

## **Semi-annual Environmental Monitoring Report**

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**Project Number: 42378-017**  
**December 2019**

**Power System Expansion and Efficiency Improvement  
Investment  
Program-Tranche-3  
ASHUGANJ 400 MW (EAST) COMBINED CYCLE  
POWER PLANT PROJECT  
Ashuganj, Brahmanbaria**

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8th Semi Annual (July-December, 2019) Report

## Environmental Monitoring Report



Ashuganj 400 MW (East) Combined  
Cycle Power Plant Project (CCPP)  
Ashuganj Power Station Company Ltd.  
Ashuganj, Brahmanbaria.

# **Environmental Monitoring Report**

**8<sup>th</sup> Semi-Annual (July – December 2019) Report**



## **ASHUGANJ 400 MW (EAST) COMBINED CYCLE POWER PLANT PROJECT**

**At Ashuganj, Brahmanbaria**



**Ashuganj Power Station Company Limited (APSCCL)**

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## **Semi-Annual Monitoring Report**

### **For Ashuganj 400 MW (East) Combined Cycle Power Plant (CCPP) Project (Ashuganj, Brahmanbaria)**

**Period: 8<sup>th</sup> Semi-Annual (July –December 2019)**

**Monitoring: Ambient Air, Water & Noise Quality**

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### **EXECUTIVE SUMMARY**

During the period from July to December 2019, the EPC Contractor has carried out mainly the Foundation work, Site Processing work including construction of Main Building, Bypass Stack, HRSG, RMS, CW pump house, Gas booster, Turbine Generator, Condenser Pit, Transformer and Turbine Base. In order to complete those works, they mobilize the equipment's, workers and materials. In this period there is no discharge and for this, there is no impact on the living things in the 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 management like spill prevention and well drainage system. Solid waste is managed by the waste management plan. Noise pollution is also a regarding issue during Steel Structure Erection activities for using of demolition equipment's and also for traffic and transport. Noise level is reduced by using of fine-tuned low noise level construction equipment's and by the proper traffic management system. Every personnel use personal protective equipment to ensure own safety. There is two minor accident occur in the site on 22<sup>nd</sup> August and 29<sup>th</sup> August, 2019. The minor accident was properly investigated and documented for achieving the target with no fatality and other accident (Zero accident philosophy). APSCL is committed to keeping 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 about 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 layout: (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 the construction phase, and (b) during the 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 minimal 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  $400 \pm 5\%$  MW capacity at site condition (35 °C, 1.013 bars, 98% 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. The basic concept for the Ashuganj 400 MW CCPP (East) 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 three pressure levels (HP, IP and LP) with reheat. The Ashuganj 400 MW (East) 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 Upazilla. The entire power plant is completely enclosed, covers an area of about 4.50 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 East 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 three pressure levels (HP, IP and LP) with reheat.

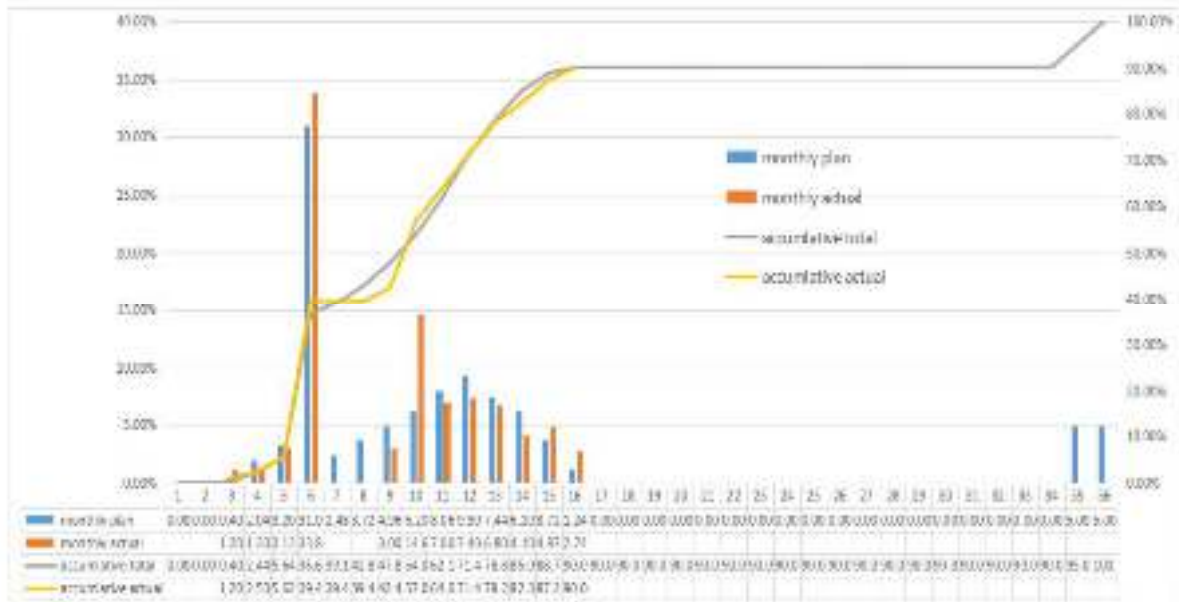
General components of the proposed CCGT project include the following: (i) 400±5% MW CCGT unit complete with necessary auxiliaries including air intake filtration facilities, inlet and exhaust silencers, control systems, main stack with delivery damper, gas fuel treatment system, (ii) Power generator 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) Di-mineralized water system complete with pumps, tanks, control system (viii) Effluent treatment system with all auxiliaries including, chemical dosing systems, settling units, control system, pumps; (ix) Other essential plant equipment including air compressor, natural gas supply system with 2200 m gas pipeline, circulating water system, cooling water pond, raw water intake structure, condensate system; (x) Construction of internal roads. (xi) Switch room (xii) Emergency generator and transformer.

#### **A. Project Progress Status**

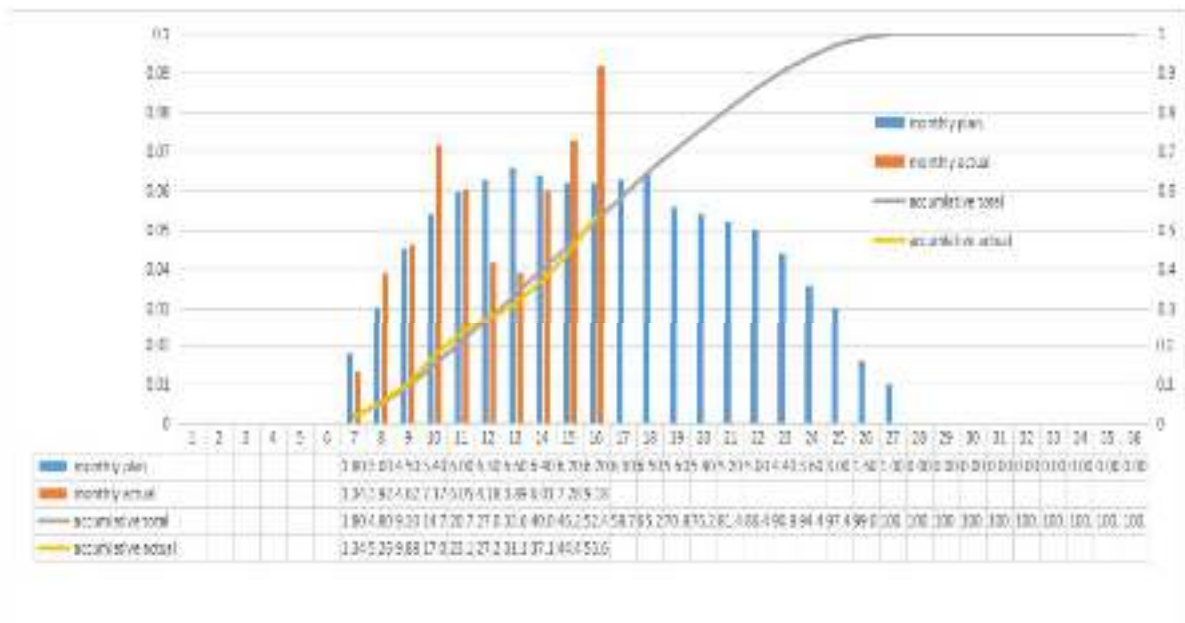
The updated status of Ashuganj 400 Mw (East) Combined Cycle Power Plant Project (CCPP) from July 2019 to December 2019 is given below in Table:

<b>Sl. No.</b>	<b>Work Description</b>	<b>Status</b>
1.	<b>Demolition Schedule</b> Demolition Schedule for old power plant	Completed 100%
2.	<b>Demolition of Existing Power Plant</b> The old power plant will be demolished	Completed 100%
3.	<b>Civil Works:</b> Main Building Bypass Stack HRSG RMS CW pump house Gas booster Turbine Generator Condenser Pit Transformer	Foundation work finished Foundation work finished Foundation work finished Site Processing work Started Site Processing work Started Site Processing work Started Foundation work finished Foundation work finished Site Processing work Started
4.	<b>Mechanical and Electrical Facilities</b> Consist of -Erection of HRSG, Steam Turbine, Generator, Cooling Tower, CW Pump House and all other BOP Equipment/Components of Power Plant. -Electrical and I&C works with commissioning	Not yet started

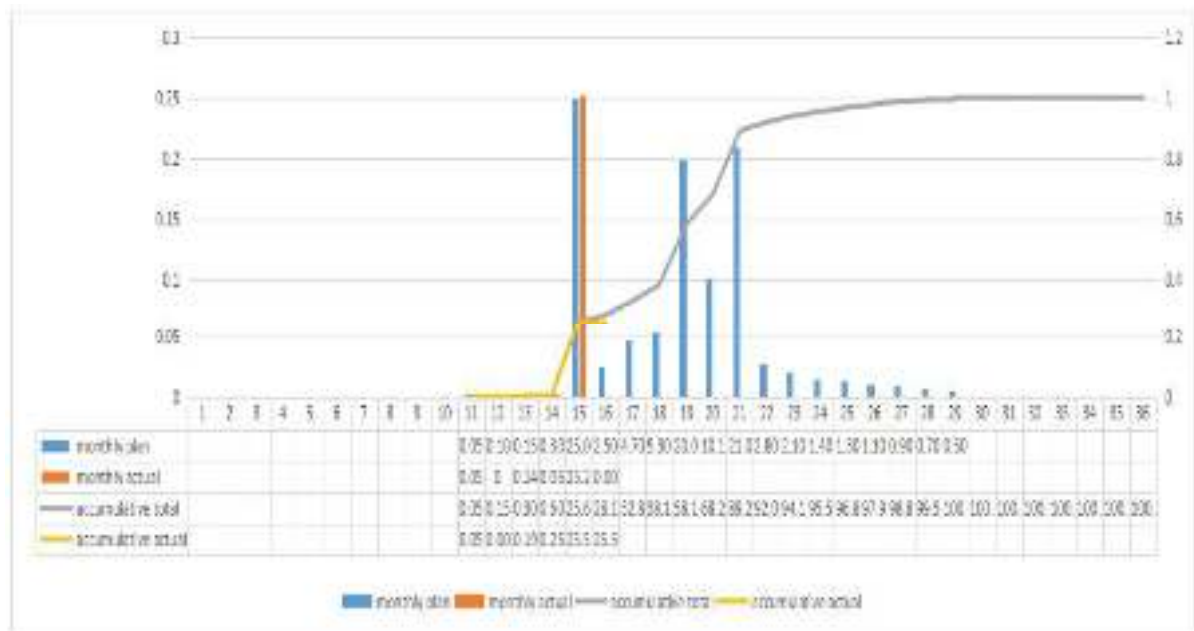
**Figure-1.1: Project Details Engineering Chart**



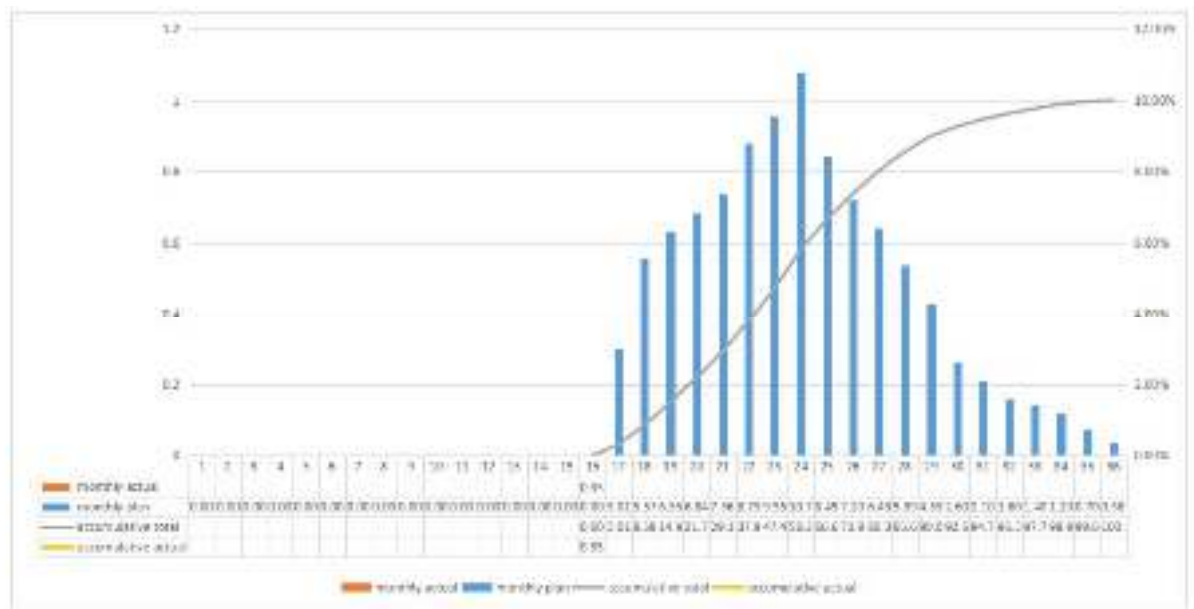
**Figure-1.2: Project Progress Chart (Civil)**



