at 0% tolerance on HHV	kJ/kWh	10123	10079	9007	9507
18	Fuel Cost	BDT/kWh	0.8064	0.8029	0.7175	0.7573
19	Bid Fuel Price	BDT/kWh	0.8068	0.8068	0.8068	0.8068
20	Saving in Fuel	BDT/kWh	0.0004	0.004	0.089	0.050
21	Spare Cost Genset + T/C	Euro/MWh	2.81	2.73	2.54	2.37
22	Spare Cost Genset + T/C	BDT/kWh	0.2951	0.2870	0.2667	0.2493
23	Lube Oil consumption	g/kWh	0.34	0.36	0.32	0.44
24	Lube Oil Cost	BDT/kWh	0.13	0.12	0.10	0.14
25	Lube oil +Spares Cost	BDT/kWh	0.4270	0.4055	0.3695	0.3928
26	Equipment Cost-Genset	USD	19,360,000	20,896,200	21,100,000	21,211,387
27	Equipment Cost-Genset/MW	USD/MW	379,608	409,729	413,725	415,910

Note: 1 Euro = 1.3680 USD

Sheet-2

Cost Summary		Unit	GE-Jenbacher	MWM-Doetz	Rolls Royace	Wartsila	Bid Price
A	Capacity Cost						
	Investment cost : BDT/kWh(Debt Service)	BDT/kWh	0.3470	0.3627	0.3547	0.3559	0.5366
	Fixed O&M	BDT/kWh	0.0800	0.0800	0.0800	0.0800	0.1109
	Total Capacity cost :A	BDT/kWh	0.4270	0.4427	0.4347	0.4359	0.6475
B	Energy Cost						
	Fuel Cost	BDT/kWh	0.8064	0.8029	0.7175	0.7573	0.8068
	Spares cost	BDT/kWh	0.2951	0.2870	0.2667	0.2493	0.2374
	Lube oil cost	BDT/kWh	0.1319	0.1185	0.1029	0.1434	0.1659
	Total variable O&M	BDT/kWh	0.4270	0.4055	0.3695	0.3928	0.4033
	Total Energy Cost :B	BDT/kWh	1.2334	1.2083	1.0870	1.1500	1.2101
	Total Generation Cost :A+B	BDT/kWh	1.6605	1.6510	1.5217	1.5859	1.8576
	Bid Price at 100% P.F	BDT/kWh	1.8577	1.8577	1.8577	1.8577	
	Savings Per KW at 100% P.F	BDT/kWh	0.1972	0.2067	0.3360	0.2718	
	Savings Per KW at 80% P.F	BDT/kWh	0.2018	0.2063	0.3113	0.2597	Levelized 2.02 BDT/kWh

After evaluation it had been perceived that the Rolls Royce engine is the most cost effective for this project. The average revenue earning / cost savings per kWh found highest among others, that is 0.3113 Tk/kWh after adjustment of all expenses.

*[Handwritten signature]*

*[Handwritten signature]*

**ANNEX-XIX**  
**PM MEASUREMENT BY ATOMIC ENERGY DHAKA**



# STATUS OF PARTICULATE MATTER (PM<sub>2.5</sub> and PM<sub>10</sub>), CO, AND NO<sub>2</sub> CONCENTRATIONS AT THE MIDLAND POWER GENERATION LTD, ASHUGANJ

## 1. LOCATION OF PM<sub>2.5</sub> and PM<sub>10</sub> MONITORING

Midland Power Generation Ltd at Ashuganj is situated near Zia Fertilizer Ltd Factory in Brahmanbaria. The city is known for its power plant which generates much of the electricity for the country especially for the capital city. Zia Fertilizer Ltd is on the southern side of Midland Power Generation Ltd at Ashuganj. It produces chemical fertilizer for the country. This area is known as commercial area. Almost 25% electricity supply from Ashuganj Power Station. In Ashuganj, more than 500 rice mills which means above 40% rice supply from Ashuganj. Zia Fertilizer is a biggest chemical fertilizer company. Ashuganj City is also known as river port. There is also a gas transmission company. The location of the project is shown in Figure 1.

