Environmental Monitoring Report

Project No. 37113-013
Semi-annual Report
January-June 2016

2769-BAN: Power System Efficiency Improvement Project

Part A: Ashuganj 450 MW (North) Combined Cycle Power Plant Project (CCPP)

Prepared by Ashuganj Power Station Company Limited for People's Republic of Bangladesh

Environmental Safeguard Monitoring Report

4th Semi Annual (January – June, 2016) Report

ASHUGANJ 450 MW (NORTH) COMBINED CYCLE POWER PLANT PROJECT (CCPP)

At Ashuganj, Brahmanbaria

Ashuganj Power Station Company Limited (APSCL)

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Semi Annual Monitoring Report

For ASHUGANJ 450 MW (NORTH) COMBINED CYCLE POWER PLANT PROJECT (CCPP)

(Ashuganj, Brahmanbaria)

Period : 4th Semi Annual (January – June, 2016)
Monitoring : Ambient Air, Water & Noise Quality

EXECUTIVE SUMMARY

During the period from January to June 2016, the EPC Contractor has carried out mainly the erection of HRSG (Boiler), Gas Turbine, Generator, Lube Oil, Steam Turbine, Condenser, Steel Structure, and GIS HVAC, foundation of Water outfall area, Admin Building and construction civil works. In order to construction works they mobilize the equipments, workers and materials. In this period there is no discharge and for this there is no impact on the living things in water body. Air Pollution caused by dust emission during construction traffic activities is controlled by good management practices like continuous water spray over the unpaved or bare surfaces, covering soil materials pile. Soil and water pollutions are also prevented by proper managements like spill prevention and well drainage system. Solid waste is managed by waste management plan. Noise pollution is also a regarding issue during Steel Structure Erection activities for using of construction equipments and also for traffic and transport. Noise level is reduced by using of fine-tuned low noise level construction equipments and by proper traffic management system. Every personnel uses personal protective equipment to ensure own safety. The remarkable achievement in this period is that till now there is no record of accident or injury. APSCL is committed to keep the accident level in Zero by implementing its proper occupational health and safety management system. This project also has a positive effect on the socio-economic condition. Local skilled and semi-skilled peoples are engaged in different levels of construction activities and they are very happy for getting employment opportunities.

1.0 INTRODUCTION

The objective of the environmental safeguard 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 EMP 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 under construction power plant project could be divided into management and monitoring: (a) during construction phase, and (b) during operation phase.

The application of this plan involved an environmental control and monitoring of the work by a technical team to verify compliance with all the indications, limitations or environmental restrictions set forth in the Environmental Management Plan (EMP), EIA and the Project, with the minimize damage caused by work on the environment.

The information obtained by the implementation of the Environmental Action Plan is required to define preventive measures or define corrective actions.
The information generated as a result of implementing the Environmental Action Plan must be duly forwarded to the Department of Environment (DoE).

1.1 Brief Project Description

A Combined Cycle Power Plant of Total net 450±20% MW capacity at site condition (39 ºC, 1.020 mbar, 87% R.H.) is intended to be set by Ashuganj Power Station Company Limited inside the existing premises. The Power Station will be connected with the Ashuganj 400 KV Gas Insulated Switchgear (GIS) Grid Sub-Station with necessary electrical equipment's. The basic concept for the Ashuganj North project shall be a CCGT Plant based on one Gas Turbine Generator unit (GTG), one Unfired Heat Recovery Steam Generator and one Steam Turbine Generator unit (STG). Water-steam cycle will be a three pressure levels (HP, IP and LP) with reheat. The

Ashuganj 450 Mw (North) Combined Cycle Power Plant Project complex is located on the Southern bank of Meghna river, just outside and to the East of Bhairab Bridge. The power plant is located in Ashuganj under Bhairab *Upazila.* The entire power plant is completely enclosed, covers an area of about 10.17 acres and is owned by the Ashuganj Power Station Company Limited (APSCL).

1.2 Project Progress Status and Implementation Schedule

The basic concept for the Ashuganj north project shall be a CCGT Plant based on one Gas Turbine Generator unit (GTG), one Unfired Heat Recovery Steam Generator and one Steam Turbine Generator unit (STG).Water-steam cycle will be a three pressure levels (HP, IP and LP) with reheat.

General components of the proposed CCGT project include the following: (i) 450MW CCGT unit complete with necessary auxiliaries including air intake filtration facilities, inlet and exhaust silencers, control systems, bypass stack with delivery damper, gas fuel treatment system, (ii) Power generator for the gas turbine unit with all auxiliaries including cooling system, control system, excitation system; (iii) one Steam turbine unit complete with necessary auxiliaries including heater, pumps, steam turbine bypass, control systems; (iv) Power generator for the steam turbine unit with all auxiliaries including cooling system, control system; (v) Heat Recovery Steam Generating system with auxiliaries including deaerators, pumps, exhaust stack, control system; (vi) Gas booster compressor system with all auxiliaries and control system; (vii) Cooling towers including motors, wet pond, fans; (viii) Di-mineralized water system complete with pumps, tanks, control system (ix) Water treatment system with all auxiliaries including storage tanks, settling basins, pumps, chemical dosing system, control system; (x) Effluent treatment system with all auxiliaries including, chemical dosing systems, settling units, control system, pumps; (xi) Other essential plant equipment including air compressor, natural gas supply system with 600 m gas pipeline, circulating water system, cooling water pond, raw water intake structure, condensate system; (xii) Construction of internal roads. (xiii) Switch room (xiv) Emergency generator and transformer.

A synopsis of work undertaken during the period

According to environmental monitoring, during the assignment the main work was to collect the ambient air samples to measure air pollutants and noise level data from the project area. For river water analysis the water sample was collected from the nearby Meghna River.

Description of Work	4th Semiannually (January – June, 2016)	Frequency
Ambient Air Quality	Done with measurement	Monthly
Noise Level	Done with measurement	Monthly
Drinking water Level	Done with measurement	Monthly
River water	Done with measurement	Monthly
Ground water Level	Done with measurement	Monthly
Soil quality	Done with measurement	Monthly
Process waste	Done	Quarterly
Health checkup	Done	Daily

Project Environmental key personnel, contact names and telephone numbers

Sl. No.	Project Key personnel	Name of Key personnel	Telephone No.
01	Manager (HSE), 450 MW North CCPP, APSCL	Md. Atiqur Rahman	01717462670
02	Executive Engineer (Mech.), Coordinator	Md. Golam Moula	01748468273
03	Manager(Chemical)	Md. Ashraful Islam	01717650871
04	Assistant Manager(Chemical)	Md. Yasin Molla	01923606305
05	Operator (3 Nos.)	1. Milon Kanti Das 2. Md. Wasi Uddin 3. Ashiq Hasan	
06	Environmental Specialist (Fichtner)	Dr. Jagadish Chandra Saha	01713117822

2.0 COMPLIANCE OF NATIONAL REGULATIONS

2.1 Environmental Conservation Rules 1997

2.1.1 Regulatory Compliance progress: Government of Bangladesh **(**GoB) Guidelines for Air and Noise Quality.

For carrying out the production, the standard for air and noise quality of the environment shall be determined in accordance with the standard specified in Schedule 2 and Schedule 4 in the Environment Conservation Rules 1997, compiled by DoE, Ministry of Environment and Forest, GoB. Schedule 2 and 4 are presented in the Table 5.1 and Table 5.2 respectively. The revised National Ambient Air Quality Standards Published in the Bangladesh Gazette (19 July 2005) and Noise Level Standard Published in the Bangladesh Gazette (7 September 2006) is shown in Table 2.1 and Table 2.2 respectively.
The guidelines for acceptable noise level, especially outside plant boundary have been considered as levels recommended by internationally acclaimed standards. Bangladesh has categorized the noise by the following levels.