**Figure-1.3: Project Progress Chart (Procurement)**



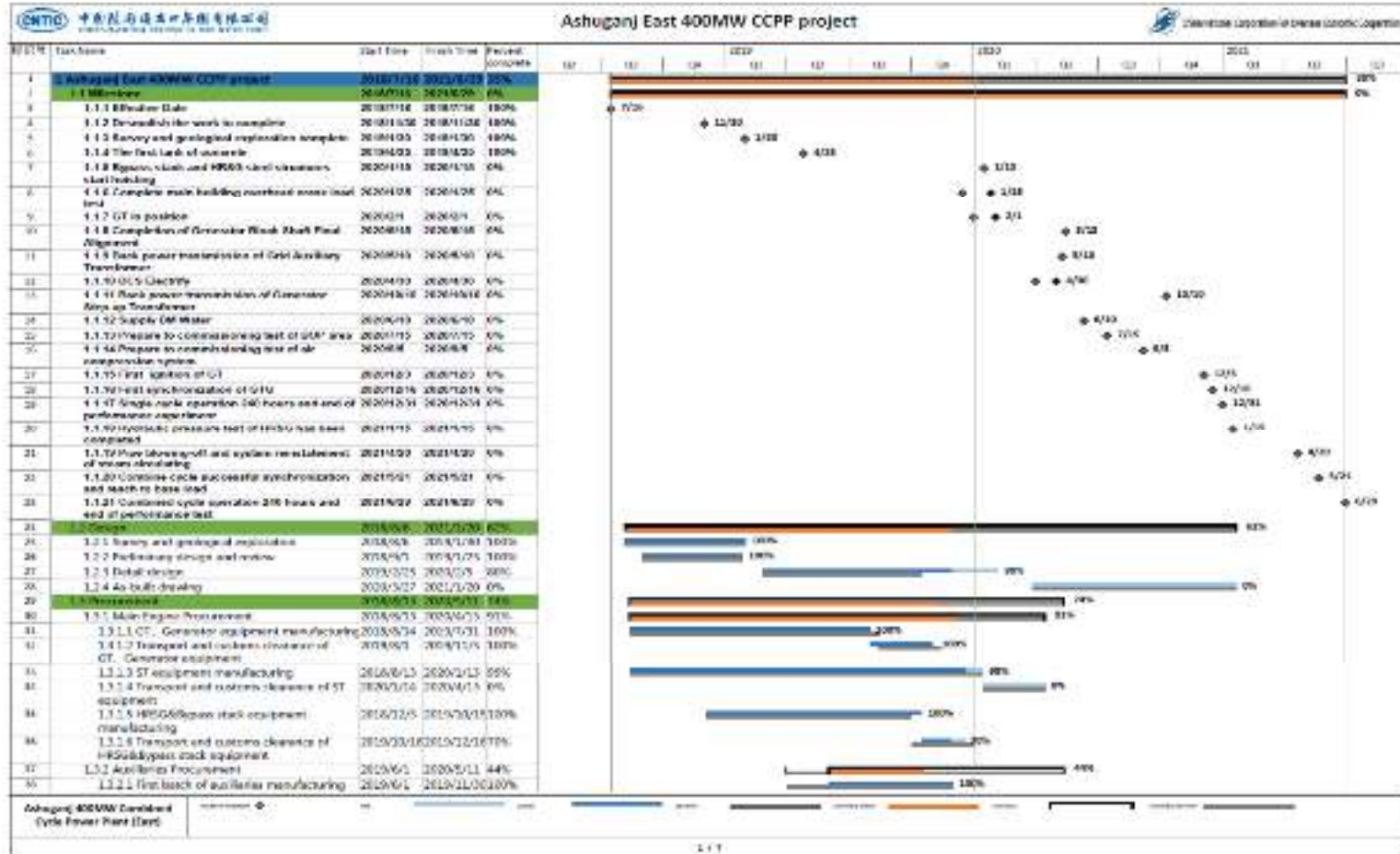
**Figure-1.4: Project Progress Chart (Installations)**

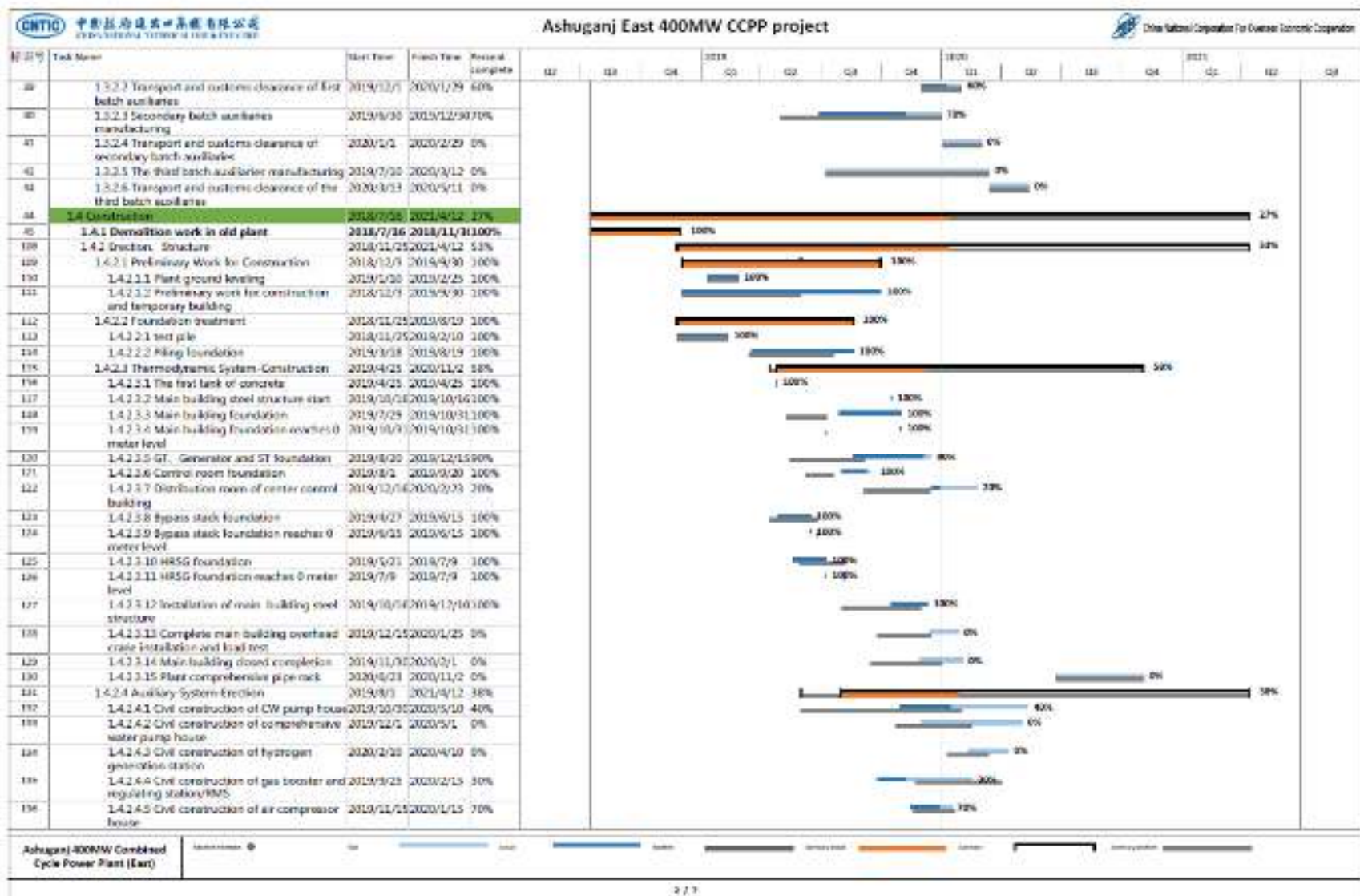


## B. Implementation Schedule for the project:

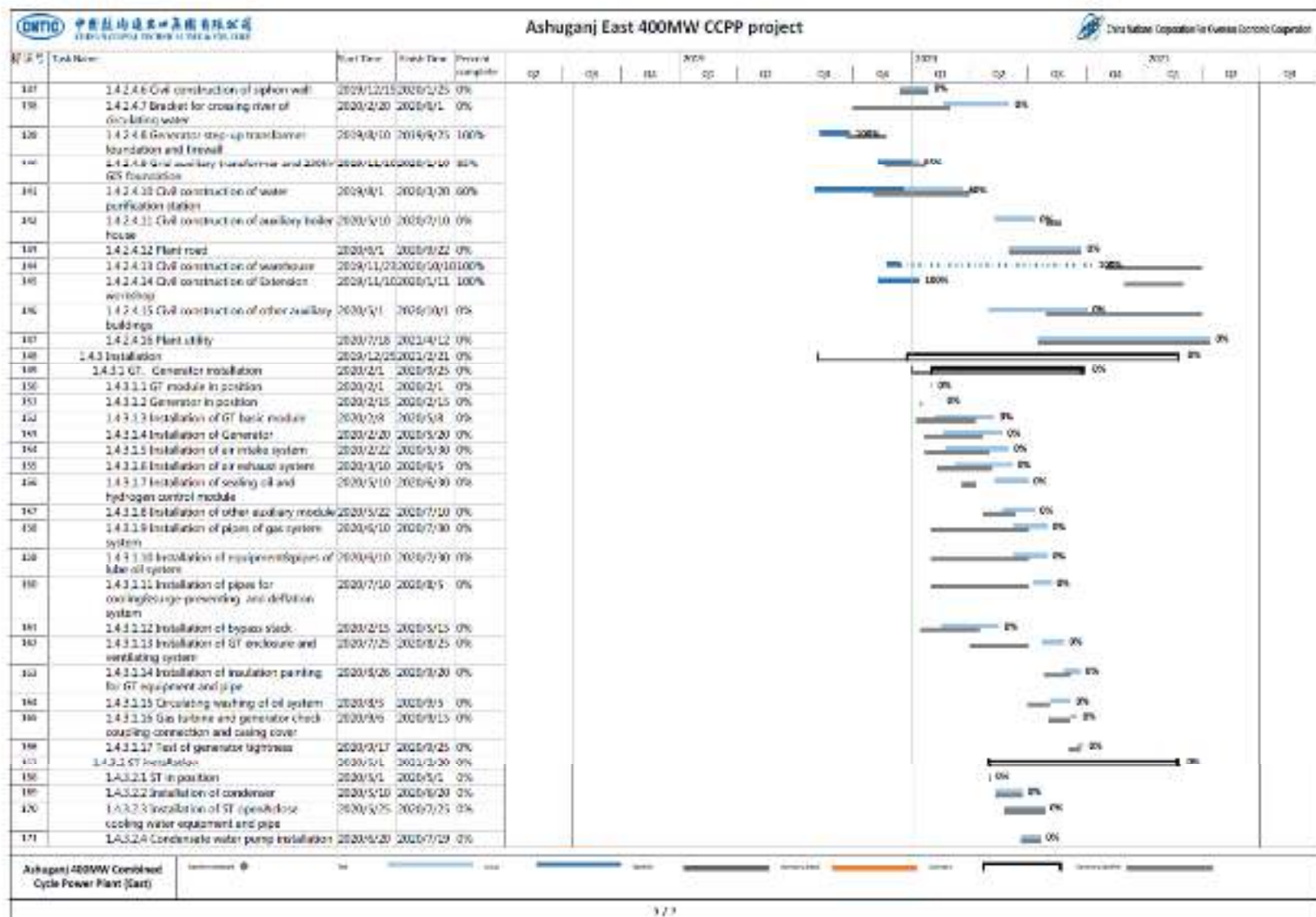
The tentative implementation schedule of Ashuganj 400 Mw (East) Combined Cycle Power Plant Project (CCPP) is given below:

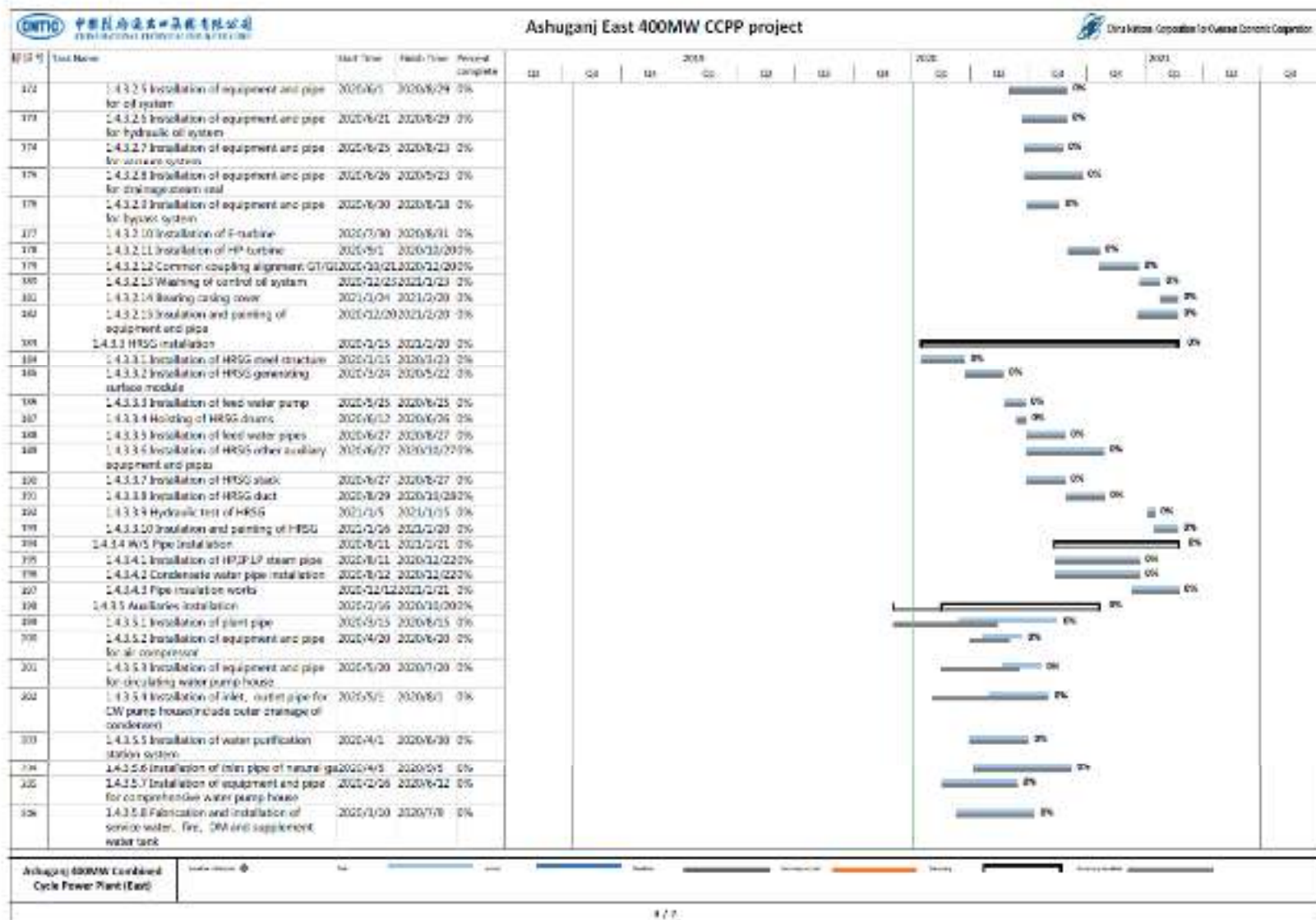
### Implementation Schedule (Tentative):