Sample Type	Location
PM sampling	24° 1.661' N 90° 59.325' E

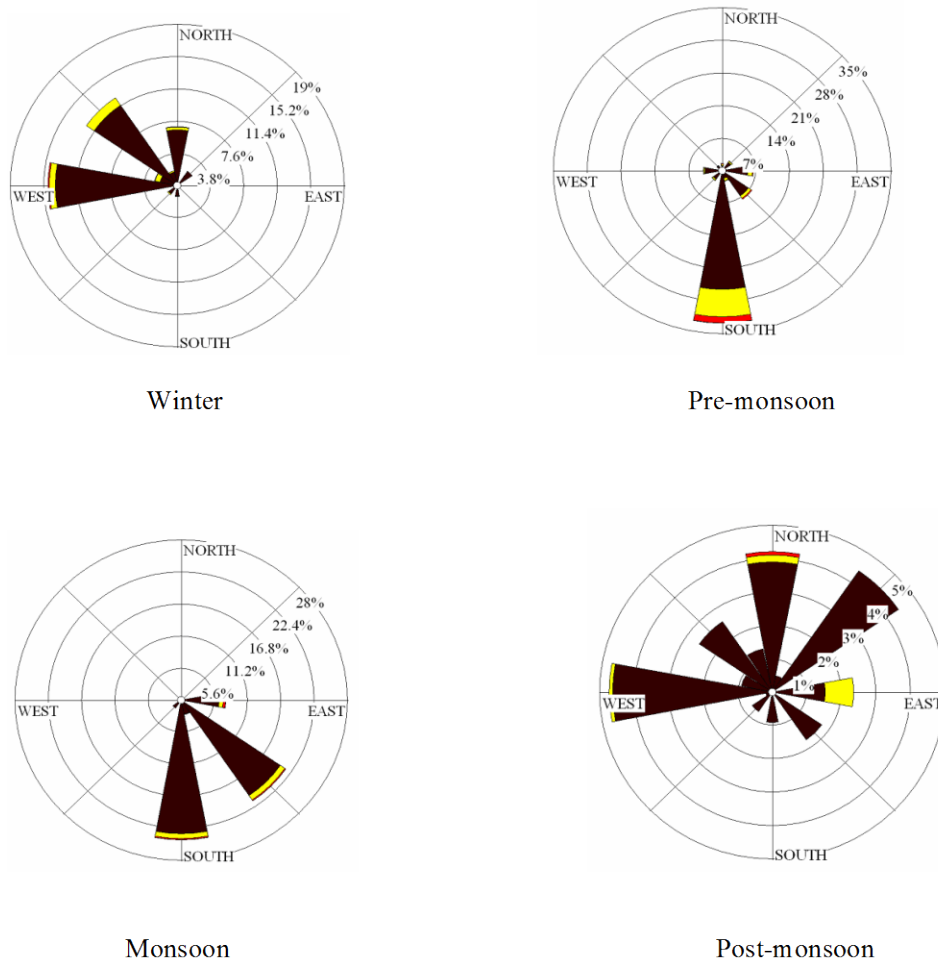


Figure 1: Midland Power Generation Ltd, Ashuganj



## 2. AIR SAMPLING TIME AND LOCATION OF SAMPLING

PM<sub>2.5</sub>, PM<sub>10</sub>, CO, and NO<sub>2</sub> at plant area were monitored from 21 January to 12 February 2015. PM<sub>2.5</sub> and PM<sub>10</sub> samples were collected every third day in a week. As there is an impact of meteorology during winter season and wind blows from north-west direction (Figure 2), therefore we have set up the two PM samplers (One for PM<sub>10</sub> and other for PM<sub>2.5</sub>) in the north-east side of the plant.



**Figure 2: Wind direction pattern**

### 2.1 PM SAMPLING

PM sampling was done using Air Matrics MiniVol sampler which was developed jointly by the U.S. Environmental Protection Agency (EPA) and the Lane Regional Air Pollution

Authority. Although not listed in the reference sampler (FRM) list, it is very close to reference sampler in performance. For sampling with MiniVol sampler (Figure 3), the flow rate was maintained 5 liter per minute (lpm) at ambient conditions for proper size fractionation. The samplers were set up in the conventional manner with filters. Two samplers were placed at co-located position in the north-east site of the plant for 24h. Both fractions of PM samples were collected on Teflon (2.0  $\mu\text{m}$  pore size) filters.



**Figure 3: AirMetric MiniVol sampler**

PM Masses were measured in the Chemistry Division of the Atomic energy Centre, Dhaka (AECD) laboratory. The aerosol samples having PM were determined by weighing the filters before and after exposure using a micro balance (METTLER Model MT5) maintaining room temperature approximately at 22°C and relative humidity at 50%. The air filters were equilibrated at constant humidity and temperature of the balance room before every weighing. A U-shaped electrode charge eliminator (STATICMASTER) was used to eliminate the static charge accumulated on the filters before each weighing. The result is given in Table 1.