Table 2.1: Bangladesh Standards for Ambient Air

Location	Unit	SPM (Suspended particulate matters)	SO_2 (Sulphur di-oxide)	NO_X (Oxide of Nitrogen)
Industrial and mixed area	mg/m^3	500	120	100
Commercial and mixed area	mg/m^3	400	100	100
Residential and Rural area	mg/m^3	200	80	80
Sensitive area	mg/m^3	100	30	30

*Source: ***(Schedule-2, Rule 12, Environment Conservation Rules 1997)***

Notes:

- Sensitive area includes national monuments, health resorts, hospital, archaeological sites, educational institutions and other government designated area (If any).
- Any industrial unit located not in a designated industrial area will not discharge such pollutants, which may contribute exceed the ambient air quality above in the surrounding areas of residential and sensitive areas.

- Suspended particulate matters mean airborne particles of diameters of 10 micron or less.

Table 2.2: Bangladesh Standards for Noise

Location Category	Standards determined at dBa unit	
	Day	Night
Silent Zone	45	35
Residential Area	50	40
Mixed Area (basically residential and together used for commercial and Industrial purposes)	60	50
Commercial area	70	60
Industrial area	75	70

Source: ECR *Schedule 4, A Compilation of Environmental Laws, DoE

Notes:

- Limits presented are one-hour energy equivalent sound exposure limits;
- 'Daytime' is 06.00 to 21.00 hours, 'nighttime' is 21.00 to 06.00 hour; and
- Sound exposure at a receptor resulting solely from the facility, irrespective of ambient sound levels, should not exceed the presented limits.

Table 2.3: Bangladesh Standards for Ambient Air (Revised 19th July in 2005)

Pollutant	Objective	Averaging Time
$PM_{2.5}$	15 µg /m^3	Annual (f)
	65 µg /m^3	24-hour (h)
PM_{10}	50 µg /m^3	Annual (b)
	150 µg /m^3	24-hours(g)
SPM	200 µg /m^3	8-hours
SO_2	80 µg / m^3; (0.03 ppm)	Annual
	365 µg / m^3; (0.14 ppm)	24-hour (a)
NO_x	100 µg /m^3; (0.053 ppm)	Annual
CO	10mg/m^3; (9 ppm) (a)	8-hours (a)
	40mg/m^3; (35 ppm) (a)	1-hour (a)
Lead	0.5 µg/m^3	Annual (i)
Ozone	157 µg /m^3; (0.08 ppm)	8-hour (e)
	235 µg /m^3; (0.12 ppm)	1-hour(d)

Notes:

a) Not to be exceeded more than once per year
b) The objective is attained when the annul arithmetic mean is less than or equal to 50µg/m^3.
c) The objective is attained when the expected number of days per calendar year with a 24-hour average of 150µg/m^3 is equal to or than 1.
d) The objective is attained when the expected number of days per calendar year with the maximum hourly average of 0.12 ppm is equal to or less than 1.
e) 3-year average of annual 4th highest concentration
f) Spatially averaged over designated monitors
g) The from the 99th percentile.
h) The from is the 98th percentile

i) Annual arithmetic average based on lead analysis of TSP samples operated on an every 6th day schedule.

Table 2.4: Bangladesh Standards for Noise (Revised 7th September in 2006)

Schedule -1

Rules 5(2) (Area Based Noise level value)

Location Category	Standards determined at dB(A) Leq	
	Day	Night
Silent Zone	50	40
Residential Area	55	45
Mixed Area (basically residential and together used for commercial and Industrial	60	50
Commercial area	70	60
Industrial area	75	70

*Source: ECR Schedule 1 (Revised 7th September 2006), A Compilation of Environmental Laws, DoE

3.0 COMPLIANCE OF ENVIRONMENTAL COVENANTS FROM THE ADB LOAN AGREEMENT

3.1 Summary of Environmental Measures

All development projects must co-exist satisfactorily with its surrounding environment so as to reduce the environmental impact caused due to this activity. To control the adverse impacts on ambient air, water, noise and safe environmental management plan has to be implemented by the proponents.

So to see the adverse impacts of the developing projects or the activities the following parameters were measured:

(a) Ambient Air : SPM, PM_{10}, $PM_{2.5}$, NOx, SO_2, CO
(b) Ambient Noise Level
(c) Drinking water : pH, Ammonia, Nitrate, Phosphate, As Fe, Mn, Total Coliform & Fecal coliforms
(d) River water: Temperature, DO, BOD_5, COD, Oil and Grease, Chromium (Cr), Lead (Pb) & Cadmium (Cd).
(e) Ground water: pH, Ammonia, Nitrate, Phosphate, As Fe, Mn, Total Coliform & Faecal Coliforms.

3.2 Enhancement Measurement

- Construction of sanitary latrine and septic tank system (one latrine for 20 persons)
- Erecting “no litter” sign, provision of waste bins/cans, where appropriate
- Waste minimization, recycle and reuse
- Proper disposal of solid waste (in designated waste bins)
- Clean bill of health a condition for employment
- Regular medical monitoring of workers

- Scheduling of deliveries during non-school hours and after regular working hours
- Protecting school going children from traffic hazard during construction phase, with installation of proper traffic sign and warnings
- Speed reduction to 10 km per hour within the Ashuganj complex
- Keeping vehicles under good condition, with regular checking of vehicle condition to ensure compliance with national standards
- Watering unpaved/dusty roads (at least twice a day; cost estimate provided)
- Sprinkling and covering stockpiles
- Covering top of trucks carrying materials to the site and carrying construction debris away from the site.
- Changing project layout by shifting the locations of WTP and ETP (as suggested in EIA)
- Use of noise suppressors and mufflers in heavy equipment
- Avoiding, as much as possible, construction equipment producing excessive noise during school hours and also at night.
- Avoiding prolonged exposure to noise (produced by equipment) by workers.
- Creating a buffer zone between the school and construction site to reduce disturbance to normal schooling and to protect school children from health hazard.
- Not using equipment such as stone crushers at site, which produce significant amount of particulate matter.
- Keeping construction equipment and generators in good operating condition
- Using equipment, especially generators with high levels of emission control (e.g., TIER-4).
- Immediate use of construction spoils as filling materials.
- Immediate disposal/sale of excavated materials.
- Continuous watering of bare areas.
- Hauling of construction debris away from the site and their appropriate disposal in a sanitary landfill.
- Good house keeping
- Proper handling of lubricating oil and fuel
- Collection, proper treatment, and disposal of spills
- Local people employed in the project activities
- Using stack as specified in the bid document.
- Using low nitrogen oxide burners, as specified in the bid document.
- Installation of stack emission monitoring equipment for major pollutants (monitoring requiring and cost estimate provided)
- Planting of trees around the project site, especially along the northern boundary of the school and residential areas located close to the project site (number and cost estimate provided)
- Restrictions may also be imposed on installation of industries in the area that emit significant amount of particulate matter.
- Provision of silencers for generators and turbines
- Planting of trees around the project site (number and cost estimate provided)
- Boarding on the school boundary walls
- Regular plant maintenance

- Regular noise monitoring, especially at the school and residential quarters located close by (monitoring requirement and cost estimate provided)
- Use of ear-muffs and ear-plugs by plant personnel working in the generator and turbine facilities of the plant.