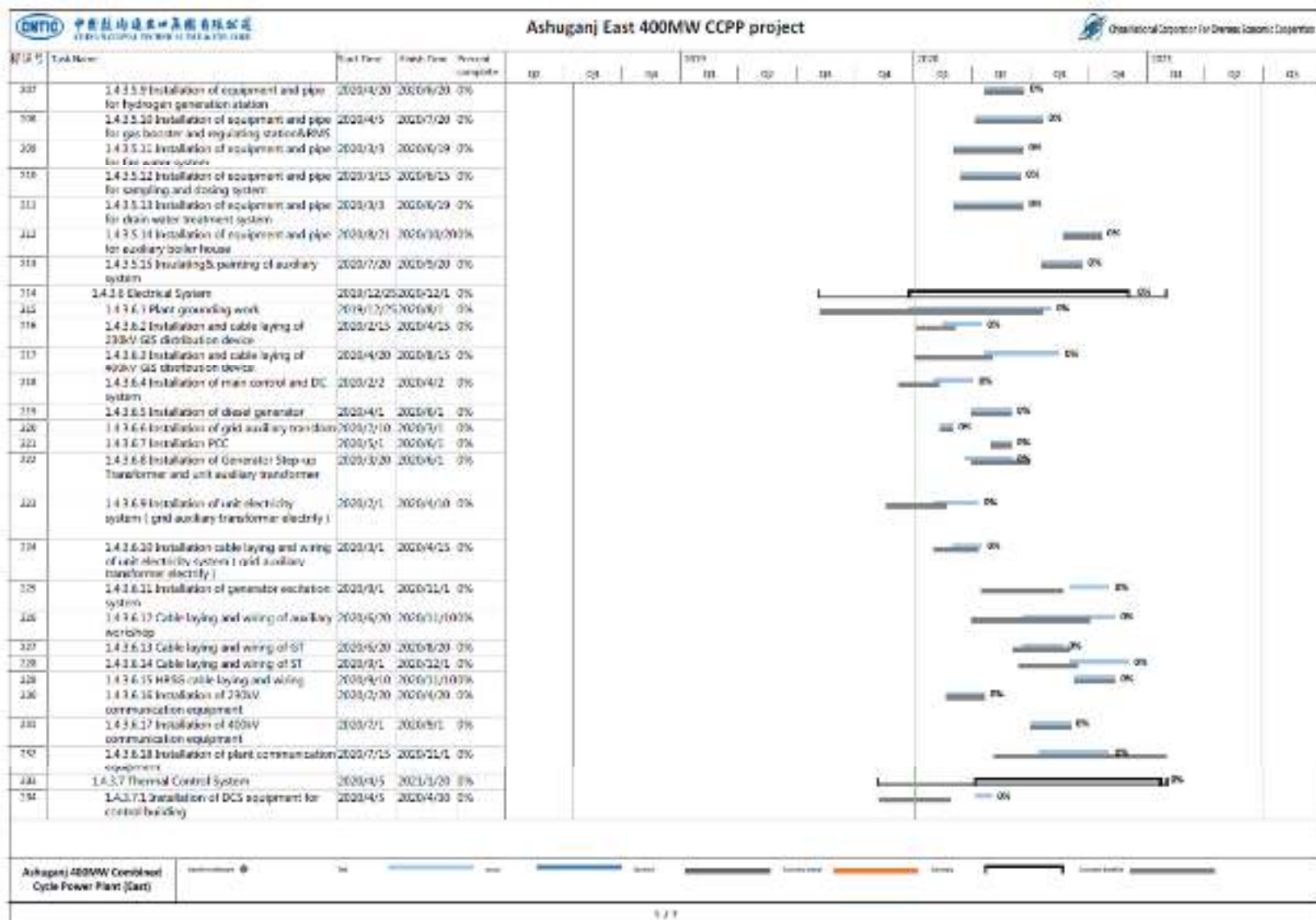


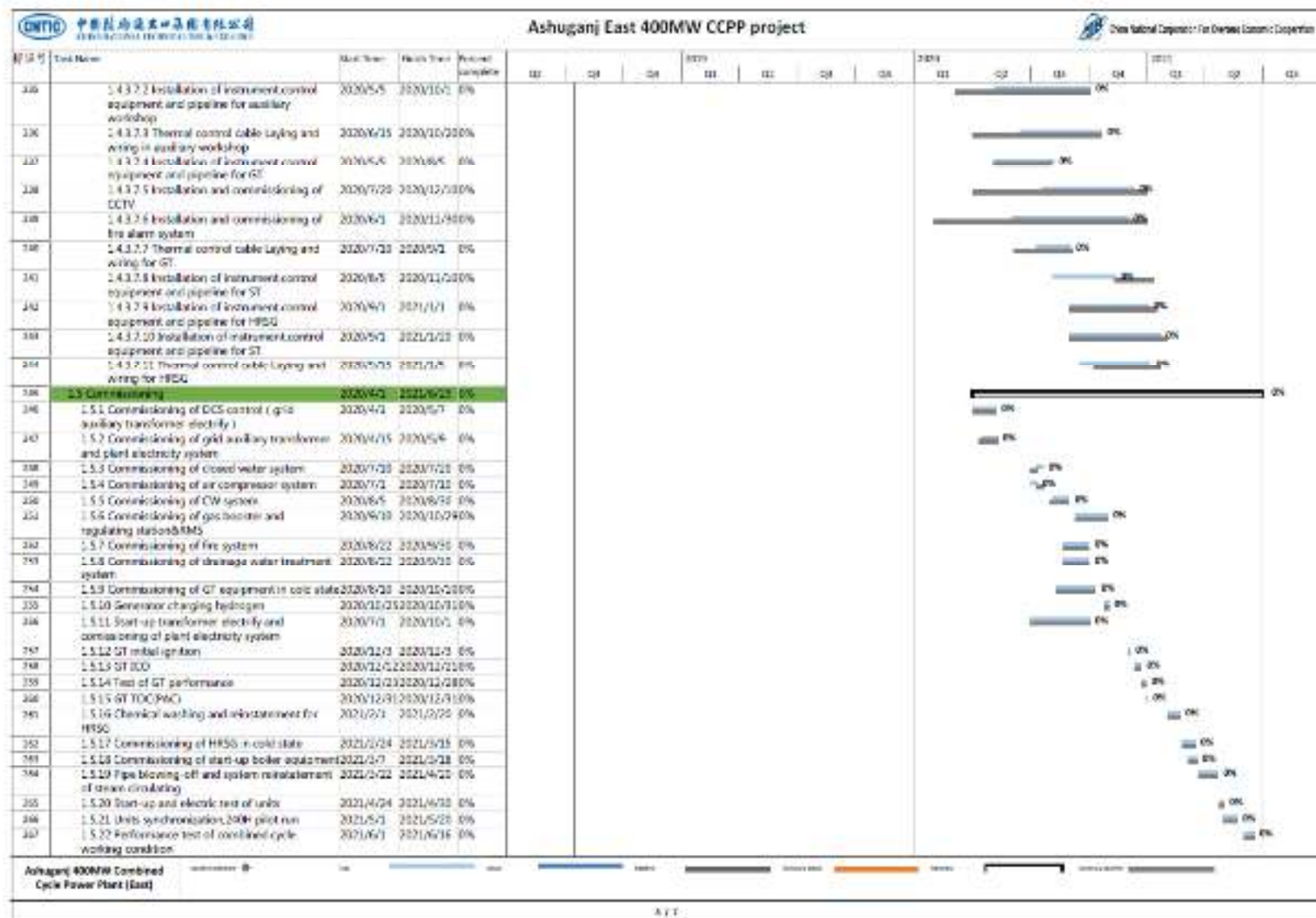














### **A Synopsis of Work Needs to be undertaken during the Construction Period**

According to environmental monitoring, during the construction phase and assignment, the main work will be 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 will also be collected from the nearby Meghna River and for groundwater analysis the water sample will be collected from the project area.

<b>Description of Work</b>	<b>8<sup>th</sup> Semiannually (July-December, 2019)</b>	<b>Frequency</b>
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
Groundwater Level	Done with Measurement	Quarterly
Soil Quality	Done with Measurement	Annually
Process Waste	Done with Measurement	Quarterly
Health Checkup	No Need to Measure	Daily

### **Project Environmental Key Personnel, Contact Names and Telephone Numbers**

<b>Sl. No.</b>	<b>Project Key personnel</b>	<b>Name of Key personnel</b>	<b>Telephone No.</b>
01	Manager (HS&E), 400 MW (East) CCPP, APSCL	Md. Atiqur Rahman	01717462670
02	Executive Engineer (Electrical.)	Md. Imrose Islam	01711100873
03	Executive Engineer (Civil.)	Mohammad Asadujjaman	01712238642
04	Manager (Chemical)	Md. Ashraful Islam	01717650871
05	Assistant Manager (HS&E)	A.K.M. Humayan Kabir Dewan	01730025431
06	Assistant Engineer (Electrical)	Aminul Islam	01739653761
07	Assistant Manager (Chemical)	Md. Yasin Molla	01923606305
08	Operator (3 Nos.)	1. Milon Kanti Das 2. Md. Wasi Uddin 3. Ashiq Hasan	
09	Independent Environmental Specialist	Mohammad Arifur Rahman	01711128593

## 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 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 <sub>2</sub> (Sulphur dioxide)	NO <sub>x</sub> (Oxide of Nitrogen)
Industrial and mixed area	mg/m <sup>3</sup>	500	120	100
Commercial and mixed area	mg/m <sup>3</sup>	400	100	100
Residential and Rural area	mg/m <sup>3</sup>	200	80	80
Sensitive area	mg/m <sup>3</sup>	100	30	30

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

Notes:

- The 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 microns or less.

**Table 2.2: Bangladesh Standards for Noise**

Location Category	Standards determined at dB(A) 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 AM to 09.00 PM, 'Nighttime' is 09.00 PM to 06.00 AM; 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 19<sup>th</sup> July, 2005)**

Pollutant	Objective	Averaging Time
PM <sub>2.5</sub>	15 µg /m <sup>3</sup>	Annual (f)
	65 µg /m <sup>3</sup>	24-hour (h)
PM <sub>10</sub>	50 µg /m <sup>3</sup>	Annual (b)
	150 µg /m <sup>3</sup>	24-hours(g)
SPM	200 µg /m <sup>3</sup>	8-hours
SO <sub>2</sub>	80 µg / m <sup>3</sup> ; (0.03 ppm)	Annual
	365 µg / m <sup>3</sup> ; (0.14 ppm)	24-hour (a)
NO <sub>x</sub>	100 µg /m <sup>3</sup> ; (0.053 ppm)	Annual
CO	10mg/m <sup>3</sup> ; (9 ppm) (a)	8-hours (a)
	40mg/m <sup>3</sup> ; (35 ppm) (a)	1-hour (a)
Lead	0.5 µg/m <sup>3</sup>	Annual (i)
Ozone	157 µg /m <sup>3</sup> ; (0.08 ppm)	8-hour (e)
	235 µg /m <sup>3</sup> ; (0.12 ppm)	1-hour(d)

Notes:

- Not to be exceeded more than once per year
- The objective is attained when the annual arithmetic mean is less than or equal to 50µg/m<sup>3</sup>.
- The objective is attained when the expected number of days per the calendar year with a 24-hour average of 150µg/m<sup>3</sup> is equal to or less than 1.
- The objective is attained when the expected number of days per the calendar year with the maximum hourly average of 0.12 ppm is equal to or less than 1.
- 3-year average of annual 4th highest concentration
- Spatially averaged over designated monitors
- From the 99th percentile.
- From the 98th percentile,
- 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 7<sup>th</sup> September, 2006)**

Schedule -1 Rules 5(2) (Area Based Noise level value)

Location Category	Standards determined at dB(A) Leq unit	
	Day	Night
Silent Zone	50	40
Residential Area	55	45
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 1 (Revised 7<sup>th</sup> September 2006), A Compilation of Environmental Laws, DoE

### 3.0 COMPLIANCE OF ENVIRONMENTAL COVENANTS FROM THE ADB LOAN AGREEMENT

#### 3.1 Covenants from the ADB Loan Agreement

Covenants	Reference	Compliance status
<b>Environment</b>		
<p>The borrower shall ensure, or cause APSCL to ensure, that the preparation, design, construction implementation, operation and decommissioning of the project and all project facilities comply with</p> <p>(a) All applicable laws and regulations of the Borrower relating to the environment, health, and safety;</p> <p>(b) The environmental safeguards;</p> <p>(c) The EARF; and</p> <p>(d) All measures and requirement set forth in the respective EIA, IEE and EMP, and any corrective or preventive actions set forth in a safeguards monitoring report</p>	LA, Schedule 5, Para 2	The environmental monitoring will have been carried out in all three phase i.e. pre-construction, during construction and post-construction phase or operation phase
<p><b>Land Acquisition and Involuntary Resettlement</b></p> <p>The borrower shall ensure, or cause APSCL to ensure, that all land and all rights-of-way required for the project, and all project facilities are made available to the works contractor in accordance with the schedule agrees under the related works contract and all land acquisition and resettlement activities are implemented in compliance with</p> <p>(a) all applicable laws and regulations of the borrower relating to land acquisition and involuntary resettlement;</p> <p>(b) the involuntary resettlement safeguards;</p> <p>(c) the RF; and</p> <p>(d) All measures and requirement set forth in the respective RP, and any corrective or preventive actions set forth in a safeguard monitoring report.</p>	LA, Schedule 5, Para 3	In the case of APSCL, this type of issues DoEs not arise due to the project location. The project location is inside the premises of APSCL own land. So, There is no requirements of Land Acquisition and Involuntary Resettlement
<b>Safeguards – Related provisions in bidding documents and works contracts</b>		