The ambient NO<sub>2</sub> and CO were monitored sequentially at plant site using Gas Badge Pro monitor (Figure 4). Sampling campaigning was continued for 1 hour. 5 minutes average NO<sub>2</sub> and CO (mg/m<sup>3</sup>) were monitored every 15 minutes interval to obtain 1-hour average. The results are also presented in Table 1. It may be noted that the sampler used is a non-FRM electrochemical equipment. As the values are low, no further attempt was made for measurement with FRM samplers.



Figure 4: CO and NO<sub>2</sub> Pro GasBadge monitor

Table 1: Ambient PM<sub>10</sub>, PM<sub>2.5</sub>, NO<sub>2</sub> and CO concentration in sampling time

Sampling Date	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>2</sub>	CO
	µg/m <sup>3</sup> (24h average)		mg/m <sup>3</sup> (1h average)	
21/01/2015	127	103	<0.2	<0.13
22/01/2015	162	130	<0.2	<0.13
31/01/2015	215	159	<0.2	<0.13
04/02/2015	255	194	<0.2	<0.13
08/02/2015	224	175	<0.2	<0.13
12/02/2015	164	116	<0.2	<0.13

Sampling Date		PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>2</sub>	CO
		$\mu\text{g}/\text{m}^3$ (24h average)		$\text{mg}/\text{m}^3$ (1h average)	
BNAAQS	24h average ( $\mu\text{g}/\text{m}^3$ )	150	65	-	40
	Annual ( $\mu\text{g}/\text{m}^3$ )	50	15	100	-
WHO	24h average ( $\mu\text{g}/\text{m}^3$ )	50	25	-	10,000
	Annual ( $\mu\text{g}/\text{m}^3$ )	20	10	40	-

### 3. Analysis of Air Quality Data

It can be seen from Table-1 that the AQ primary standards (i.e., for the protection of public health) are specified both for yearly and shorter periods. The time available for measurements being short, direct determination of yearly average values are not feasible. So, these values have been determined using the assumption that the dispersion conditions for air pollutants are similar in Bangladesh except for the hilly areas. This is a reasonable assumption based on observation of weather parameters. Thus, the differences in AQ parameter values arise mainly due to local sources with dispersion conditions being the same. In order to derive the yearly values, the data from the Dhaka CAMS at Farmgate has been normalized to measured values for equivalent period to the measured values at the Midland Power Plant site. Using the same normalization, the values for other periods of the year have been found. The calculated yearly averages are  $54 \pm 32 \mu\text{g}/\text{m}^3$  and  $103 \pm 56 \mu\text{g}/\text{m}^3$  for PM<sub>2.5</sub> and PM<sub>10</sub> respectively which are higher than BNAAQS.

The results for this exercise for PM data are shown in Figure 5. It can be seen that the plant site belongs to a degraded airshed for PM as yearly NAAQ standards for both PM<sub>10</sub> and PM<sub>2.5</sub> are exceeded. The measured daily values are also non-complaint with the daily NAAQS for much of the year. However, during wet season (May-September), the daily AAQ are within standards. Although, the area is non-compliant for PM, the contribution of the plant itself is estimated to be rather low compared to cumulative emissions of the other polluting industries in the area. Being mostly an industrial area, small populations who are involved in the industries are impacted.