4.0 COMPLIANCE TO ENVIRONMENTAL MANAGEMENT PLAN

4.1 Major Environmental activities of the project

Major Environmental Activities of the project during construction period are given below:

- Influx of workers
- Transportation of equipment, materials and personnel; storage of materials
- Construction activities, including operation of construction equipment

4.2 Semiannually assessment of construction impact on air, water, noise, construction waste and labor camp management

4.2.1 Impact on Air Quality

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) crusher is used at the site, this may result in significant emission of particulate matter during its operation. But to control it, batching plant is situated in an isolated place outside of project area which has no impacts on the project and also its adjacent places.

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. Ambient Air Quality was monitoring from four different places at Ashuganj 450 MW North Combined Cycle power plant project such as North side and south side of the plant. Test Results of Ambient Air Quality from these different places are presented in Table 4.1.

The result for ambient air quality monitoring shows the SPM, PM_{10}, $PM_{2.5}$, concentrations of the ambient air. From the analysis it is observed that the concentration of SPM, PM_{10}, and $PM_{2.5}$ is within the allowable limit, as in the proposed project area the different constructions activities, highway traffic movements were being done. So, the SPM and PM_{10} are found higher level during movement of vehicle but after spraying of water the dust level is reduced remarkably low. Having construction activities many diesel vehicles were moving around and three to four cranes were also under operation, so it can be though that the NOx level would be higher level. $PM_{2.5}$ is composed of a mixture of primary and secondary particles, Primary particles are emitted directly into the atmosphere and include soil-related particles and carbon particles from fossil fuel combustion, and secondary particles are sulphate, nitrate, organic and elemental carbon, trace elements and ammonium. The under constructed

project is at Ashuganj in Brahmanbaria district which is unplanned urban and planned industrial area, so the cumulative air pollution is high in this area during the construction period.

Mitigation measures as outlined in **Section 4.3** adopted to minimize the possible adverse impacts of project activities on air quality.

4.2.2 Impact on Noise

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:

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

SN	Location	GPS Locations
01	L1	N 24^{O} 02 ’13.7 “ E 91^{O}00’30.7”
02	L2	N 24^{O} 02 ’17.1 “ E 91^{O}00’28.1”
03	L3	N 24^{O} 02 ’15.2 “ E 91^{O}00’32.7”
04	L4	N 24^{O} 02 ’17.9 “ E 91^{O}00’29.5”

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. Measured noise level in the construction site are summarized in table 4.1.

4.2.3 Impact on Water Quality

The drinking, surface and ground water sample were collected from the supplied water, Meghna River and ground water. The tested results are presented in Table 4.2, 4.3 and 4.4 respectively.

The Meghna River passes through from East to West direction near the project area and there are few industries at the right bank of this river. So the water of this river is less polluted that was also found from environmental monitoring. The DO level of this water is more than 6.5 mg/L which is within DoE standard level. The BOD_5 is also in lower level than DoE standards.

Table: 4.1 Ambient Air and Noise Quality

PARTICULATE MATERIAL	LIMITS		JANUARY 2016				
PARAMETER	DoE (Bangladesh) Standard *	IFC/World Bank Standard	L1	L2	L3	L4	AVERAGE JANUARY
PM 2.5	65 µg/m^3	75 µg/m3	34	33	38	41	36.50
PM 10	150 µg/m^3	150 µg/m3	33	44	42	41	40.00
SPM	200 µg/m^3	NF	51	50	56	54	52.75
PARTICULATE MATERIAL	**LIMITS**		**FEBRUARY 2016**				
PARAMETER	DoE (Bangladesh) Standard *	IFC/World Bank Standard	L1	L2	L3	L4	AVERAGE FEBRUARY
PM 2.5	65 µg/m^3	75 µg/m3	31	32	34	32	32.25
PM 10	150 µg/m^3	150 µg/m3	29	30	32	30	30.25
SPM	200 µg/m^3	NF	48	47	49	46	47.50
PARTICULATE MATERIAL	**LIMITS**		**MARCH 2016**				
PARAMETER	DoE (Bangladesh) Standard *	IFC/World Bank Standard	L1	L2	L3	L4	AVERAGE MARCH
PM 2.5	65 µg/m^3	75 µg/m3	32	33	34	32	32.75
PM 10	150 µg/m^3	150 µg/m3	31	30	31	30	30.50
SPM	200 µg/m^3	NF	48	47	49	47	47.75
PARTICULATE MATERIAL	**LIMITS**		**APRIL 2016**				
PARAMETER	DoE (Bangladesh) Standard *	IFC/World Bank Standard	L1	L2	L3	L4	AVERAGE APRIL
PM 2.5	65 µg/m^3	75 µg/m3	35	34	36	33	34.50
PM 10	150 µg/m^3	150 µg/m3	32	31	31	31	31.25
SPM	200 µg/m^3	NF	49	49	50	48	49.00
PARTICULATE MATERIAL	**LIMITS**		**MAY 2016**				
PARAMETER	DoE (Bangladesh) Standard *	IFC/World Bank Standard	L1	L2	L3	L4	AVERAGE MAY
PM 2.5	65 µg/m^3	75 µg/m3	33	34	32	32	32.75
PM 10	150 µg/m^3	150 µg/m3	31	30	30	31	30.50
SPM	200 µg/m^3	NF	43	44	44	42	43.25
PARTICULATE MATERIAL	**LIMITS**		**JUNE 2016**				
PARAMETER	DoE (Bangladesh) Standard *	IFC/World Bank Standard	L1	L2	L3	L4	AVERAGE JUNE
PM 2.5	65 µg/m^3	75 µg/m3	31	33	30	32	31.50
PM 10	150 µg/m^3	150 µg/m3	30	29	30	30	29.75
SPM	200 µg/m^3	NF	42	43	41	40	41.50