<p>The borrower shall ensure, or cause each project executing agency to ensure, that all bidding documents and contracts for works contain provisions that require the contractor to:</p> <ul style="list-style-type: none"> <li>(a) Comply with the measures and requirements relevant to the contractor set forth in the EIA, IEE, the EMP, the RP and any small ethnic community peoples plan (to the extent they concern impacts on affected people during construction), and any corrective or preventive actions set out in a safeguards monitoring report;</li> <li>(b) Make available a budget for all such environmental and social measures;</li> <li>(c) Provide the borrower with a written notice of any unanticipated environmental, resettlement or small ethnic community people risks or impacts that arise during construction, implementation or operation of the project that were not considered in the EIA, the IEE, the EMP, the RP or any small ethnic community peoples plan;</li> <li>(d) Adequately record the condition of roads, agricultural and other infrastructure prior to starting to transport materials and construction;</li> <li>(e) Fully reinstate pathways, other local infrastructure, and agricultural land to at least their pre-project condition upon the completion of construction.</li> </ul>	<p>LA, Schedule 5, Para 7</p>	<p>The safeguards- related provisions in bidding documents and work contracts have been followed strictly and update time to time for further requirements.</p>
<p><b>Safeguards- Monitoring and Reporting</b></p>		
<p>The borrower shall do the following or shall cause APSCL to do the following:</p> <ul style="list-style-type: none"> <li>(a) Submit semiannual safeguards monitoring reports to ADB and disclose relevant information from such reports to affected persons promptly upon submission;</li> <li>(b) If any unanticipated environmental and or social risks and impacts arise during construction, implementation or operation of the project that were not considered in the EIA, the IEE, the EMP or the RP,</li> </ul>	<p>LA, Schedule 5, Para 7</p>	<p>The Safeguards monitoring will have been carried out in all three phase i.e. pre-construction, during construction and post-construction phase or operation phase</p>



<p>promptly inform ADB of the occurrence of such risks or impacts, with detailed description of the event and proposed corrective action plan;</p> <p>(c) No later than the mobilization of the turnkey contractor for APSCL's power plant, engage qualified and experienced external experts or qualified non-governmental organizations under a selection process and terms of reference acceptable to ADB, to verify information produced through the project monitoring process, and facilitated the carrying out of any verification by such external experts; and</p> <p>(d) Report any actual or potential breach of compliance with the measures and requirements set forth in the EMP or the RP promptly after becoming aware of the breach.</p>		
<b>Labor standards</b>		
<p>The borrower shall ensure that all works contract documents to be prepared under the project incorporate provisions and budget to the effect that contractors</p> <p>(a) Comply with all applicable labor laws and related international treaty obligations of the borrower and do not employ child labor as defined under Bangladesh law;</p> <p>(b) Provide safe working conditions for male and female workers;</p> <p>(c) Carry out HIV/ AIDS and human trafficking prevention and awareness campaigns in the campsites and corridors of influence;</p> <p>(d) Engage women worker as wage laborers depending on their skill; and</p> <p>(e) Provide equal wages for equal work between men and women</p>	<p>LA, Schedule 5, Para 10</p>	<p>The labor standards will have been followed strictly.</p>

#### **4.0 COMPLIANCE TO ENVIRONMENTAL MANAGEMENT PLAN**

##### **4.1 Major Environmental Activities of the Project**

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

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

##### **4.1.1 Site-Specific Environmental Management Plan**

**Table 4.1:** HS&E and Social Mitigation and Management Plan for Pre-construction and Construction Phase

Mitigation No.	Issue/Impact	Receptor	Mitigation	Responsibility		Key Performance Indicators
				Implementation	Supervision	
1	<ul style="list-style-type: none"> <li>Dust emissions caused by construction activities, construction vehicle movements, transport of construction materials.</li> <li>Exhaust emissions from vehicles being used for transportation/operation of construction, materials/supplies and workforce.</li> </ul>	Air Quality	<ul style="list-style-type: none"> <li>Appropriate siting and maintenance of stockpiles of materials so as to minimize dust blow (seek to achieve a distance of at least 500m from nearest sensitive receptors);</li> <li>The design of stockpiles will be optimized to retain a low profile with no sharp changes in shape;</li> <li>Minimizing drop heights for material transfer activities such as unloading of materials;</li> <li>All chutes, conveyors and skips will be covered at all times.</li> <li>Site access and roads will be regularly kept damp via a water browser;</li> <li>Wheel wash for all vehicles leaving the Project site will be provided;</li> <li>Open burning on the project site will be prohibited;</li> <li>Roads will be compacted and graveled if necessary;</li> </ul>	CNTIC (EPC Contractor)	<ul style="list-style-type: none"> <li>APSCL;</li> <li>OE E&amp;S Safeguard Consultants;</li> <li>Independent Local Environmental and Social Monitoring Consultant.</li> </ul>	<ul style="list-style-type: none"> <li>SPM, PM<sub>2.5</sub>, PM<sub>10</sub>, NO<sub>2</sub>, SO and CO monitoring at sensitive receptors in accordance with the requirements specified in Table 3;</li> <li>Vehicle, equipment and machinery checklists observed;</li> <li>Annual maintenance records observed.</li> <li>Community grievance mechanism implemented and records documented.</li> </ul>

Mitigation No.	Issue/Impact	Receptor	Mitigation	Responsibility		Key Performance Indicators
				Implementation	Supervision	
			<ul style="list-style-type: none"> <li>• Site roads will be maintained in good order;</li> <li>• Lorries transporting construction materials and soil will be covered appropriately to avoid soil dispersion;</li> <li>• Enforcement of vehicle speed limits within the APSCL site to not exceed 10 km/h;</li> <li>• All sand and aggregates will be stored in bounded areas and will not be allowed to dry out unless specifically required;</li> <li>• On-site and off-site haul roads will be inspected for integrity and necessary repairs to the surfaces will be undertaken as soon as reasonably practicable;</li> <li>• All vehicles, equipment and machinery will undergo a pre-use inspection prior to use;</li> <li>• All vehicles will undergo periodic maintenance inspections;</li> <li>• Implement community grievance mechanism shown in the stakeholder engagement plan in Annex D.</li> <li>• Monitoring of Suspended Particulate Matter (SPM), Particulate Matter 2.5</li> </ul>			

Mitigation No.	Issue/Impact	Receptor	Mitigation	Responsibility		Key Performance Indicators
				Implementation	Supervision	
			(PM <sub>2.5</sub> ) and Particulate Matter 10 (PM <sub>10</sub> ), Nitrogen Dioxide (NO <sub>2</sub> ), Sulphur Dioxide (SO <sub>2</sub> ) and Carbon Monoxide (CO) by third party consultant.			
2	Increased noise in the Project area and at sensitive receptors a result of the use of construction activities, machinery and increased vehicle movements.	Noise	<ul style="list-style-type: none"> <li>• Provision of a noise barrier around the project site to reduce off-site noise levels;</li> <li>• Enforcement of vehicle speed limits which will not exceed 10 km/h within the APSCL site;</li> <li>• Strict controls of vehicle routing;</li> <li>• Diesel engine construction equipment will be fitted with silencers;</li> <li>• Noisy construction activities will be limited at night;</li> <li>• Light vehicle movements will be prohibited at night;</li> <li>• Piling activities will be carried out during the daytime hours (i.e. 7AM to 6PM);</li> <li>• Where possible the CCGT construction works and activities will conclude at 6PM daily;</li> <li>• Implementation of a community grievance mechanism shown in the</li> </ul>	CNTIC (EPC Contractor)	<ul style="list-style-type: none"> <li>• APSCL;</li> <li>• OE E&amp;S Safeguard Consultants;</li> <li>• Independent Local Environmental and Social Monitoring Consultant.</li> </ul>	<ul style="list-style-type: none"> <li>• Noise monitoring at sensitive receptors in accordance with the requirements specified in Table 3;</li> <li>• Community grievance mechanism implemented and records documented.</li> </ul>

Mitigation No.	Issue/Impact	Receptor	Mitigation	Responsibility		Key Performance Indicators
				Implementation	Supervision	
			stakeholder engagement plan in Annex D; <ul style="list-style-type: none"> <li>Monitoring of noise by a third-party consultant.</li> </ul>			
3	Site Clearance-Vegetation removal and Habitat disturbance	Terrestrial Biodiversity	<ul style="list-style-type: none"> <li>Hunting and poaching will be prohibited for staff, workers, all contractors and personnel engaged in or associated with the Project, with penalties levied, including fines and dismissal, and prosecution under the relevant laws for clearing vegetation;</li> <li>Training to staff and workers on all rules, regulations and information concerning restrictions related to hunting and poaching will be provided, as well as the punishment that can expected if any staff or workers or other person associated with the Project violates rules and regulations;</li> <li>All vehicles are to maintain a speed of a maximum of 10km/hr within the APSCL site to reduce the risk of fauna strike;</li> <li>The planned vegetation clearance area for the construction works shall be clearly identified and marked/fenced to avoid accidental clearing.</li> </ul>	CNTIC (EPC Contractor)	<ul style="list-style-type: none"> <li>APSCL;</li> <li>OE E&amp;S Safeguard Consultants;</li> <li>Independent Local Environmental and Social Monitoring Consultant.</li> </ul>	<ul style="list-style-type: none"> <li>Vegetation clearance areas marked/fenced;</li> <li>No. of floral species conserved or planted recorded, if any;</li> <li>Workers Training Records showing appropriate training.</li> </ul>

Mitigation No.	Issue/Impact	Receptor	Mitigation	Responsibility		Key Performance Indicators
				Implementation	Supervision	
4	<p>Site clearance, excavation and disposal of material activities resulting in exposure of potentially contaminated soils and impacting groundwater.</p> <p>Spillage or leakage of substances on land, movement of equipment and vehicles on site resulting in contamination of soils and groundwater.</p>	Soils and Groundwater	<ul style="list-style-type: none"> <li>• Development of an effective site drainage systems designed to include allowance for climate change;</li> <li>• Restrict site access only to construction site areas;</li> <li>• Disposal of waste materials unsuitable for reuse on-site, (e.g. for landfilling) at appropriately licensed sites;</li> <li>• Installation of oil and suspended solid interceptors;</li> <li>• Management of excavations during construction to avoid the generation of drainage pathways to underlying aquifers;</li> <li>• Provision of impermeable bases in operational areas to prevent absorption of spillages.</li> <li>• Scheduling clearance activities to avoid extreme weather events such as heavy rainfall, extreme dry and high winds.</li> <li>• Demarcate routes for movement of heavy vehicles to minimize disturbance of exposed soils and compaction of sub-surface layers.</li> </ul>	CNTIC (EPC Contractor)	<ul style="list-style-type: none"> <li>• APSCL;</li> <li>• OE E&amp;S Safeguard Consultants;</li> <li>• Independent Local Environmental and Social Monitoring Consultant.</li> </ul>	<ul style="list-style-type: none"> <li>• Groundwater Monitoring in accordance with the requirements specified in Table 3.</li> <li>• Soil Quality Monitoring in accordance with the requirements specified in Table 3.</li> </ul>

Mitigation No.	Issue/Impact	Receptor	Mitigation	Responsibility		Key Performance Indicators
				Implementation	Supervision	
			<ul style="list-style-type: none"> <li>• Reuse topsoil within rehabilitation activities.</li> <li>• Control erosion through diversion drains, sediment fences, and sediment retention basins.</li> <li>• Stockpiles are to be located in areas surrounded by natural wind barriers to minimize the potential for wind erosion.</li> <li>• No septic tanks will be installed within 500m of a deep or shallow tube well used by the community for drinking water.</li> <li>• Septic tanks will be installed in well drained and permeable soils well above high groundwater level and where sufficient soil percolation exists for design wastewater loading rate. It will be appropriately designed to prevent hazards to human health or contamination of land or water. Regular maintenance will be undertaken. No overflow of septic tank is permitted.</li> <li>• Quarterly monitoring of groundwater wells within 1 km of septic tanks by third party consultant;</li> <li>• Annual soil quality sampling by third party consultant.</li> </ul>			



Mitigation No.	Issue/Impact	Receptor	Mitigation	Responsibility		Key Performance Indicators
				Implementation	Supervision	
5	Increased suspended sediment and pollutant loads, permanent loss and disturbance to aquatic flora and fauna due to the construction of the intake structure and water discharge structure.	Aquatic Environment and River Water Quality	<ul style="list-style-type: none"> <li>Construction Method Statement to be produced by the CNTIC;</li> <li>Coffer dam to be used during in-channel works to minimize downstream sediment release;</li> <li>Inlet structure construction in river will be undertaken outside the breeding season of fishes;</li> <li>Dredged areas will be limited to the minimum area required;</li> <li>Disposal of dredged sediments to an agreed site only;</li> <li>All works will be made clearly visible using flags, beacons and/or signals;</li> <li>Bank area will be reinstated following construction;</li> <li>River water sampling during dredging and in river works by third party consultant.</li> </ul>	CNTIC (EPC Contractor)	<ul style="list-style-type: none"> <li>APSCL;</li> <li>OE E&amp;S Safeguard Consultants;</li> <li>Independent Local Environmental and Social Monitoring Consultant.</li> </ul>	<ul style="list-style-type: none"> <li>Construction Method Statement by CNTIC</li> <li>River water sampling in accordance with the requirements specified in Table 3.</li> </ul>
6	Contamination of the aquatic environment as a result of construction activities on land e.g. spillages, disposal of liquid wastes; surface run-off,	Aquatic Environment and River Water Quality	<ul style="list-style-type: none"> <li>No discharge of effluents into the river. All effluents shall be collected and removed off site for treatment by approved firms or disposed after appropriate treatment at site (records of effluent transfers to be maintained);</li> </ul>	CNTIC (EPC Contractor)	<ul style="list-style-type: none"> <li>APSCL;</li> <li>OE E&amp;S Safeguard Consultants;</li> </ul>	<ul style="list-style-type: none"> <li>Waste transfer note system to document transport of waste;</li> <li>Temporary Site Drainage Plan;</li> </ul>