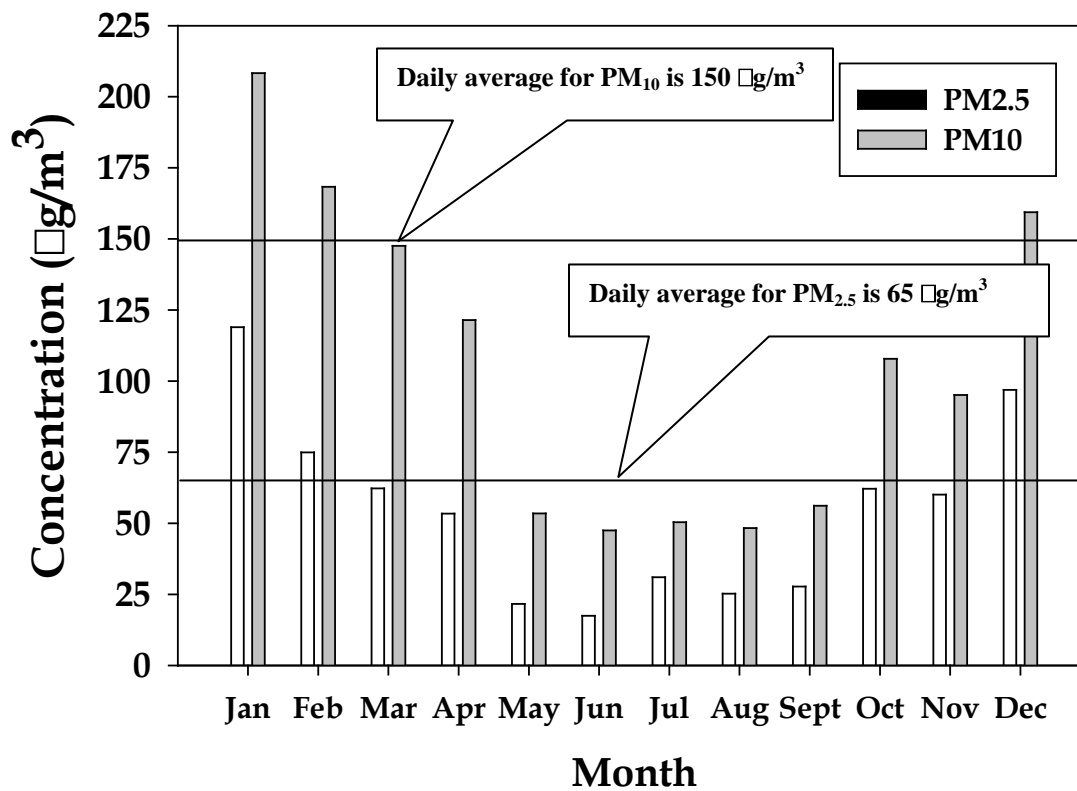


Figure 5: The yearly plot for ambient PM<sub>10</sub>, PM<sub>2.5</sub> concentrations at the plant site using normalization procure.

Table 2: Ambient PM<sub>10</sub>, PM<sub>2.5</sub>, NO<sub>2</sub> and CO concentrations using extrapolation

Pollutant	Averaging Time	Who Guidelines	Proposed Bangladesh Standards	Measured Concentration
CO	1 hour	30 mg/m <sup>3</sup>	40 mg/m <sup>3</sup> (35 ppm)	<0.130 mg/m <sup>3</sup>
	8 hour	10 mg/m <sup>3</sup>	10 mg/m <sup>3</sup> (9 ppm)	
SO <sub>2</sub> *	24 hour	125 $\mu\text{g}/\text{m}^3$	365 $\mu\text{g}/\text{m}^3$ (140 ppb)	----
	Annual	50 $\mu\text{g}/\text{m}^3$	80 $\mu\text{g}/\text{m}^3$ (30 ppb)	-----
NO <sub>2</sub>	1 hour	---	---	<0.200 mg/m <sup>3</sup>
	Annual	40 $\mu\text{g}/\text{m}^3$	100 $\mu\text{g}/\text{m}^3$ (53 ppb)	-
Ozone	1 hour	---	235 $\mu\text{g}/\text{m}^3$ (120 ppb)	
	8 hour	120 $\mu\text{g}/\text{m}^3$	157 $\mu\text{g}/\text{m}^3$ (80 ppb)	----
PM <sub>10</sub>	24 hour	---	150 $\mu\text{g}/\text{m}^3$	191 $\pm$ 48 $\mu\text{g}/\text{m}^3$
	Annual	---	50 $\mu\text{g}/\text{m}^3$	105 $\pm$ 56 $\mu\text{g}/\text{m}^3$
PM <sub>2.5</sub>	24 hour	---	65 $\mu\text{g}/\text{m}^3$	146 $\pm$ 36 $\mu\text{g}/\text{m}^3$
	Annual	---	15 $\mu\text{g}/\text{m}^3$	54 $\pm$ 32 $\mu\text{g}/\text{m}^3$

\*Source: Not measured as there is no Sulfur in NG fuel used in the plant.

Table 2 represents the ambient PM<sub>10</sub>, PM<sub>2.5</sub>, NO<sub>2</sub> and CO concentrations as per NAAQS as determined using extrapolation procedure. For NO<sub>2</sub> and CO very low values have been found in common with the observations at all the 11 CAMS in the country. Although the emission specification of the engines for NO<sub>x</sub> at 250 mg/Nm<sup>3</sup> is higher the WB guidelines value of 200 mg/Nm<sup>3</sup>, the emission level can be tolerated as the ambient level are low compared to NAAQS. The values for SO<sub>2</sub> have not been measured as Bangladesh NG used in the plant is Sulfur free. The O<sub>3</sub> values have not also been measured as precursor (i.e., NO<sub>2</sub>) values are low.