Table: 4.1 Ambient Air and Noise Quality

NOISE	LIMITS		JANUARY 2016				
(LAeq) dBA	DoE (Bangladesh) Standard *	IFC/World Bank Standard	L1	L2	L3	L4	AVERAGE JANUARY
DAY	75	70	50.5	50.0	49.0	51.0	50.12
NIGHT	70	70	43.0	45.0	42.0	44.0	43.50
NOISE	**LIMITS**		**FEBRUARY 2016**				
(LAeq) dBA	DoE (Bangladesh) Standard *	IFC/World Bank Standard	L1	L2	L3	L4	AVERAGE FEBRUARY
DAY	75	70	46.0	44.00	42.00	43.00	43.75
NIGHT	70	70	42.0	41.00	40.00	40.00	40.75
NOISE	**LIMITS**		**MARCH 2016**				
(LAeq) dBA	DoE (Bangladesh) Standard *	IFC/World Bank Standard	L1	L2	L3	L4	AVERAGE MARCH
DAY	75	70	45.00	44.00	42.00	43.00	43.50
NIGHT	70	70	42.00	41.00	41.00	40.00	41.00
NOISE	**LIMITS**		**APRIL 2016**				
(LAeq) dBA	DoE (Bangladesh) Standard *	IFC/World Bank Standard	L1	L2	L3	L4	AVERAGE APRIL
DAY	75	70	48.00	46.00	49.00	45.00	47.00
NIGHT	70	70	46.00	42.00	42.00	41.00	42.75
NOISE	**LIMITS**		**MAY 2016**				
(LAeq) dBA	DoE (Bangladesh) Standard *	IFC/World Bank Standard	L1	L2	L3	L4	AVERAGE MAY
DAY	75	70	47.00	46.00	48.00	46.00	46.75
NIGHT	70	70	43.00	41.00	42.00	41.00	41.75
NOISE	**LIMITS**		**JUNE 2016**				
(LAeq) dBA	DoE (Bangladesh) Standard *	IFC/World Bank Standard	L1	L2	L3	L4	AVERAGE JUNE
DAY	75	70	45.00	44.00	46.00	44.00	44.75
NIGHT	70	70	42.00	40.00	40.00	41.00	40.75

Table: 4.2 Drinking Water Quality

DRINKING WATER	LIMIT		JANUARY 2016				
PARAMETER	DoE (Bangladesh) Standard	IFC/World Bank Standard	D1	D2	D3	D4	AVERAGE JANUARY
pH	6.5 -8.5	6.5 -8.5	7.02	7.02	7.03	7.02	7.02
Ammonia	0.5 mg/l	---	0.01	0.01	0.01	0.01	0.01
Nitrate	10 mg/l	50 mg/l	<0.10	<0.10	<0.10	<0.10	<0.10
Phosphate	6 mg/l	---	<0.12	<0.12	<0.16	<0.10	<0.12
As	0.05 mg/l	0.01 mg/l	0.001	0.001	0.001	0.001	0.001
Fe	0.3 -1 mg/l	0.3 mg/l	0.08	0.08	0.10	0.02	0.07
Mn	0.1 mg/l	0.5 mg/l	0.2	0.07	0.01	0.01	0.05
Total Coliform	0/100 ml	0/100 ml	0	0	0	0	0.00
Faecal Coliform	0/100 ml	0/100 ml	0	0	0	0	0.00
DRINKING WATER	**LIMIT**		**FEBRUARY 2016**				
PARAMETER	DoE (Bangladesh) Standard	IFC/World Bank Standard	D1	D2	D3	D4	AVERAGE FEBRUARY
pH	6.5 -8.5	6.5 -8.5	7.03	7.02	7.03	7.03	7.02
Ammonia	0.5 mg/l	---	0.01	0.01	0.01	0.01	0.01
Nitrate	10 mg/l	50 mg/l	<0.10	<0.10	<0.10	<0.10	<0.10
Phosphate	6 mg/l	---	<0.12	<0.12	<0.14	<0.10	<0.11
As	0.05 mg/l	0.01 mg/l	0.001	0.001	0.001	0.001	0.001
Fe	0.3 -1 mg/l	0.3 mg/l	0.07	0.08	0.09	0.03	0.06
Mn	0.1 mg/l	0.5 mg/l	0.05	0.06	0.02	0.01	0.03
Total Coliform	0/100 ml	0/100 ml	0	0	0	0	0.00
Faecal Coliform	0/100 ml	0/100 ml	0	0	0	0	0.00
DRINKING WATER	**LIMIT**		**MARCH 2016**				
PARAMETER	DoE (Bangladesh) Standard	IFC/World Bank Standard	D1	D2	D3	D4	AVERAGE MARCH
pH	6.5 -8.5	6.5 -8.5	7.02	7.02	7.03	7.03	7.02
Ammonia	0.5 mg/l	---	0.01	0.01	0.01	0.01	0.01
Nitrate	10 mg/l	50 mg/l	<0.10	<0.10	<0.10	<0.10	<0.10
Phosphate	6 mg/l	---	<0.12	<0.12	<0.14	<0.10	<0.11
As	0.05 mg/l	0.01 mg/l	0.001	0.001	0.001	0.001	0.001
Fe	0.3 -1 mg/l	0.3 mg/l	0.07	0.08	0.09	0.03	0.06
Mn	0.1 mg/l	0.5 mg/l	0.05	0.06	0.02	0.01	0.03
Total Coliform	0/100 ml	0/100 ml	0	0	0	0	0.00
Faecal Coliform	0/100 ml	0/100 ml	0	0	0	0	0.00

Table: 4.2 Drinking Water Quality

DRINKING WATER	LIMIT		APRIL 2016				
PARAMETER	DoE (Bangladesh) Standard	IFC/World Bank Standard	D1	D2	D3	D4	AVERAGE APRIL
pH	6.5 -8.5	6.5 -8.5	7.02	7.02	7.03	7.03	7.02
Ammonia	0.5 mg/l	---	0.01	0.01	0.01	0.01	0.01
Nitrate	10 mg/l	50 mg/l	<0.10	<0.10	<0.10	<0.10	<0.10
Phosphate	6 mg/l	---	<0.12	<0.12	<0.14	<0.10	<0.11
As	0.05 mg/l	0.01 mg/l	0.001	0.001	0.001	0.001	0.001
Fe	0.3 -1 mg/l	0.3 mg/l	0.07	0.08	0.09	0.03	0.06
Mn	0.1 mg/l	0.5 mg/l	0.05	0.06	0.02	0.01	0.03
Total Coliform	0/100 ml	0/100 ml	0	0	0	0	0.00
Faecal Coliform	0/100 ml	0/100 ml	0	0	0	0	0.00
DRINKING WATER	**LIMIT**		**MAY 2016**				
PARAMETER	DoE (Bangladesh) Standard	IFC/World Bank Standard	D1	D2	D3	D4	AVERAGE MAY
pH	6.5 -8.5	6.5 -8.5	7.03	7.02	7.03	7.02	7.02
Ammonia	0.5 mg/l	---	0.01	0.01	0.01	0.01	0.01
Nitrate	10 mg/l	50 mg/l	<0.10	<0.10	<0.10	<0.10	<0.10
Phosphate	6 mg/l	---	<0.12	<0.12	<0.14	<0.10	<0.11
As	0.05 mg/l	0.01 mg/l	0.001	0.001	0.001	0.001	0.001
Fe	0.3 -1 mg/l	0.3 mg/l	0.07	0.08	0.08	0.03	0.06
Mn	0.1 mg/l	0.5 mg/l	0.05	0.06	0.02	0.01	0.03
Total Coliform	0/100 ml	0/100 ml	0	0	0	0	0.00
Faecal Coliform	0/100 ml	0/100 ml	0	0	0	0	0.00
DRINKING WATER	**LIMIT**		**JUNE 2016**				
PARAMETER	DoE (Bangladesh) Standard	IFC/World Bank Standard	D1	D2	D3	D4	AVERAGE JUNE
pH	6.5 -8.5	6.5 -8.5	7.03	7.02	7.03	7.02	7.02
Ammonia	0.5 mg/l	---	0.01	0.01	0.01	0.01	0.01
Nitrate	10 mg/l	50 mg/l	<0.10	<0.10	<0.10	<0.10	<0.10
Phosphate	6 mg/l	---	<0.12	<0.12	<0.14	<0.10	<0.11
As	0.05 mg/l	0.01 mg/l	0.001	0.001	0.001	0.001	0.001
Fe	0.3 -1 mg/l	0.3 mg/l	0.07	0.08	0.08	0.03	0.06
Mn	0.1 mg/l	0.5 mg/l	0.05	0.06	0.02	0.01	0.03
Total Coliform	0/100 ml	0/100 ml	0	0	0	0	0.00
Faecal Coliform	0/100 ml	0/100 ml	0	0	0	0	0.00