Mitigation No.	Issue/Impact	Receptor	Mitigation	Responsibility		Key Performance Indicators
				Implementation	Supervision	
	exposure of contaminated soils.		<ul style="list-style-type: none"> <li>• No discharge of surface water runoff direct into the river;</li> <li>• Development of a temporary site drainage plan which reduces flow velocity and sediment load by passing discharge through a sediment pond;</li> <li>• Protection of temporary stockpiles of soil from erosion by using a reduced slope angle where practical, sheeting and by incorporating sediment traps in drainage ditches;</li> <li>• Stockpiles will be located at least 100 m from water bodies;</li> <li>• All fuel, oil and chemicals will be stored in bounded area to accommodate 110% volume;</li> <li>• Impermeable surfaces will be used for refueling;</li> <li>• Regular training of all workers in spill response;</li> <li>• Provision of spill equipment at easily accessible locations around the site;</li> <li>• River water sampling by third party consultant.</li> </ul>		<ul style="list-style-type: none"> <li>• Independent Local Environmental and Social Monitoring Consultant.</li> </ul>	<ul style="list-style-type: none"> <li>• Workers Training Records showing appropriate training;</li> <li>• River water sampling in accordance with the requirements specified in Table 3.</li> </ul>

Mitigation No.	Issue/Impact	Receptor	Mitigation	Responsibility		Key Performance Indicators
				Implementation	Supervision	
7	Generation, handling, treatment and disposal of solid and liquid hazardous and non- hazardous wastes.	Environmental Quality	<ul style="list-style-type: none"> <li>• All waste taken off-site will be undertaken by a licensed contractor and the CNTIC will audit the disposal procedure;</li> <li>• Collection and segregation of wastes and safe storage onsite will be undertaken;</li> <li>• Prior agreement of standards for storage, management and disposal with relevant authorities will be obtained.</li> <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 will be undertaken;</li> <li>• Appropriate disposal of solid waste (in designated waste bins);</li> <li>• Development of a Waste Inventory (hazardous and non-hazardous) detailing waste name, waste classification, waste type, source of waste, waste storage area, storage quality, delivery quality, balance quality, agreement information with disposal company.</li> </ul>	CNTIC (EPC Contractor)	<ul style="list-style-type: none"> <li>• APSCL;</li> <li>• OE E&amp;S Safeguard Consultants;</li> <li>• Independent Local Environmental and Social Monitoring Consultant.</li> </ul>	<ul style="list-style-type: none"> <li>• Waste Inventory (hazardous and non-hazardous) implemented.</li> <li>• Waste transfer note system to document transport of waste.</li> </ul>

Mitigation No.	Issue/Impact	Receptor	Mitigation	Responsibility		Key Performance Indicators
				Implementation	Supervision	
			<ul style="list-style-type: none"> <li>A system for documenting waste movements to be created. A trip ticket or waste transfer note system to be used to document all waste types leaving the Project area, their hauler, source, proposed disposal site etc. These tickets should be produced as counterfoil to create a full audit trail.</li> </ul>			
8	Health and Safety impacts due to construction traffic.	Local communities and workers.	<ul style="list-style-type: none"> <li>Traffic Management Plan shown in Annex E to be implemented and updated as required;</li> <li>Adherence of abnormal load movements to prescribed routes, outside peak hours and advance publication to of movements to communities if required;</li> <li>Construction shifts will be staggered;</li> <li>Scheduling of traffic to avoid peak hours on local roads;</li> <li>Routing of transport to avoid residential areas;</li> <li>Provision of adequate signage and flagmen along transport route and at site entrance;</li> <li>Transportation of construction workers by contract bus;</li> </ul>	CNTIC (EPC Contractor)	<ul style="list-style-type: none"> <li>APSCL;</li> <li>OE E&amp;S Safeguard Consultants;</li> <li>Independent Local Environmental and Social Monitoring Consultant.</li> </ul>	<ul style="list-style-type: none"> <li>Traffic Management Plan implemented and updated;</li> <li>Survey of roads and bridges prior to start of works for safety;</li> <li>Vehicle checklists observed;</li> <li>Annual maintenance vehicle records observed;</li> <li>Driver training records observed;</li> <li>Speed test monitoring results</li> </ul>

Mitigation No.	Issue/Impact	Receptor	Mitigation	Responsibility		Key Performance Indicators
				Implementation	Supervision	
			<ul style="list-style-type: none"> <li>• Ensure all roads and bridges used by construction traffic are maintained in at least their current state during construction with any damage immediately repaired;</li> <li>• Condition survey of roads and bridges to be undertaken by third party consultant prior to start of works to provide a baseline for monitoring compliance;</li> <li>• Installation of appropriate traffic sign and warnings;</li> <li>• Enforce speed limit regulations on off-site access roads;</li> <li>• Speed limit of 10 km per hour within APSCL site;</li> <li>• Vehicles will be kept in good condition, with regular checks of vehicle condition undertaken to ensure compliance with national standards;</li> <li>• Ensure all Project drivers are trained in safety awareness;</li> <li>• Implement a grievance mechanism for communities.</li> </ul>			<p>(onsite and offsite) observed;</p> <ul style="list-style-type: none"> <li>• Community grievance mechanism implemented and records documented.</li> </ul>

Mitigation No.	Issue/Impact	Receptor	Mitigation	Responsibility		Key Performance Indicators
				Implementation	Supervision	
9	Health and Safety impacts due to unauthorized persons accessing the site.	Local Communities.	<ul style="list-style-type: none"> <li>Public access to the site will be restricted;</li> <li>Site security procedures to be established.</li> </ul>	CNTIC (EPC Contractor)	<ul style="list-style-type: none"> <li>APSCL;</li> <li>OE E&amp;S Safeguard Consultants;</li> <li>Independent Local Environmental and Social Monitoring Consultant.</li> </ul>	<ul style="list-style-type: none"> <li>Site Security Procedures established and implemented.</li> </ul>
10	Health and Safety impacts due to influx of workers.	Local Communities.	<ul style="list-style-type: none"> <li>Regular talks on communicable diseases including HIV to be held for all workers;</li> <li>Compulsory medical examinations for construction workers;</li> <li>Liaison with the local police and healthcare providers to ensure no additional pressure has been placed on them due to construction worker influx;</li> <li>Implement community grievance mechanism shown in the stakeholder engagement plan in Annex D.</li> </ul>	CNTIC (EPC Contractor)	<ul style="list-style-type: none"> <li>APSCL;</li> <li>OE E&amp;S Safeguard Consultants;</li> <li>Independent Local Environmental and Social Monitoring Consultant.</li> </ul>	<ul style="list-style-type: none"> <li>Workers Health and Education Procedures established and implemented;</li> <li>Workers Training Records showing appropriate trainings.</li> <li>Medical Examination Records observed;</li> <li>Records of engagement with local police and</li> </ul>

Mitigation No.	Issue/Impact	Receptor	Mitigation	Responsibility		Key Performance Indicators
				Implementation	Supervision	
						healthcare providers <ul style="list-style-type: none"> <li>Community grievance mechanism implemented and records documented.</li> </ul>
11	Potential chance finds of archaeological remains during Construction.	Cultural Heritage and Archaeology	If remains are found, the following actions will be undertaken: <ul style="list-style-type: none"> <li>Cease activities and consult with archaeological department and DOE;</li> <li>Protection in situ if possible;</li> <li>Excavation of areas where protection not feasible following discussion and agreement of archaeological department and DOE.</li> </ul>	CNTIC (EPC Contractor)	<ul style="list-style-type: none"> <li>APSCL;</li> <li>OE E&amp;S Safeguard Consultants;</li> <li>Independent Local Environmental and Social Monitoring Consultant</li> </ul>	<ul style="list-style-type: none"> <li>Cultural Heritage and Archaeology Site Find Records (if remains are found).</li> </ul>
12	Occupational Health and Safety	Workers Health and Safety	<ul style="list-style-type: none"> <li>Sufficient and qualified HSE staff to ensure safe working practices.</li> <li>Pre-construction and continued assessment of the HSE and social risks and hazards by implementing an HSE and social Risk Register;</li> <li>Implementation of contractors HSE Plan which will considers the requirements of</li> </ul>	CNTIC (EPC Contractor)	<ul style="list-style-type: none"> <li>APSCL;</li> <li>OE E&amp;S Safeguard Consultants;</li> <li>Independent Local Environmental and Social</li> </ul>	<ul style="list-style-type: none"> <li>HS&amp;E capacity and competency observed to be appropriate;</li> <li>HS&amp;E and Social Risk Register established and reviewed;</li> </ul>

Mitigation No.	Issue/Impact	Receptor	Mitigation	Responsibility		Key Performance Indicators
				Implementation	Supervision	
			<p>the WBG HSE Guidelines for Occupational, Health Safety;</p> <ul style="list-style-type: none"> <li>• Method Statement and Permit to Work procedures to be implemented.</li> <li>• Implementation of Fire Safety Plan prior to commissioning any part of the plant;</li> <li>• Implementation of Emergency Response and Disaster Management Plan shown in Annex F.</li> <li>• Provision of appropriate training on HSE issues for all workers;</li> <li>• Provision of health and safety information;</li> <li>• Regular inspection, review and recording of HSE performance;</li> <li>• Appointment of site nurse and provision of free on-site medical care for all construction staff;</li> <li>• Pest and vector borne disease control procedures established and be implemented;</li> <li>• Maintenance of a high standard of housekeeping at all times.</li> <li>• Provision of first aid equipment at easily</li> </ul>		Monitoring Consultant	<ul style="list-style-type: none"> <li>• Contractors HS&amp;E Plan established and implemented;</li> <li>• Method Statement and Permit to Work Procedures implemented appropriately.</li> <li>• Fire Safety Plan;</li> <li>• Emergency Response and Disaster Management Plan established and implemented;</li> <li>• HSE Training Plan established and implemented;</li> <li>• HSE Training Records showing appropriate training;</li> <li>• Pest and vector borne disease control procedures</li> </ul>



Mitigation No.	Issue/Impact	Receptor	Mitigation	Responsibility		Key Performance Indicators
				Implementation	Supervision	
			<ul style="list-style-type: none"> <li>No employee should be exposed to a noise level greater than 85 dB (A) for a duration of more than 8 hours per day without hearing protection. And no unprotected ear should be exposed to a peak sound pressure level of more than 140 dB(C). The use of hearing protection should be enforced actively when the equivalent sound level over 8 hours reaches 85 dB(A), the peak sound levels reaches 140 dB(C), or the average maximum sound level reaches 110 dB(A). Hearing protective devices provided should be capable of reducing sound levels at the ear to at least 85dB(A);</li> <li>Monthly monitoring of the quality of workers drinking water by third party consultant.</li> </ul>			<p>established and implemented</p> <ul style="list-style-type: none"> <li>Incident Reporting Procedure (records of fatalities, incidents, accidents, near misses and corrective actions) established and implemented.</li> <li>Drinking water quality monitoring in accordance with requirements shown in Table 4.0.1.</li> </ul>

**Table 4.2:** HS&E and Social Monitoring Plan for Construction

Mitigation No. Ref.	Environmental and Social Parameter	Aspect	Monitoring Activities	Duration and Frequency	Responsibility	Monitoring Locations	Methods	Reporting	Applicable Standards
1	Air Quality	Dust generation and exhaust emissions.	Implementation of mitigation measures and assessment of performance indicators.	Daily	CNTIC	Dust generation activities onsite and offsite.	Visual observation	<ul style="list-style-type: none"> <li>CNTIC Monthly HSE Monitoring Report for APSCL and DoE.</li> <li>APSCL Semi-Annual Environmental Report for ADB</li> </ul>	<ul style="list-style-type: none"> <li>Bangladesh Environmental Conservation Rules, 1997.</li> <li>WBG General EHS Guidelines for Construction and Decommissioning, 2007.</li> </ul>
			Monitoring and supervision to ensure the implementation of mitigation measures by all contractors.	Weekly	APSCL	Dust generation activities onsite and offsite.	Visual observation	<ul style="list-style-type: none"> <li>CNTIC Monthly HSE Monitoring Report for APSCL and DoE.</li> <li>APSCL Semi-Annual Environmental Report for ADB.</li> </ul>	<ul style="list-style-type: none"> <li>Bangladesh Environmental Conservation Rules, 1997.</li> <li>WBG General EHS Guidelines for Construction and Decommissioning, 2007.</li> </ul>
			SPM, PM <sub>2.5</sub> , PM <sub>10</sub> , NO <sub>2</sub> , SO <sub>2</sub> and CO monitoring by	Once per month for a 24-hour period.	CNTIC	<ul style="list-style-type: none"> <li>South-West side of Project area near APSCL Admin building.</li> </ul>	Particulates Respirable Dust Sampler (Model-Envirotech India APM-460BL) and Fine	<ul style="list-style-type: none"> <li>CNTIC Monthly HSE Monitoring Report for</li> </ul>	<ul style="list-style-type: none"> <li>Bangladesh National Ambient Air Quality</li> </ul>

Mitigation No. Ref.	Environmental and Social Parameter	Aspect	Monitoring Activities	Duration and Frequency	Responsibility	Monitoring Locations	Methods	Reporting	Applicable Standards
			third party consultant.			Location: 24°02'38.5'' N and 91°1'0.0'' E • Settlement, near south east corner of the project – Location: 24°02'34.7'' N and 91°01'8.7'' E • PDB High School – Location: 24°02'30.5'' N and 91°0'42.2'' E • Hazzi Jolli High School – Location: 24°02'31.7'' N and 91°0'30.3'' E • APSCL Dormitory – Location: 24°02'58.5'' N and 91°01'23.9'' E.	Particulate Sampler (Model-Envirotech India AAS-127BL). <u>Nitrogen Dioxide</u> Gravimetric <u>Sulphur Dioxide</u> Gravimetric <u>Carbon Monoxide</u> Gravimetric	APSCL and DoE. • APSCL Semi-Annual Environmental Report for ADB	Standards – Environmental Conservation Rules – Schedule 2 (Amended in 2005) by S.R.O. No: 220-Law/2005. Refer to Annex G.