### 3. OBSERVATION

- ✓ The PM<sub>10</sub> and PM<sub>2.5</sub> concentrations are higher than the yearly average Bangladesh National Ambient Air Quality Standards and also for 24 hour standards except for the wet season.
- ✓ The observed level of NO<sub>2</sub> and CO level is compliant with BNAAQS. The equipment used in these measurements are non-FRM but as the levels are very low this does not constitute much risk.
- ✓ The contribution of the plant to the cumulative level of air pollutants in the airshed is presumed to be low based on the size and number of other plants in the area.

ANNEX-XX

NORMALIZATION OF NOISE LEVEL DATA



## A. NL2 Noise Level Monitoring Location:

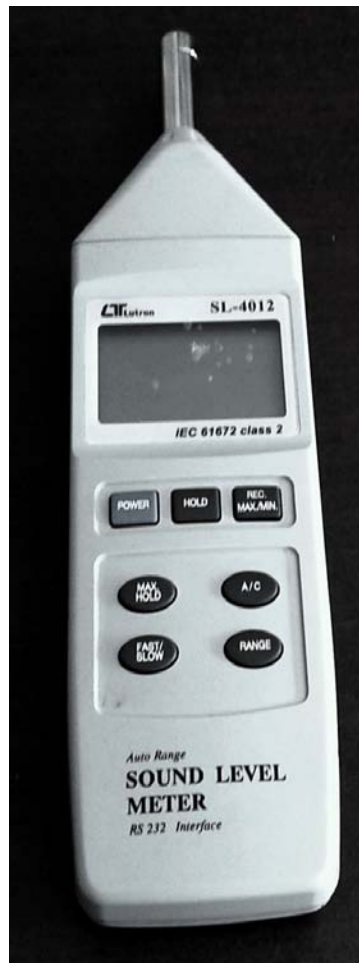
- 
- |   |     |  |                                |            |
|---|-----|--|--------------------------------|------------|
| • | NL2 | North-west corner of the<br>plant boundary | 24° 1'42.26"N<br>90°59'17.22"E | Industrial |
|---|-----|--|--------------------------------|------------|
- 



## B. Standard Operating Procedure for the Sound Level Meter (SLM)

1. Batteries must be checked before use and during long measuring sessions.
2. A windshield must be used if the air velocity is noticeable. It should anyway be used all the time as a dust shield.
3. All intruding objects such as the body of the sound level meter (SLM) or the operator itself will degrade the frequency response of the microphone at high frequencies and directivity effects will appear at much smaller frequencies. Therefore, the SLM should be, whenever possible, installed on a stable and sturdy tripod equipped with resilient blocks to isolate the sound level meter from vibration and consequent spurious readings. The operator should be at a reasonable distance (2-3 m) behind the sound level meter. For walk-through surveys, the SLM should be held well away from the body.
4. The SLM (Figure 1) must be calibrated before any measuring session using a calibrator. If the temperature of the instrument is significantly different from the ambient temperature where it will be used, it should be first warmed up before calibration and use. The calibration must be checked at the end of the session.

5. Press the "ON" button. Wait for the display to read in dBa. Then record at least 10-noise value in every 30-second interval from each corner of the plant area. Enter the necessary data into the log sheet.



**Figure-1: Portable Sound Level Meter**

### **C. Portable Sound Level Meter Specification**

#### **Features**

- Max/Min Function
- Low battery indication
- External battery access door for easy battery changing
- AC / DC signal output
- IEC 651 Type II

#### **SPECIFICATIONS**

Microphone: Electric condenser microphone

Accuracy:  $\pm 1.5$  dB (ref 94dB @ 1KHz)

Level Range: Lo = 35 ~ 80 dB Med = 50 ~ 100 dB

Hi = 80 ~ 130 dB  
 Frequency Weighting: A, C  
 Time Weighting: Fast, Slow  
 Auxiliary Outputs: AC output  
 Output voltage 1 Vrms (at full scale)  
 Output impedance : Approx. 600 ohms  
 DC output  
 Output voltage : 10mV / dB  
 Output impedance : Approx. 50 ohms  
 Dynamic Range: 50 dB  
 Frequency Range: 31.5Hz to 8KHz  
 Operation Condition: 0°C ~ 40°C (<80% R.H.)  
 Storage Temperature: 10°C ~ 60°C (<70% R.H.)  
 Battery Life: 50 hours (with alkaline battery)  
 Power Supply: 9V battery NEDA 1604, IEC 6F22,  
 JIS 006P