Table: 4.3 River Water Quality

RIVER WATER	LIMITS		JANUARY 2016				
PARAMETER	DoE (Bangladesh) Standard	IFC/World Bank Standard	R1	R2	R3	R4	AVERAGE JANUARY
Temperature	40°C	---	21.5	21.3	21.9	21.4	21.52
Dissolved Oxygen (DO)	4.5 -8 mg/l	---	6.63	6.64	6.77	6.81	6.71
BOD5	50 mg/l	50 mg/l	11	12	11	10	11.00
COD	200 mg/l	250 mg/l	23.00	23.00	22.00	24.00	23.00
Oil & Grease	10 mg/l	10 mg/l	0.07	0.08	0.09	0.08	0.08
Chromium (Total)	0.5 mg/l	0.5 mg/l	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	0.5 mg/l	0.1 mg/l	<0.001	<0.001	<0.001	<0.001	<0.001
Lead (Pb)	0.1 mg/l	0.1 mg/l	<0.001	<0.001	<0.001	<0.001	<0.001
RIVER WATER	**LIMITS**		**FEBRUARY 2016**				
PARAMETER	DoE (Bangladesh) Standard	IFC/World Bank Standard	R1	R2	R3	R4	AVERAGE FEBRUARY
Temperature	40°C	---	21.30	21.34	20.70	21.40	21.18
Dissolved Oxygen (DO)	4.5 -8 mg/l	---	6.64	6.62	6.69	6.71	6.66
BOD5	50 mg/l	50 mg/l	11	11	10	10	10.50
COD	200 mg/l	250 mg/l	20.00	21.00	19.00	21.00	20.25
Oil & Grease	10 mg/l	10 mg/l	0.07	0.08	0.08	0.08	0.07
Chromium (Total)	0.5 mg/l	0.5 mg/l	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	0.5 mg/l	0.1 mg/l	<0.001	<0.001	<0.001	<0.001	<0.001
Lead (Pb)	0.1 mg/l	0.1 mg/l	<0.001	<0.001	<0.001	<0.001	<0.001
RIVER WATER	**LIMITS**		**MARCH 2016**				
PARAMETER	DoE (Bangladesh) Standard	IFC/World Bank Standard	R1	R2	R3	R4	AVERAGE MARCH
Temperature	40°C	---	24.30	24.34	24.70	24.40	24.43
Dissolved Oxygen (DO)	4.5 -8 mg/l	---	6.68	6.67	6.69	6.72	6.69
BOD5	50 mg/l	50 mg/l	11	11	10	10	10.50
COD	200 mg/l	250 mg/l	20.00	21.00	19.00	21.00	20.25
Oil & Grease	10 mg/l	10 mg/l	0.07	0.07	0.08	0.08	0.07
Chromium (Total)	0.5 mg/l	0.5 mg/l	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	0.5 mg/l	0.1 mg/l	<0.001	<0.001	<0.001	<0.001	<0.001
Lead (Pb)	0.1 mg/l	0.1 mg/l	<0.001	<0.001	<0.001	<0.001	<0.001

Table: 4.3 River Water Quality

RIVER WATER	LIMITS		APRIL 2016				
PARAMETER	DoE (Bangladesh) Standard	IFC/World Bank Standard	R1	R2	R3	R4	AVERAGE APRIL
Temperature	40°C	---	24.60	24.65	24.80	25.10	24.78
Dissolved Oxygen (DO)	4.5 -8 mg/l	---	6.69	6.71	6.72	6.71	6.70
BOD5	50 mg/l	50 mg/l	10	11	11	10	10.50
COD	200 mg/l	250 mg/l	20.00	20.00	19.00	21.00	20.00
Oil & Grease	10 mg/l	10 mg/l	0.07	0.07	0.07	0.08	0.07
Chromium (Total)	0.5 mg/l	0.5 mg/l	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	0.5 mg/l	0.1 mg/l	<0.001	<0.001	<0.001	<0.001	<0.001
Lead (Pb)	0.1 mg/l	0.1 mg/l	<0.001	<0.001	<0.001	<0.001	<0.001
RIVER WATER	**LIMITS**		**MAY 2016**				
PARAMETER	DoE (Bangladesh) Standard	IFC/World Bank Standard	R1	R2	R3	R4	AVERAGE MAY
Temperature	40°C	---	24.80	24.90	24.80	25.10	24.90
Dissolved Oxygen (DO)	4.5 -8 mg/l	---	6.70	6.72	6.72	6.73	6.71
BOD5	50 mg/l	50 mg/l	10	11	11	10	10.50
COD	200 mg/l	250 mg/l	21.00	20.00	19.00	21.00	20.25
Oil & Grease	10 mg/l	10 mg/l	0.07	0.07	0.07	0.08	0.07
Chromium (Total)	0.5 mg/l	0.5 mg/l	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	0.5 mg/l	0.1 mg/l	<0.001	<0.001	<0.001	<0.001	<0.001
Lead (Pb)	0.1 mg/l	0.1 mg/l	<0.001	<0.001	<0.001	<0.001	<0.001
RIVER WATER	**LIMITS**		**JUNE 2016**				
PARAMETER	DoE (Bangladesh) Standard	IFC/World Bank Standard	R1	R2	R3	R4	AVERAGE JUNE
Temperature	40°C	---	24.49	24.48	24.50	24.52	24.49
Dissolved Oxygen (DO)	4.5 -8 mg/l	---	6.71	6.72	6.73	6.72	6.72
BOD5	50 mg/l	50 mg/l	11	11	11	10	10.75
COD	200 mg/l	250 mg/l	20.00	20.00	19.00	21.00	20.00
Oil & Grease	10 mg/l	10 mg/l	0.08	0.07	0.07	0.07	0.07
Chromium (Total)	0.5 mg/l	0.5 mg/l	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	0.5 mg/l	0.1 mg/l	<0.001	<0.001	<0.001	<0.001	<0.001
Lead (Pb)	0.1 mg/l	0.1 mg/l	<0.001	<0.001	<0.001	<0.001	<0.001