Mitigation No. Ref.	Environmental and Social Parameter	Aspect	Monitoring Activities	Duration and Frequency	Responsibility	Monitoring Locations	Methods	Reporting	Applicable Standards
			Community Grievance Records	As received.	CNTIC	Not applicable	Visual observation	<ul style="list-style-type: none"> <li>CNTIC Monthly HSE Monitoring Report for APSCL and DoE.</li> <li>APSCL Semi-Annual Environmental Report for ADB</li> </ul>	<ul style="list-style-type: none"> <li>ADB Safeguards Policy Statement: Environmental Safeguards, 2009.</li> </ul>
2	Noise	Construction noise from machinery and vehicle movements	Implementation of mitigation measures and assessment of performance indicators.	Daily	CNTIC	Noise generation activities onsite and offsite.	Visual observation	<ul style="list-style-type: none"> <li>CNTIC Monthly HSE Monitoring Report for APSCL and DoE.</li> <li>APSCL Semi-Annual Environmental Report for ADB</li> </ul>	<ul style="list-style-type: none"> <li>Bangladesh Environmental Conservation Rules, 1997.</li> <li>WBG General EHS Guidelines for Construction and Decommissioning, 2007.</li> </ul>
			Monitoring and supervision to ensure the implementation of the mitigation measures.	Weekly	APSCL	Noise generation activities onsite and offsite.	Visual observation	<ul style="list-style-type: none"> <li>CNTIC Monthly HSE Monitoring Report for APSCL and DoE.</li> <li>APSCL Semi-Annual Environmental</li> </ul>	<ul style="list-style-type: none"> <li>Bangladesh Environmental Conservation Rules, 1997.</li> <li>WBG General EHS Guidelines for Construction and</li> </ul>

Mitigation No. Ref.	Environmental and Social Parameter	Aspect	Monitoring Activities	Duration and Frequency	Responsibility	Monitoring Locations	Methods	Reporting	Applicable Standards
								Report for ADB.	Decommissioning, 2007.
			Noise monitoring of LAeq, one 1 hour noise levels by third party consultant.	Once per month for a 24 hour period.	CNTIC	<ul style="list-style-type: none"> <li>• South-West side of Project area near APSCL Admin building. Location: 24°02'38.5'' N and 91°1'0.0'' E</li> <li>• Settlement, near south east corner of the project – Location: 24°02'34.7'' N and 91°01'8.7'' E</li> <li>• PDB High School – Location: 24°02'30.5'' N and 91°0'42.2'' E</li> <li>• Hazzi Jolli High School – Location: 24°02'31.7'' N and 91°0'30.3'' E</li> </ul>	Noise quality is being measured instantly on the site by CEM Sound level meter (Model DT8850. Continuous monitoring observed at each location.	<ul style="list-style-type: none"> <li>• CNTIC Monthly HS&amp;E Monitoring Report for APSCL and DoE.</li> <li>• APSCL Semi-Annual Environmental Report for ADB.</li> </ul>	<ul style="list-style-type: none"> <li>• Bangladesh Standard for Sound – Environmental Conservation Rules – Schedule 4. Refer to Annex G.</li> <li>• WBG General EHS Guidelines for Construction and Decommissioning, 2007.</li> </ul>

Mitigation No. Ref.	Environmental and Social Parameter	Aspect	Monitoring Activities	Duration and Frequency	Responsibility	Monitoring Locations	Methods	Reporting	Applicable Standards
						<ul style="list-style-type: none"> <li>APSCL Dormitory – Location: 24°02'58.5'' N and 91°01'23.9'' E.</li> </ul>			
			Community Grievance Records	As received.	CNTIC	Not applicable	Visual observation	<ul style="list-style-type: none"> <li>CNTIC Monthly HS&amp;E Monitoring Report for APSCL and DoE.</li> <li>APSCL Semi-Annual Environmental Report for ADB</li> </ul>	<ul style="list-style-type: none"> <li>ADB Safeguards Policy Statement: Environmental Safeguards, 2009.</li> </ul>
3	Terrestrial Biodiversity	Site Clearance - Vegetation removal and Habitat disturbance .	Implementation of mitigation measures and assessment of performance indicators.	Daily	CNTIC	Construction Site	Visual observation	<ul style="list-style-type: none"> <li>CNTIC Monthly HS&amp;E Monitoring Report for APSCL and DoE.</li> <li>APSCL Semi-Annual Environmental Report for ADB</li> </ul>	<ul style="list-style-type: none"> <li>ADB Safeguard Policy Statement: Environmental Safeguards, 2009.</li> </ul>
			Monitoring and supervision to	Weekly	APSCL	Construction Site	Visual observation	<ul style="list-style-type: none"> <li>CNTIC Monthly HS&amp;E Monitoring</li> </ul>	<ul style="list-style-type: none"> <li>ADB Safeguard Policy</li> </ul>

Mitigation No. Ref.	Environmental and Social Parameter	Aspect	Monitoring Activities	Duration and Frequency	Responsibility	Monitoring Locations	Methods	Reporting	Applicable Standards
			ensure the implementation of the mitigation measures.					Report for APSCL and DoE. • APSCL Semi-Annual Environmental Report for ADB.	Statement: Environmental Safeguards, 2009.
4	Soils and Groundwater	Site clearance, excavation and disposal of material, exposure of potentially contaminated soils, spillage or leakage of substances on land, movement of equipment and vehicles on site.	Implementation of mitigation measures and assessment of performance indicators.	Daily	CNTIC	Construction Site	Visual observation	• CNTIC Monthly HS&E Monitoring Report for APSCL and DoE. • APSCL Semi-Annual Environmental Report for ADB	• WBG General EHS Guidelines for Construction and Decommissioning, 2007.
			Monitoring and supervision to ensure the implementation of the mitigation measures.	Weekly	APSCL	Construction Site	Visual observation	• CNTIC Monthly HS&E Monitoring Report for APSCL and DoE. • APSCL Semi-Annual Environmental Report for ADB.	• WBG General EHS Guidelines for Construction and Decommissioning, 2007.

Mitigation No. Ref.	Environmental and Social Parameter	Aspect	Monitoring Activities	Duration and Frequency	Responsibility	Monitoring Locations	Methods	Reporting	Applicable Standards
			Groundwater monitoring for Groundwater level, pH, TDS, Ammonia, Nitrate, Phosphate, Arsenic (As), Iron (Fe), Manganese (Mn) and Coliforms by third party consultant.	Quarterly (every 3 months)	CNTIC	i. Inside the project area. Location: 24° 02'38.1''N and 91° 0'58.0''E ii. South-west side of Project area near PDB High School. Location: 24° 2'30.5"N and 91°00'42.2"E. iii. South-East side of the project. Location: 24° 02'34.1''N and 91° 1' 9.3''E iv. North-East side of the project area. Location: 24° 02' 47.2''N and 91° 1'12.3''E	pH – pH meter; TDS – TDS meter Ammonia – Photometric. Nitrate – Potentiometric. Phosphate – Photometric. As – Atomic Absorption Spectroscopy. Fe – Spectrophotometer. Mn – Atomic Absorption Spectroscopy. Coliforms – Membrane Filter Techniques.	<ul style="list-style-type: none"> <li>CNTIC Monthly HS&amp;E Monitoring Report for APSCL and DoE.</li> <li>APSCL Semi-Annual Environmental Report for ADB.</li> </ul>	<ul style="list-style-type: none"> <li>Bangladesh Standard for Drinking Water – Environmental Conservation Rules – Schedule 3. Refer to Annex G.</li> </ul>
			Soil quality monitoring for	Annual	CNTIC	One location on the construction site.	Cr - Acid digestion and AAS;	<ul style="list-style-type: none"> <li>CNTIC Monthly HS&amp;E</li> </ul>	



Mitigation No. Ref.	Environmental and Social Parameter	Aspect	Monitoring Activities	Duration and Frequency	Responsibility	Monitoring Locations	Methods	Reporting	Applicable Standards
			Chromium (Cr), Cadmium (Cd), Lead (Pb) and Oil & Grease.				<p>Cd - Acid digestion and AAS;</p> <p>Pb - Acid digestion and AAS;</p> <p>Oil &amp; Grease - EPA 9071 B (Oil &amp; Grease) in soil.</p>	<p>Monitoring Report for APSCL and DoE.</p> <ul style="list-style-type: none"> <li>• APSCL Semi-Annual Environmental Report for ADB.</li> </ul>	
5, 6	Aquatic Environment and River Water Quality	Increased suspended sediment and pollutant loads, permanent loss and disturbance to aquatic flora and fauna due to construction of the intake structure and water	Implementation of mitigation measures and assessment of performance indicators.	Daily during dredging and in river works.	CNTIC	Dredging area and in river works.	Visual observation	<ul style="list-style-type: none"> <li>• CNTIC Monthly HS&amp;E Monitoring Report for APSCL and DoE.</li> <li>• APSCL Semi-Annual Environmental Report for ADB</li> </ul>	<ul style="list-style-type: none"> <li>• WBG General EHS Guidelines for Construction and Decommissioning, 2007.</li> </ul>
			Monitoring and supervision to ensure the implementation of the mitigation measures.	Weekly during dredging and in river works.	APSCL	Dredging area and in river works.	Visual observation	<ul style="list-style-type: none"> <li>• CNTIC Monthly HS&amp;E Monitoring Report for APSCL and DoE.</li> <li>• APSCL Semi-Annual Environmental</li> </ul>	<ul style="list-style-type: none"> <li>• WBG General EHS Guidelines for Construction and Decommissioning, 2007.</li> </ul>

Mitigation No. Ref.	Environmental and Social Parameter	Aspect	Monitoring Activities	Duration and Frequency	Responsibility	Monitoring Locations	Methods	Reporting	Applicable Standards
		discharge structure.						Report for ADB.	
			River water sampling during dredging and in river works for Temperature, pH, Chemical Oxygen Demand (COD), Biochemical Oxygen Demand 5 (BOD5), Dissolved Oxygen (DO), oil & grease, Chromium (Cr), Cadmium (Cd) and Lead (Pb) by third party consultant.	Weekly during dredging and in river works.	CNTIC	i. North-West side of Project area near the project location (Upstream) Location: 24°02'53.1'' N and 91°01' 3.1'' E ii. North-West side of Project area and near Ashuganj Chor Sonarampur (Downstream) Location: 24°02'44.0'' N and 91°00' 33.2'' E iii. North-East side of Project area near APSCL power plant area (outfall) Location: 24°02'40.3'' N and 91°01' 10.8'' E	Temperature – Mercury Filled Thermometer; pH – pH meter; COD – Open Reflux; BOD – 5-day BOD test; DO – DO meter. Oil & Grease – APHA – 5520. B Cr – Atomic Absorption Spectroscopy Cd- Atomic Absorption Spectroscopy Lead - Atomic Absorption Spectroscopy	<ul style="list-style-type: none"> <li>CNTIC Monthly HS&amp;E Monitoring Report for APSCL and DoE.</li> <li>APSCL Semi-Annual Environmental Report for ADB</li> </ul>	<ul style="list-style-type: none"> <li>Bangladesh Standard for Inland Surface Water – Environmental Conservation Rules – Schedule 3. Refer to Annex G.</li> </ul>
		Contamination of the	Implementation of mitigation	Daily	CNTIC	Construction Site	Visual observation	<ul style="list-style-type: none"> <li>CNTIC Monthly HS&amp;E</li> </ul>	<ul style="list-style-type: none"> <li>WBG General EHS</li> </ul>

Mitigation No. Ref.	Environmental and Social Parameter	Aspect	Monitoring Activities	Duration and Frequency	Responsibility	Monitoring Locations	Methods	Reporting	Applicable Standards
		aquatic environment as a result of construction activities on land e.g. spillages, disposal of liquid wastes; surface run-off, exposure of contaminated soils.	measures and assessment of performance indicators.					Monitoring Report for APSCL and DoE. • APSCL Semi-Annual Environmental Report for ADB	Guidelines for Construction and Decommissioning, 2007.
			Monitoring and supervision to ensure the implementation of the mitigation measures.	Weekly	APSCL	Construction Site	Visual observation	• CNTIC Monthly HS&E Monitoring Report for APSCL and DoE. • APSCL Semi-Annual Environmental Report for ADB.	• WBG General EHS Guidelines for Construction and Decommissioning, 2007.
			River water sampling for Temperature, pH, Chemical Oxygen Demand (COD), Biochemical Oxygen Demand 5	Monthly	CNTIC	i. North-West side of Project area near the project location (Upstream) Location: 24°02'53.1'' N and 91°01' 3.1'' E ii. North-West side of Project area and near Ashuganj Chor	Temperature – Mercury Filled Thermometer; pH – pH meter; COD – Open Reflux; BOD – 5-day BOD test; DO – DO meter. Oil & Grease – APHA – 5520. B	• CNTIC Monthly HS&E Monitoring Report for APSCL and DoE. • APSCL Semi-Annual Environmental Report for ADB	• Bangladesh Standard for Inland Surface Water – Environmental Conservation Rules – Schedule 3. Refer to Annex G.

Mitigation No. Ref.	Environmental and Social Parameter	Aspect	Monitoring Activities	Duration and Frequency	Responsibility	Monitoring Locations	Methods	Reporting	Applicable Standards
			(BOD5), Dissolved Oxygen (DO), oil & grease, Chromium (Cr), Cadmium (Cd) and Lead (Pb) by third party consultant.			Sonarampur (Downstream) Location: 24°02'44.0'' N and 91°00' 33.2'' E iii. North-East side of Project area near APSCL power plant area (outfall) Location: 24°02'40.3'' N and 91°01' 10.8'' E	Cr – Atomic Absorption Spectroscopy Cd- Atomic Absorption Spectroscopy Lead - Atomic Absorption Spectroscopy		
7	Waste Management	Generation, handling, treatment and disposal of solid and liquid hazardous and non-hazardous wastes.	Implementation of mitigation measures and assessment of performance indicators.	Daily	CNTIC	Construction Site	Visual observation	<ul style="list-style-type: none"> <li>CNTIC Monthly HS&amp;E Monitoring Report for APSCL and DoE.</li> <li>APSCL Semi-Annual Environmental Report for ADB</li> </ul>	<ul style="list-style-type: none"> <li>WBG General EHS Guidelines for Construction and Decommissioning, 2007.</li> </ul>
			Monitoring and supervision to ensure the implementation of the	Weekly	APSCL	Construction Site	Visual observation	<ul style="list-style-type: none"> <li>CNTIC Monthly HS&amp;E Monitoring Report for APSCL and DoE.</li> </ul>	<ul style="list-style-type: none"> <li>WBG General EHS Guidelines for Construction and</li> </ul>