### **Model Description**

AI320 Portable Sound Level Meter

### **D. Procedure/Steps followed in Noise Level Data Collection:**

- Step-1: The Noise meter was placed at neck Height i.e. 5ft from the ground level on a stand.
- Step-2: Approximately Ten seconds counting i.e. slowly counting 1to10 in silent mood and then note the reading of the noise meter
- Step-3: Note 10 nos. of noise level reading by repeating Step-2

### **E. Noise Level Data:**

There were 320 nos. noise level reading noted down during the noise level measurement at NL-2 location and listed in excel sheet with max, min, average and standard deviation. Only the average values from first 10 data points were taken into calculation. So 32 data point for one site were noted. Then averages of all points for NL-2 site are calculated and with the noted ratio comparing with the previous data are defined then.

### **F. Location of Noise Monitoring:**

Sl.	Code	Location	Geographic Location	Location Setting
•	NL1	South-west corner of the plant boundary	24° 1'37.79"N 90°59'13.38"E	Industrial
•	NL2	North-west corner of the plant boundary	24° 1'42.68"N	Industrial

Sl.	Code	Location	Geographic Location	Location Setting
			90°59'17.54"E	
•	NL3	North-east corner of the plant boundary	24° 1'40.34"N 90°59'20.57"E	Industrial
•	NL4	South-east corner of the plant boundary	24° 1'36.35"N 90°59'15.92"E	Industrial
•	NL5	North side of the plant boundary	24° 1'41.91"N 90°59'18.49"E	Industrial
•	NL6	North side of the plant boundary	24° 1'41.46"N 90°59'19.09"E	Industrial
•	NL7	North side of the plant boundary	24° 1'41.00"N 90°59'19.67"E	Industrial
•	NL8	East side of the plant boundary	24° 1'39.43"N 90°59'19.82"E	Industrial
•	NL9	East side of the plant boundary	24° 1'38.94"N 90°59'18.86"E	Industrial
•	NL10	East side of the plant boundary	24° 1'37.37"N 90°59'17.07"E	Industrial
•	NL11	South side of the plant boundary	24° 1'36.73"N 90°59'15.15"E	Industrial
•	NL12	South side of the plant boundary	24° 1'37.14"N 90°59'14.25"E	Industrial
•	NL13	Adjacent to the engine room (Western side)	24° 1'39.96"N 90°59'15.79"E	Industrial
•	NL14	In front of the engine room (east side)	24° 1'39.62"N 90°59'17.16"E	Industrial
•	NL15	Infront of the engine room (east side)	24° 1'40.47"N 90°59'17.67"E	Industrial
•	NL16	Halima Begum's House, Char Chartala	24° 1'35.05"N 90°59'27.42"E	Industrial

Sl.	Code	Location	Geographic Location	Location Setting
•	NL17	Habibur Rahman House, Char Chartala	24° 1'39.42"N 90°59'21.69"E	Industrial
•	NL18	Akter Mia's House, Char Chartala	24° 1'37.66"N 90°59'21.03"E	Industrial
•	NL19	Khorshed Mia's House, Char Chartala	24° 1'36.70"N 90°59'16.84"E	Industrial

### G. Normalized Noise Data

Location	Daytime	Nighttime
	dB	dB
NL1	63.0±3.0	60.0±2.82
NL2	69.0±3.2	65.8±3.09
NL3	51.2±2.4	50.3±2.37
NL4	61.3±2.9	58.0±2.73
NL5	63.6±3.0	62.0±2.91
NL6	61.8±2.9	59.0±2.77
NL7	53.2±2.5	52.6±2.47
NL8	55.6±2.6	53.3±2.50
NL9	64.9±3.1	63.7±2.99
NL10	59.0±2.8	58.6±2.75
NL11	60.5±2.8	60.1±2.82
NL12	60.9±2.9	60.4±2.84
NL13	66.3±3.1	64.9±3.05
NL14	67.0±3.1	66.3±3.12
NL15	65.2±3.1	62.7±2.95
NL16	56.3±2.6	53.4±2.51
NL17	59.6±2.8	58.6±2.75
NL18	57.9±2.7	56.9±2.68
NL19	62.5±2.9	61.9±2.91