Table: 4.4 Ground Water Quality

GROUND WATER	LIMIT		JANUARY 2016				
PARAMETER	DoE (Bangladesh) Standard	IFC/World Bank Standard	G1	G2	G3	G4	AVERAGE JANUARY
pH	6.5 -8.5	6.5 -8.5	7.07	7.06	7.06	7.07	7.06
TDS	1000 mg/l	1200 mg/l	210.00	206.00	204.00	203.00	205.75
Ammonia	0.5 mg/l	---	0.04	0.10	0.09	0.04	0.068
Nitrate	10 mg/l	50 mg/l	1.40	1.48	1.00	1.04	1.23
Phosphate	6 mg/l	---	<0.10	<0.10	<0.10	<0.10	<0.10
As	0.05 mg/l	0.01 mg/l	0.001	0.001	0.001	0.001	0.001
Fe	0.3 - 1 mg/l	0.3 mg/l	0.10	0.10	0.05	0.04	0.07
Mn	0.1 mg/l	0.5 mg/l	0.01	0.01	0.01	0.01	0.01
Total coliform	0/100 ml	0/100 ml	0.00	0.00	0.00	0.00	0.00
Faecal Coliform	0/100 ml	0/100 ml	0.00	0.00	0.00	0.00	0.00
GROUND WATER	**LIMIT**		**FEBRUARY 2016**				
PARAMETER	DoE (Bangladesh) Standard	IFC/World Bank Standard	G1	G2	G3	G4	AVERAGE FEBRUARY
pH	6.5 -8.5	6.5 -8.5	7.05	7.06	7.06	7.06	7.05
TDS	1000 mg/l	1200 mg/l	198.00	200.00	202.00	201.00	196.00
Ammonia	0.5 mg/l	---	0.04	0.08	0.07	0.05	0.04
Nitrate	10 mg/l	50 mg/l	1.40	1.43	1.00	1.04	1.40
Phosphate	6 mg/l	---	<0.10	<0.10	<0.10	<0.10	<0.10
As	0.05 mg/l	0.01 mg/l	0.001	0.001	0.001	0.001	0.001
Fe	0.3 - 1 mg/l	0.3 mg/l	0.08	0.07	0.06	0.04	0.08
Mn	0.1 mg/l	0.5 mg/l	0.01	0.01	0.01	0.01	0.01
Total coliform	0/100 ml	0/100 ml	0.00	0.00	0.00	0.00	0.00
Faecal Coliform	0/100 ml	0/100 ml	0.00	0.00	0.00	0.00	0.00
GROUND WATER	**LIMIT**		**MARCH 2016**				
PARAMETER	DoE (Bangladesh) Standard	IFC/World Bank Standard	G1	G2	G3	G4	AVERAGE MARCH
pH	6.5 -8.5	6.5 -8.5	7.07	7.06	7.06	7.06	7.05
TDS	1000 mg/l	1200 mg/l	200.00	201.00	201.00	199.5	196.00
Ammonia	0.5 mg/l	---	0.08	0.07	0.05	0.06	0.04
Nitrate	10 mg/l	50 mg/l	1.43	1.00	1.04	1.21	1.40
Phosphate	6 mg/l	---	<0.10	<0.10	<0.10	<0.10	<0.10
As	0.05 mg/l	0.01 mg/l	0.001	0.001	0.001	0.001	0.001
Fe	0.3 - 1 mg/l	0.3 mg/l	0.07	0.06	0.04	0.06	0.08
Mn	0.1 mg/l	0.5 mg/l	0.01	0.01	0.01	0.01	0.01
Total coliform	0/100 ml	0/100 ml	0.00	0.00	0.00	0.00	0.00
Faecal Coliform	0/100 ml	0/100 ml	0.00	0.00	0.00	0.00	0.00

Table: 4.4 Ground Water Quality

GROUND WATER	LIMIT		APRIL 2016				
PARAMETER	DoE (Bangladesh) Standard	IFC/World Bank Standard	G1	G2	G3	G4	AVERAGE APRIL
pH	6.5 -8.5	6.5 -8.5	7.06	7.06	7.05	7.06	7.06
TDS	1000 mg/l	1200 mg/l	194.00	199.00	201.00	200.00	198.50
Ammonia	0.5 mg/l	---	0.05	0.07	0.06	0.05	0.06
Nitrate	10 mg/l	50 mg/l	1.40	1.41	1.00	1.04	1.21
Phosphate	6 mg/l	---	<0.10	<0.10	<0.10	<0.10	<0.10
As	0.05 mg/l	0.01 mg/l	0.001	0.001	0.001	0.001	0.001
Fe	0.3 - 1 mg/l	0.3 mg/l	0.07	0.07	0.06	0.05	0.06
Mn	0.1 mg/l	0.5 mg/l	0.01	0.01	0.01	0.01	0.01
Total coliform	0/100 ml	0/100 ml	0.00	0.00	0.00	0.00	0.00
Faecal Coliform	0/100 ml	0/100 ml	0.00	0.00	0.00	0.00	0.00
GROUND WATER	**LIMIT**		**MAY 2016**				
PARAMETER	DoE (Bangladesh) Standard	IFC/World Bank Standard	G1	G2	G3	G4	AVERAGE MAY
pH	6.5 -8.5	6.5 -8.5	7.06	7.06	7.05	7.06	7.06
TDS	1000 mg/l	1200 mg/l	192.00	198.00	200.00	198.00	197.00
Ammonia	0.5 mg/l	---	0.05	0.07	0.06	0.05	0.06
Nitrate	10 mg/l	50 mg/l	1.40	1.41	1.00	1.04	1.21
Phosphate	6 mg/l	---	<0.10	<0.10	<0.10	<0.10	<0.10
As	0.05 mg/l	0.01 mg/l	0.001	0.001	0.001	0.001	0.001
Fe	0.3 - 1 mg/l	0.3 mg/l	0.07	0.07	0.06	0.05	0.06
Mn	0.1 mg/l	0.5 mg/l	0.01	0.01	0.01	0.01	0.01
Total coliform	0/100 ml	0/100 ml	0.00	0.00	0.00	0.00	0.00
Faecal Coliform	0/100 ml	0/100 ml	0.00	0.00	0.00	0.00	0.00
GROUND WATER	**LIMIT**		**JUNE 2016**				
PARAMETER	DoE (Bangladesh) Standard	IFC/World Bank Standard	G1	G2	G3	G4	AVERAGE JUNE
pH	6.5 -8.5	6.5 -8.5	7.06	7.06	7.05	7.06	7.06
TDS	1000 mg/l	1200 mg/l	193.00	197.00	198.00	198.0	196.50
Ammonia	0.5 mg/l	---	0.05	0.07	0.06	0.05	0.06
Nitrate	10 mg/l	50 mg/l	1.40	1.41	1.00	1.04	1.21
Phosphate	6 mg/l	---	<0.10	<0.10	<0.10	<0.10	<0.10
As	0.05 mg/l	0.01 mg/l	0.001	0.001	0.001	0.001	0.001
Fe	0.3 - 1 mg/l	0.3 mg/l	0.07	0.07	0.06	0.05	0.06
Mn	0.1 mg/l	0.5 mg/l	0.01	0.01	0.01	0.01	0.01
Total coliform	0/100 ml	0/100 ml	0.00	0.00	0.00	0.00	0.00
Faecal Coliform	0/100 ml	0/100 ml	0.00	0.00	0.00	0.00	0.00

4.2.4 Impact on waste and labor camp

Construction debris and wastes to be generated during the construction phases are scrap iron, steel, wooden frames, piping, and other solid wastes. Most of them are 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 are described in Section 4.3.

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 are disposed of properly as outlined in Section 4.3.

Assessment of construction impact on air, water, noise, construction waste and labor camp management

Table 4.5 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, air quality and noise level. As discussed above, water 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 4.3 are adopted. The overall negative impact of such activities is likely to be “short-term (Sh)” and of “low” intensity.

Deterioration of air quality during construction phase may result from increased concentration of particulate matter in the air from construction activities such as vehicular movement and wind-blown dust. However, these adverse impacts are greatly minimized by adopting mitigation measures as outlined in Section 4.3.