Mitigation No. Ref.	Environmental and Social Parameter	Aspect	Monitoring Activities	Duration and Frequency	Responsibility	Monitoring Locations	Methods	Reporting	Applicable Standards
			mitigation measures.					<ul style="list-style-type: none"> <li>APSCL Semi-Annual Environmental Report for ADB.</li> </ul>	Decommissioning, 2007.
8, 9, 10	Community Health and Safety	Construction Traffic;  Health and safety impacts due to influx of workers;	Implementation of mitigation measures and assessment of performance indicators.	Daily	CNTIC	Construction Site and Offsite	Visual observation	<ul style="list-style-type: none"> <li>CNTIC Monthly HS&amp;E Monitoring Report for APSCL and DoE.</li> <li>APSCL Semi-Annual Environmental Report for ADB</li> </ul>	<ul style="list-style-type: none"> <li>WBG General EHS Guidelines for Construction and Decommissioning, 2007.</li> </ul>
		Health and safety impacts due to unauthorized persons accessing the site.	Monitoring and supervision to ensure the implementation of the mitigation measures.	Weekly	APSCL	Construction Site and Offsite	Visual observation	<ul style="list-style-type: none"> <li>CNTIC Monthly HS&amp;E Monitoring Report for APSCL and DoE.</li> <li>APSCL Semi-Annual Environmental Report for ADB.</li> </ul>	<ul style="list-style-type: none"> <li>WBG General EHS Guidelines for Construction and Decommissioning, 2007..</li> </ul>
11	Cultural Heritage and Archaeology	Chance finds of archaeologists	Implementation of mitigation measures and	During the period when archaeologists	CNTIC and APSCL	Location of archaeological remains.	Visual observation	<ul style="list-style-type: none"> <li>CNTIC Monthly HS&amp;E Monitoring</li> </ul>	<ul style="list-style-type: none"> <li>WBG General EHS Guidelines for</li> </ul>

Mitigation No. Ref.	Environmental and Social Parameter	Aspect	Monitoring Activities	Duration and Frequency	Responsibility	Monitoring Locations	Methods	Reporting	Applicable Standards
		cal remains.	assessment of performance indicators if archaeological remains discovered.	cal remains are found.				Report for APSCL and DoE. • APSCL Semi-Annual Environmental Report for ADB	Construction and Decommissioning, 2007.
12	Occupational Health and Safety	Workers Health and Safety	Implementatio n of mitigation measures and assessment of performance indicators.	Daily	CNTIC	Construction Site	Visual observation	• CNTIC Monthly HS&E Monitoring Report for APSCL and DoE. • APSCL Semi-Annual Environmental Report for ADB	• WBG General EHS Guidelines for Construction and Decommissioning, 2007.
			Monitoring and supervision to ensure the implementatio n of the mitigation measures.	Weekly	APSCL	Construction Site	Visual observation	• CNTIC Monthly HS&E Monitoring Report for APSCL and DoE. • APSCL Semi-Annual Environmental Report for ADB.	• WBG General EHS Guidelines for Construction and Decommissioning, 2007.

Mitigation No. Ref.	Environmental and Social Parameter	Aspect	Monitoring Activities	Duration and Frequency	Responsibility	Monitoring Locations	Methods	Reporting	Applicable Standards
			Drinking water sampling for pH, Ammonia, Nitrate, Phosphate, Arsenic (As), Iron (Fe), Manganese (Mn) and Coliforms by third party consultant.	Monthly	CNTIC	Drinking water stations of the Project	pH – pH Meter; Ammonia – Photometric; Nitrate – Potentiometric; Phosphate – Photometric; As - Atomic Absorption Spectroscopy; Fe – Spectrophotometer; Mn - Atomic Absorption Spectroscopy; Coliforms - Membrane Filter Technique.	<ul style="list-style-type: none"> <li>CNTIC Monthly HS&amp;E Monitoring Report for APSCL and DoE.</li> <li>APSCL Semi-Annual Environmental Report for ADB.</li> </ul>	<ul style="list-style-type: none"> <li>Bangladesh Standard for Drinking Water – Environmental Conservation Rules – Schedule 3. Refer to Annex G.</li> </ul>
13	Plantation	Act as noise buffer, carbon sink,	Visual inspection to observe growth of saplings as per provided green belt design	Monthly	CNTIC	Project site	Visual monitoring	CNTIC Monthly HS&E Monitoring Report for APSCL and DoE. APSCL Semi-Annual Environmental Report for ADB.	No standard.

## 4.2 Methodology

### 4.2.1 Methodology for Air Quality Assessment

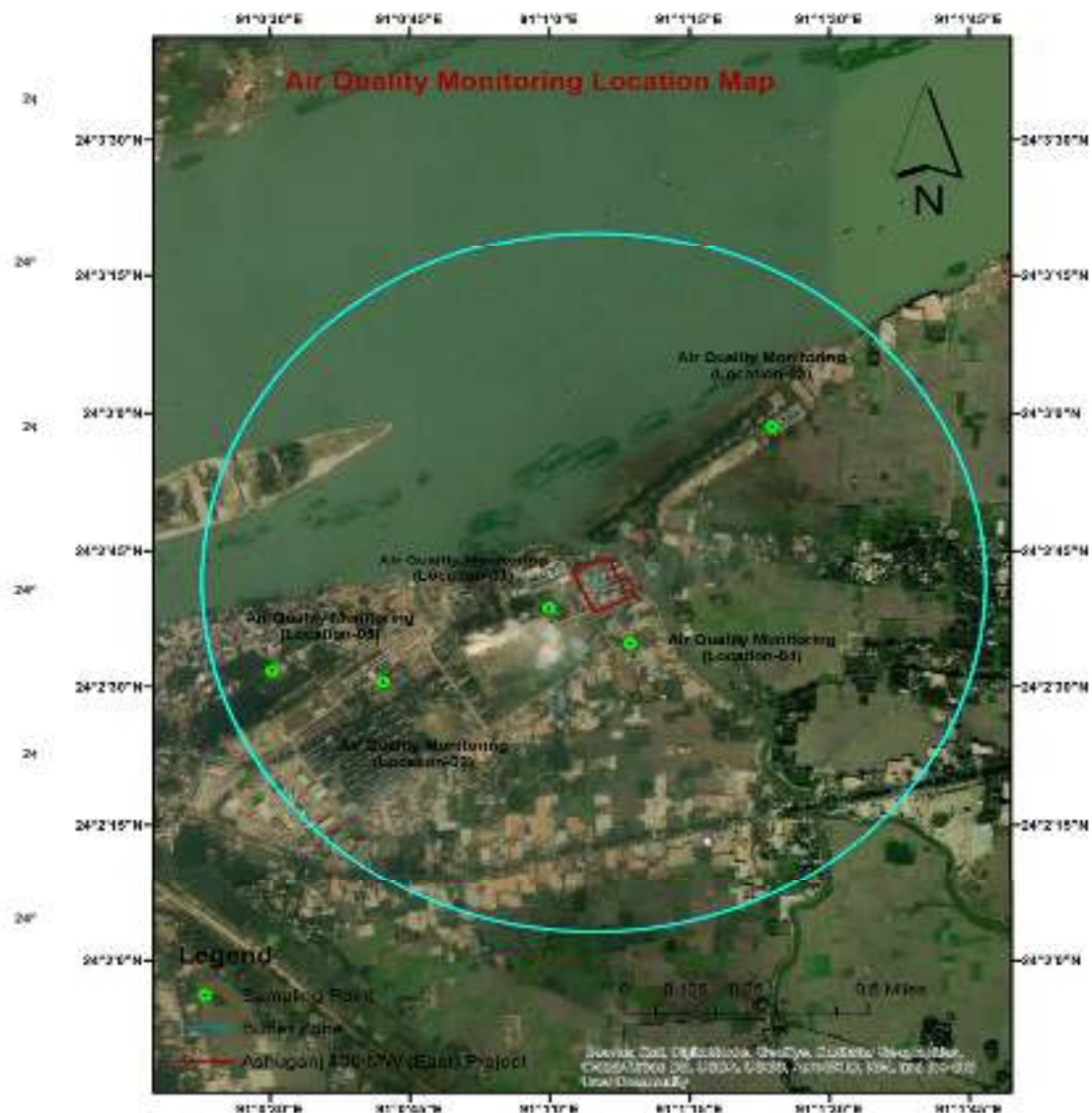
During the operation phase of this power plant project, the important sources of emissions would include those from the operations of equipment and machinery, vehicles carrying materials to the site and taking debris out of the site and stack emission for electricity generation.

Particulate monitoring is usually accomplished with a **Respirable Dust sampler**, which is a vacuum type device that draws air with particulate matter through a filter paper. This sampling filter paper is dried up in the laboratory and the weight difference is the amount of SPM, PM<sub>10</sub> or PM<sub>2.5</sub>, content measured in micrograms per cubic meter of air collected over a period of 24 hours. Sulfur dioxide and Oxide of Nitrogen sampling are conducted by using 20 ml absorbing reagent. Ambient Air Quality monitoring was done from five different places at Ashuganj 400 MW East Combined Cycle power plant project described in Table 4.2.1 and illustrated in Figure 4.1. Test Results of Ambient Air Quality from these different places are presented in Table 4.3.2.

**Table 4.2.1: Measuring Points of Ambient Air Quality**

SN	Location	Latitude	Longitude	Description of the Location
1.	Location 1	24°02'30.5"N	91°0'42.2" E	South-west side of Project area near PDB High School
2.	Location 2	24°02'31.7"N	91 °0'30.3" E	South-West side of Project area near Haji Abdul Jalil High School
3.	Location 3	24°02'58.5"N	91°01'23.9"E	North-East side of Project area near APSCL dormitory.
4.	Location 4	24°02'34.7"N	91°01'8.7"E	South-East side of Project area near APSCL power plant
5.	Location 5	24°02'31.1"N	91°0'3.8"E	South-West side of Project area near APSCL Admin building.





**Figure 4.1: Sampling Points for Ambient Air Quality Measurement**

#### **4.2.2 Methodology for Ambient Noise Measurement**

To assess the noise generated by different activities it is essential to identify the equipment to be used at various stages of the operation work. Therefore, an inventory of the probable equipment to be used and their reference noise generation data are of utmost importance. The noise level in the control room was tried to measure in the maximum silent condition. The noise was measured at different points of the project area at receptor levels; Table 4.2.2 and described in Figure 4.2; like a control room, turbine building, Water Treatment Area, Transformer area, GIS area and other outdoor places to determine the impact of noise generated from plant operational activities. The noise measurement was carried out with calibrated CEM Digital Sound Level Meter (Model No: DT 8850). Five noise reading was

taken for each point placing the noise meter 1 meter above from the ground and 1 meter away from the source. The measured noise level in the operational sites is summarized in table 4.3.3.

**Table 4.2.2: Measurement Points of Ambient Noise**

SN	Latitude	Longitude	Description of the Location
1.	24°02'30.5" N	91°0'42.2" E	South-west side of Project area near PDB High School
2.	24°02'31.7" N	91°0'30.3" E	South-West side of Project area near Haji Abdul Jalil High School
3.	24°02'58.5" N	91°01'23.9" E	North-East side of Project area near APSCL dormitory
4.	24°02'34.7" N	91°01'8.7" E	South-East side of Project area near APSCL power plant
5.	24°02'31.1" N	91°0'3.8" E	South-West side of Project area near APSCL Admin building.



**Figure 4.2: Noise Measuring Points in Project Area**

### 4.2.3 Methodology for Water Quality Measurement

The drinking water, groundwater and a river water sample were collected from the tube well & supplied water, Tube Well & Pump and Meghna River (Table 4.2.3 & Figure 4.3,4.4 and 4.5) respectively. After sampling, temperature,  $P^H$ , Total Dissolved solid and Dissolved oxygen was measured on the field and transferred immediately to Environmental Lab for further analytical experiment maintaining sampling protocol. The following Table 4.2.3, show here the parameters tested along with their method for drinking water, surface water and groundwater respectively. The tested results are presented in Table 4.3.4, 4.3.5 and 4.3.6 separately for drinking water, river and groundwater.

**Table 4.2.3: Measuring Points of Drinking water, Groundwater and River water**

Location	Latitude	Longitude	Description of the Location
<b>Drinking water</b>			
Location-1 (D1)	24° 02' 43.22'' N	91° 1' 3.52'' E	Inside the project area
Location-2 (D2)	24° 2' 38.61'' N	91° 1' 4.99'' E	South-West side of the project at PDB High School
Location-3 (D3)	24° 02' 34.1'' N	91° 1' 9.3'' E	South-East side of the project at Local Settlement
Location-4 (D4)	24° 02' 57.9'' N	91° 1' 24.3'' E	North-East side of Project area near APSCL dormitory.
<b>Groundwater</b>			
Location 1: G1	24° 02' 38.1'' N	91° 0' 58.0'' E	Inside the project area
Location 2: G2	24° 2' 30.5'' N	91° 0' 42.2'' E	South-west side of Project area near PDB High School
Location 3: G3	24° 02' 34.1'' N	91° 1' 9.3'' E	South-East side of the project
Location 4: G4	24° 02' 47.2'' N	91° 1' 12.3'' E	North-East side of the project area
<b>River water</b>			
Upstream	24° 02' 53.1'' N	91° 01' 3.1'' E	North-West side of Project area near the project location
Downstream	24° 02' 44.0'' N	91° 00' 33.2'' E	North-West side of Project area and near Ashuganj Chor Sonarampur
Outfall	24° 02' 40.3'' N	91° 01' 10.8'' E	North-East side of Project area near APSCL power plant area