The likely noise level to be generated for different construction activities and its impact on the surrounding environment were assessed using a noise meter. Results of the assessment are presented in table 4.1 shows that different construction activities would generate significant noise and would produce some adverse impacts.

Similarly, the cumulative noise caused by the heavy trucks and excavator simultaneously during the construction of the access road is also of some concern. The adverse effect of project activities on noise level has therefore been categorized as “short term (Sh)” and of “moderate” intensity.

Table 4.5: 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
Air Quality					X (Sh)		
Noise Level						X (Sh)	
Drinking Water Quality					X (Sh)		
River Water Quality					X (Sh)		
Ground Water Quality					X (Sh)		

Note: Sh=Short-term; Lo=Long-term

4.3 Mitigation measure

4.3.1 Air Quality

Construction materials at the site are properly covered while hauled and stored, roads properly cleaned and water sprayed in order to minimize concentration of dust in air when dust increases. Vehicle movement to and from the site are properly managed to ensure that is does not significantly aggravate the traffic problem and air pollution. Stone (aggregate) crushing activities are properly done in fine tune batching plant which is far away from the construction site and not allowed within the Ashuganj plant premises. Health status of all workers is monitored regularly at the Health Center established at the project site.

4.3.2 Water Quality

The human wastes from the labour camp are appropriately disposed of through construction of sanitary latrines connected to appropriately designed septic tank system (consisting of septic tank and soakage pit). Wastewater generated from different construction activities is not likely to be significant in volume. Disposal of such wastewater are 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 are separated from the storm water stream, which is disposed of separately utilizing the existing storm water disposal system at the Ashuganj complex.

4.3.3 Noise Level

- Use “quiet” equipment (i.e., equipment designed with noise-control elements);

- Route truck traffic away from noise-sensitive areas, where feasible;
- Install sound barriers for pile driving activity, where practicable (e.g., use an acoustic curtain or blanket around the point of impact);
- Unnecessary vehicle movement are avoided
- Switch off the engines while remain unused.

4.3.4 Solid Waste

The solid wastes of domestic nature generated mainly in the labor sheds are collected and stored separately (i.e., without mixing it with construction wastes/debris) in appropriate containers within the construction site. The solid wastes are disposed of away from the site (e.g., in a municipal landfill/waste dumping ground) outside the complex, at the responsibility of the Contractor & monitored by APSCL.

4.4 Progress of Work

Ambient air quality monitoring: Measurements of selected air quality parameters for $PM_{2.5}$, PM_{10} and SPM has been carried out (January–June 2016) during the ongoing construction work. Air samples were collected for measurements of selected air quality parameters for $PM_{2.5}$, PM_{10} and SPM.

Drinking water monitoring: Drinking water sample was collected from supply water in January-June 2016 for analyzing pH, Ammonia, nitrate, phosphate, As, Fe, Mn, Fecal and total coliform. Test report also shown in Annex II.

River water monitoring: River water sample was collected from Meghna River in January-June 2016 for analyzing temperature, dissolved oxygen (DO) along with BOD_5, COD, Oil and Grease, and selected heavy metals (Cr, Cd, Pb). Test report also shown in Annex II.

Ground water monitoring: Ground water sample was collected from supply water in January-June 2016 for analyzing pH, TDS, Ammonia, nitrate, phosphate, As, Fe, Mn, Fecal and Total coliform. Test report also shown in Annex II.

Noise level monitoring: Noise level monitoring is also necessary during construction period, because use of heavy construction equipment may increase the noise level at the work location. So, Noise level data were collected from selected 4 locations.

Waste management and process waste monitoring: Disposal of construction debris away the site and their appropriate disposal sanitary landfill are ongoing. Hazardous waste and non-hazardous waste are also disposing by proper way.

Trees cutting: The project site is in bare field. So, there was no scope of tree cutting. But tree plantation program and landscaping is going on for providing the better environment at the project site and APSCL area.

Others: There is no significant impact on the existing road network in the project area. Major transportation of plant and construction material are done by the Meghna River with unloading of materials by crane owned by APSCL and at the jetty which is within the existing APSCL complex.

All slopes are protected and suitable erosion protection measures are employed to reduce any impact from runoff during the monsoon rainy season.

Health and Safety: The general health and safety of workers is safeguarded with the provision of medical and health facilities on-site, the provision of personal protective equipment (hard hats, safety belt, full body safety harness, ear plugs, ear muff, welding shield, grinding shield, safety shoe, safety goggle, welding apron, hand gloves, safety jacket, anti-dust masks, anti-gas masks etc. as required). There is an emergency response system and workers and supervisors are received training on any accident and immediate medical facility in its own round the clock medical center. There is a full time emergency ambulance to provide immediate service if required. Safe drinking water and sanitation facilities are established and provided to all project related employees (officer, staff and workers) at the site.

Set up of in-house monitoring system

APSCL is being set up of in-house monitoring system and require manpower with its own staffs. In-house environmental monitoring system with man power is as follows.

Manpower for Environmental Management Plan.

1. Manager (Health, Safety & Environment) – 1 nos.
2. Asst. Manager (Health, Safety & Environment), for ambient air, stacks emission and noise etc.-01 no's
3. Manager (Chemical) For ETP, WTP, etc. -1 nos.
4. Assistant Manager (Chemical) For ETP, WTP, etc. - 1 no's.
5. Operator – 3 Nos.
6. Environmental Specialist (Fichtner) – 1 nos.

Environmental Clearance Certificate /Renewal of Environment Clearance:

ASPCL received exemption of IEE and approval of Term of Reference (ToR) for EIA for Implementation of APSCL 450 MW CCGT PP on 31.05.2010 from DoE. APSCL also received the EIA approval letter from the DoE on 31.05.2010.
Based on the EIA approval letter from DoE, APSCL has started construction work. After completion of construction work APSCL will apply for environmental clearance certificate for operation of the plant. DoE did not provide any environmental certificate or any condition in the EIA approval letter, hence no renewal issue is arises.

4.5 WORK SHOP AND TRAINING MEETING AND DISCUSSION

At present an environmental team headed by Md. Atiqur Rahman, Manager (Health, Safety & Environment of APSCL) looking after and overall supervising the monitoring of 450 MW North CCGT PP environmental issues. The consultant conducted a training programed on environmental issues for APSCL personnel and EPC contractors.

A training program for capacity building program of APSCL personnel and EPC contractors was arranged in 28.04.2016 upon availability of require manpower. There

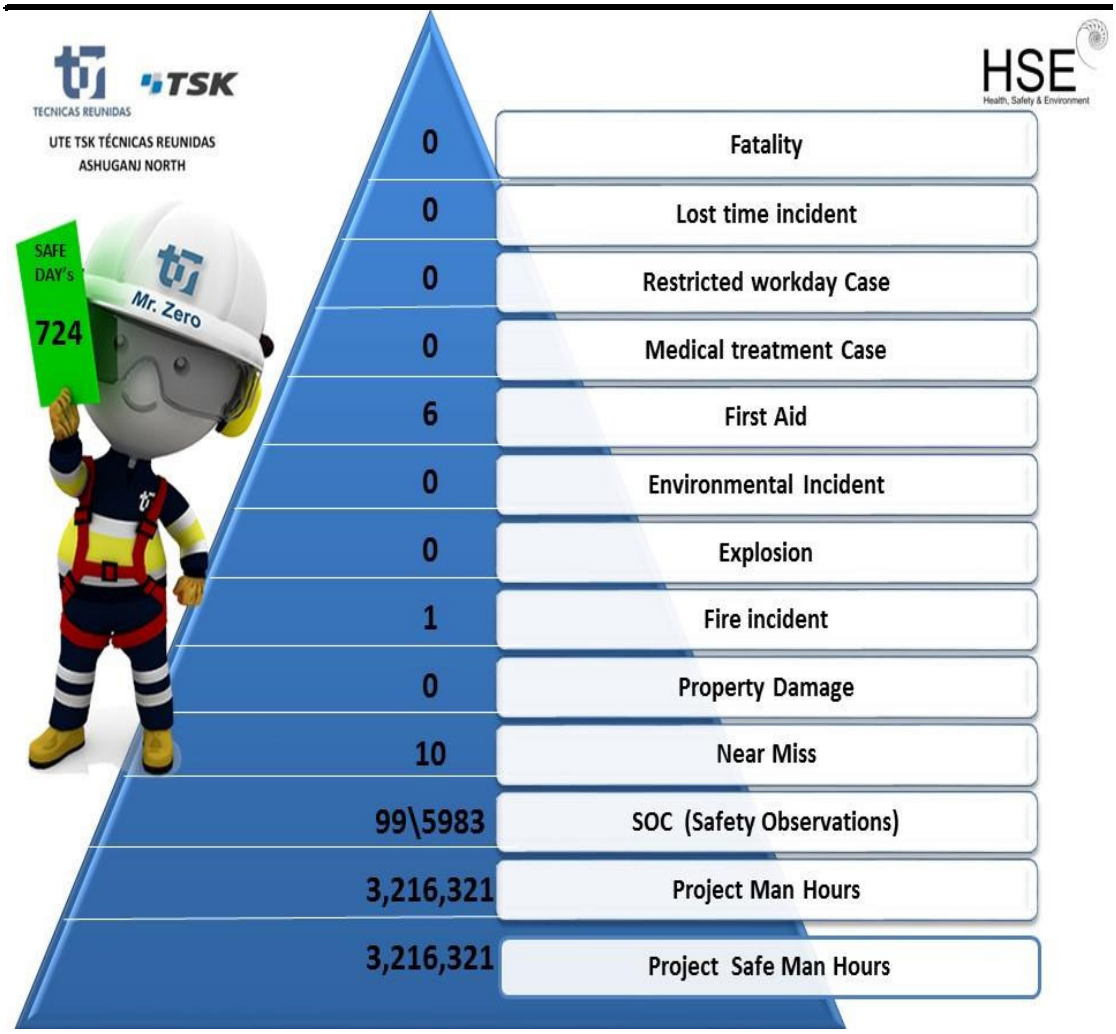
is environmental meeting performed in every month and discussed the overall performance of the environmental issues of under construction power plant.

5.0 SAFEGUARD MONITORING RESULTS AND UNANTICIPATED IMPACTS

5.1 Safety assurance of the project site

Personal Safety Equipment (PSE): Use of proper safety materials is mandatory for all at project site. Workers use appropriate personal protective equipment, such as safety boots, helmet, safety jacket, safety belt, safety harness, gloves, protective clothing, goggles, grinding shield, welding shield, anti-dust mask, anti-gas mask and ear protection etc. Daily toolbox meeting before starting of work is a mandatory practice at the project site. So long as safety does not suffer due to this action. There is no fatality and other casualty and detail of safety issue is described in the following HSE Statistics chart.

HSE STATISTICS



5.2 OTHERS

5.2.1 Weather condition

The weather condition during the ambient air quality and noise monitoring was cold and partly sunny during the sampling. Wind direction was found calm. Hence there is no impact on monitoring due to weather condition.

5.2.2 Other factors which affect the monitoring results

Air monitoring: Factors which affect the air monitoring results including:

- Topography
- Congested Space
- Physical and chemical properties of pollutants
- Air Pressure
- Air Turbulence

Water monitoring: Factors which affect the water monitoring results including:

- Soil erosion
- Waste discharge
- Surface runoff
- Large numbers of bottom feeders (such as carp), which stir up bottom sediments
- Excessive algal growth.

Noise Monitoring: Factors which affect the noise monitoring results including:

- Type of source (point or line)
- Distance from source
- Atmospheric absorption
- Obstacles such as barriers and buildings
- Ground absorption
- Reflections
- Humidity

6.0 IMPLEMENTATION OF GRIEVANCE REDRESS MECHANISM AND COMPLAINTS RECEIVED FROM STAKEHOLDERS

There is a grievance redress mechanism developed in the project site. But till now there is not received any grievance to address.

7.0 CONCLUSION AND RECOMMENDATION

The environmental monitoring report is consist of 4th Semiannually environmental monitoring reporting based on monthly measured ambient air, noise, drinking water, ground and river water quality parameters. The work has been assigned EPC contractor UTE TSK TECNICAS REUNIDAS and performed for the period of January to June 2016. Ambient air quality parameters were determined in the site with the help of high volume sampler and noise quality was done by noise level meter. Drinking water, ground and surface water quality parameters were analyzed in the laboratory. All of the mitigation measures are taken following ADB Environmental Safeguard Policy 2009, IFC/World Bank Thermal Power plant guideline 2008 and DoE, Bangladesh guideline.

From the analysis it is found that the ambient air quality results found within DoE standards. This values is cumulative with surrounding ambient air and noise level. SOx and CO are not a problem of the construction period of the power plant. But SPM, $PM_{2.5}$, PM_{10} level during construction period of power plant are controlled by taking proper mitigation measures and spraying of water.

Noise level quality of Ashuganj CCPP has also been measured by EPC contractor. According to the measurement, the noise level around the plant area found within the allowable limit of Industrial zone both the day and also at night time. The noise level are controlled by using modern, new and fine-tuned equipment.

Surface water quality parameter at Meghna River was performed to evaluate whether this plant poses any detrimental effect on the water environment. From the analysis it has been found that the project does not contaminate water pollution to the natural environment. Otherwise, any spill is not detected next to riverbeds around the worksite (oils, concrete waste or conglomerate asphalt, any color changes of the water, etc.). Drinking and ground water quality is also found good.

House-keeping is also in good condition at the plant site. All solid, liquid and hazardous waste are disposed the designated container at the plant site. Most of the solid wastes are disposed by landfill. The usable solid wastes are handed over to proper party for recycling. Liquid hazardous waste is conserved and properly clean of the storage area. Hazardous waste is kept at designated places by labeling.

Finally it can be concluded that the plant has minor detrimental impact for short period on the environment in terms of ambient air and ambient noise during the construction period. The plant provides a good working environment for the workers.

ANNEX-I: PHOTO APPENDIX

BRIDGE AT SITE

GAS TURBINE AREA

CONDENSATE TANK

SERVICE & FIRE WATER TANK

GIS BUILDING & DUCT SUPPORT

TURBINE HALL STEEL STRUCTURE ERECTIO

FIRE FIGHTING PUMP BUILDING

DAILY TOOL BOX

SAFETY SIGN

WEEKLY WALK THROUGH AND PPE INSPECTION

SAFETY SIGN

SAFETY SIGN