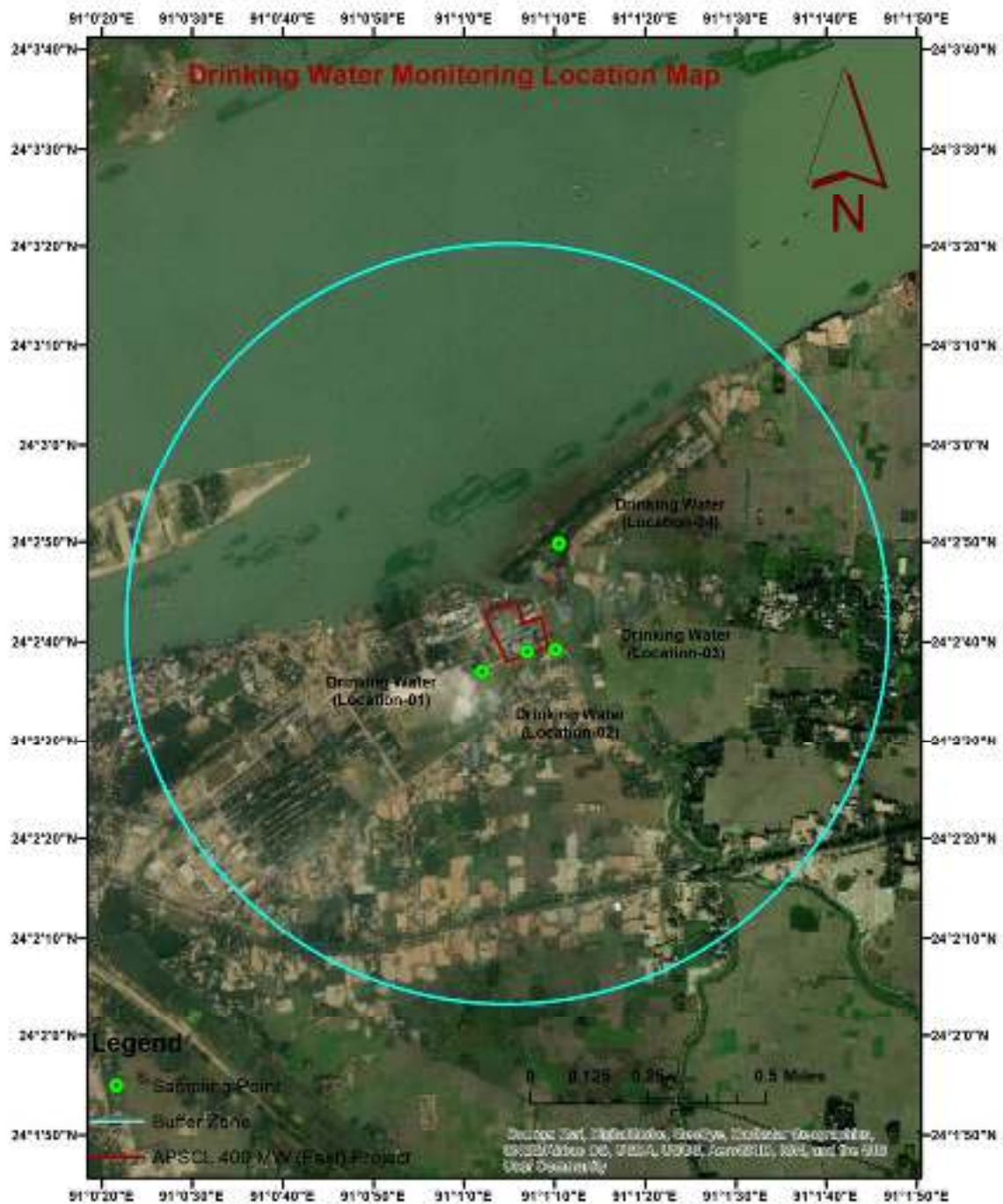


Figure 4.3: Drinking water Measuring Points in Project Area





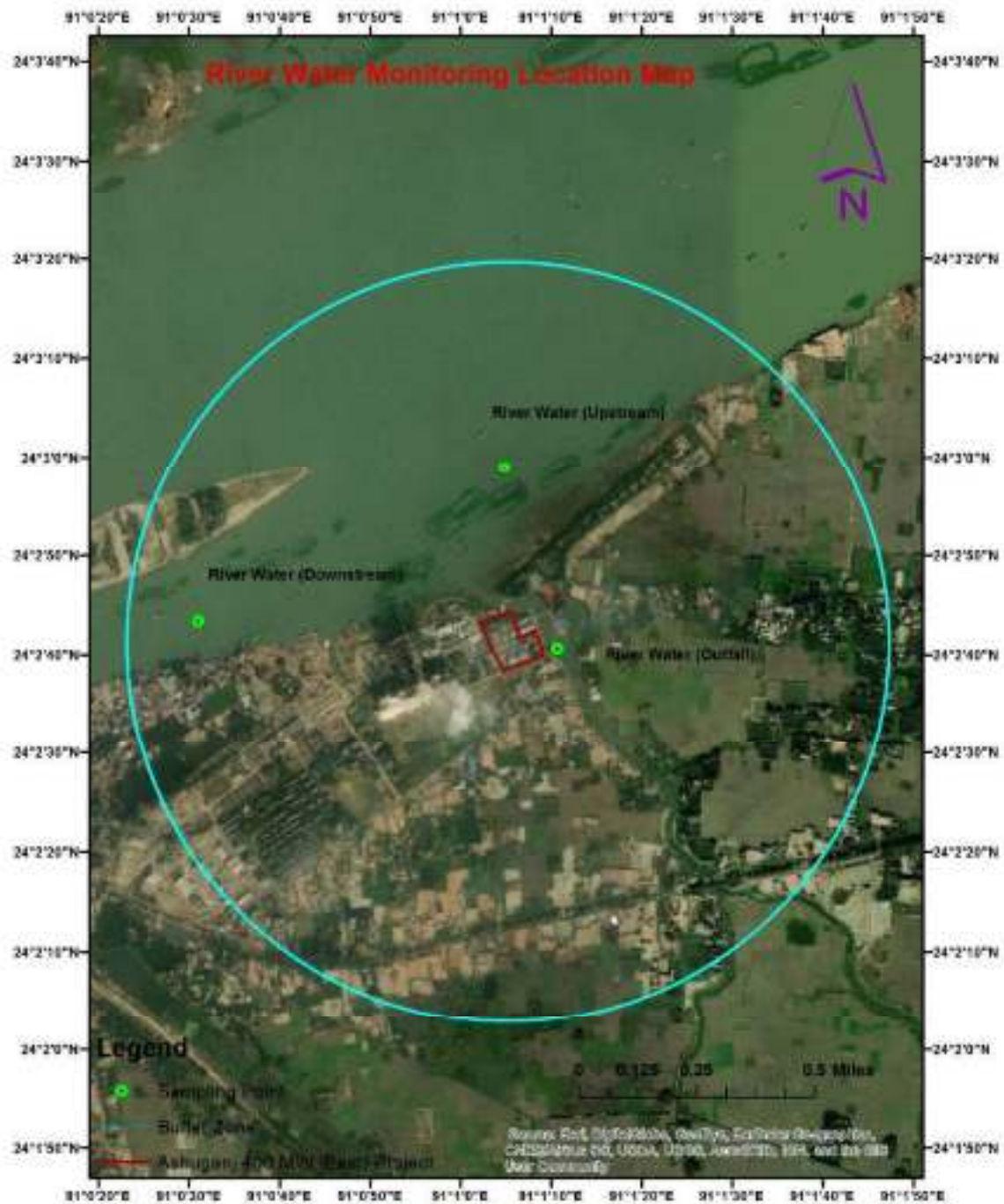


Figure 4.5: River Water Measuring Points in Project Area

#### 4.2.4 Methodology for Soil Quality Monitoring:

The soil sample were collected from inside the project site of three different location (Table 4.2.4 & Figure 4.6) respectively. The following Table 4.5, show here the parameters tested along with their method for soil quality monitoring respectively. The tested results are presented in Table 4.3.7 for Soil Quality Monitoring.

**Table 4.2.4: Measurement Points of Soil Quality Monitoring**

SN	Latitude	Longitude	Description of the Location
1.	24° 02' 41.82'' N	91° 1' 3.83'' E	Inside the project site
2.	24° 2'40.27'' N	91° 1'6.05"E	Inside the project site
3.	24° 02' 39.72'' N	91° 1' 8.25'' E	Inside the project site



**Figure 4.6: Soil Quality Measuring Points in Project Area**

### **4.3 Semiannually Assessment of Construction Impact on Air, Water, Noise, Construction Waste and Labor Camp Management**

#### **4.3.1 Impact on Air Quality**

During the construction phase of the power plant project, the important sources of emissions would include those from the operations of construction equipment and machinery, 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, the 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 the construction of the 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 400 MW CCPP (East) project such as Northside and south side of the plant. Test Results of Ambient Air Quality from these different places are presented in Table 4.3.2.

From the analysis of last six month of 2019 results it is observed that the concentrations of all these parameters are within the allowable limit according to DoE and IFC/ World Bank Standard.

So, the project construction activities do not hamper the air quality in the project area.

#### **4.3.2 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.

The measured noise level in the construction site is summarized in table 4.3.3.

From these studies it was found that the ambient noise qualities of the Project area were found within the allowable limit of DoE, Bangladesh & IFC Standard.

It is also observed that last six-month of 2019 noise level results are not exceed the previous year (2018) last six-month results. So, the project construction activities do not hamper the noise quality in the project area.



### 4.3.3 Impact on Water Quality

Health, Safety & Environment Division of APSCL has provided pure drinking water at several locations in APSCL plant area that also covers the under construction 400 MW CCPP (East) project to supply pure and safe drinking water to all the workers of this project and also to other employees, contractors and visitors of APSCL. Inside the project, drinking water jars are also filled with this pure drinking water for workers' convenience and easy availability of pure drinking water. The drinking, surface and groundwater sample were collected from the supplied drinking water, Meghna River and groundwater. 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. In some samples we found excess amount of Fe, Mn, nitrate and total coliform. Here are the probable causes:

Occurrence of high concentration of iron (Fe) in groundwater is very common particularly in areas of tropical climate. In groundwater, Fe generally occurs in the oxidation state - reduced soluble divalent ferrous iron ( $\text{Fe}^{2+}$ ). When groundwater comes in contact with oxygen of the atmosphere, the Fe is oxidized to the ferric state and is precipitated as Fe-mineral. The subsurface reducing conditions have significant influence on the high Fe content of groundwater that is not influenced by project activities.

The root causes of Nitrate concentrations increase due to human activities, such as agriculture, industry, domestic effluents and emissions from combustion engines.

Manganese (Mn) is a metal that occurs naturally in soils, rocks and minerals. In the aquifer, groundwater comes in contact with these solid materials dissolving them, releasing their constituents to the water.

Total coliforms include bacteria that are found in the ground water that has been influenced by surface water, and in human or animal waste. The presence of these bacteria indicates that ground water is contaminated with feces or sewage, and it has the potential to cause disease. But this ground water is not used in any purpose of this under construction project or any other activities of existing plants and residential colonies of APSCL.

From the analysis of all the parameters of drinking water, it was found within standard limit of DoE, Bangladesh & WHO. The drinking water is purified by six stages purification systems with alkaline RO and UV disinfection system that is produced from supplied water system of APSCL that is treated river water.

From the analysis, it has been observed that surface water quality was found within the acceptable limit of DoE and IFC. These indicate that the project is not posing any detrimental effect to surrounding environment by surface water pollution.

**Table 4.3.1: Monitoring Parameters and Methods of Monitoring**

Issue	Monitoring Frequency	Parameter Tested	Test Method
Ambient Air	Monthly	PM <sub>2.5</sub> , PM <sub>10</sub> , SPM, SO <sub>2</sub> , NO <sub>x</sub> , CO	Gravimetric
Ambient Noise	Monthly	Noise Level Assessment	Leq Value in dB (A)
Drinking & Ground Water	Monthly & Once in 3 months	p <sup>H</sup>	p <sup>H</sup> Meter
		Ammonia	Photometric
		Nitrate	Potentiometry
		Phosphate	Photometric
		As	Atomic Absorption Spectroscopy
		Fe	Spectrophotometer
		Mn	Atomic Absorption Spectroscopy
		Coliforms	Membrane Filter Technique
River Water	Monthly	Water temp.	Mercury filled thermometer
		DO	DO meter
		BOD <sub>5</sub>	5-day BOD test
		COD	Open Reflux
		Oil and Grease	APHA 5520.B
		Cr	Atomic Absorption Spectroscopy
		Cd	Atomic Absorption Spectroscopy
		Pb	Atomic Absorption Spectroscopy
Soil Quality	Once in 12 months	Cr	Atomic Absorption Spectroscopy
		Cd	Atomic Absorption Spectroscopy
		Pb	Atomic Absorption Spectroscopy
		Oil and Grease	APHA 5520.B

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<sub>5</sub> is also in a lower level than DoE standards.

**Table: 4.3.2: Test Result of Ambient Air Quality**

PARTICULATE MATERIAL		LIMITS		JULY 2019				
PARAMETER	DoE (Bangladesh) Standard *	IFC/World Bank Standard	L1	L2	L3	L4	L5	AVERAGE JULY
PM 2.5	65 µg/m <sup>3</sup>	75 µg/m <sup>3</sup>	19.32	17.48	36.85	51.49	22.21	29.47
PM 10	150 µg/m <sup>3</sup>	150 µg/m <sup>3</sup>	35.81	85.55	46.37	52.28	69.28	57.88
SPM	200 µg/m <sup>3</sup>	NF	45.33	95.45	43.17	80.21	80.57	68.95
SO <sub>2</sub>	365 µg/m <sup>3</sup>	125 µg/m <sup>3</sup>	8.9	15.40	12.33	15.01	10.86	12.5
NO <sub>x</sub>	NF	200 µg/m <sup>3</sup>	8.8	16.18	20.92	18.30	16.88	16.22
CO	9 ppm	NF	0	0	0	0	0	0
<b>Comments</b>								
From the result it is observed that the concentrations of all these parameters are within the allowable limit according to DoE and IFC/ World Bank Standard.								
PARTICULATE MATERIAL		LIMITS		AUGUST 2019				
PARAMETER	DoE (Bangladesh) Standard *	IFC/World Bank Standard	L1	L2	L3	L4	L5	AVERAGE AUGUST
PM 2.5	65 µg/m <sup>3</sup>	75 µg/m <sup>3</sup>	22.66	49.53	24.77	19.21	22.03	27.64
PM 10	150 µg/m <sup>3</sup>	150 µg/m <sup>3</sup>	52.61	72.65	39.32	38.84	107.8	62.25
SPM	200 µg/m <sup>3</sup>	NF	100.17	138.2	80.01	84.92	151.0	110.8
SO <sub>2</sub>	365 µg/m <sup>3</sup>	125 µg/m <sup>3</sup>	8.57	20.10	6.88	9.32	40.70	17.11
NO <sub>x</sub>	NF	200 µg/m <sup>3</sup>	12.61	2.64	3.86	9.24	14.72	8.61
CO	9 ppm	NF	0	2	6	4	0	2.4
<b>Comments</b>								
From the result it is observed that the concentrations of all these parameters are within the allowable limit according to DoE and IFC/ World Bank Standard.								
PARTICULATE MATERIAL		LIMITS		SEPTEMBER 2019				
PARAMETER	DoE (Bangladesh) Standard *	IFC/World Bank Standard	L1	L2	L3	L4	L5	AVERAGE SEPTEMBER
PM 2.5	65 µg/m <sup>3</sup>	75 µg/m <sup>3</sup>	17.74	48.13	15.05	27.27	31.36	27.91
PM 10	150 µg/m <sup>3</sup>	150 µg/m <sup>3</sup>	94.52	55.47	83.03	29.84	87.15	70
SPM	200 µg/m <sup>3</sup>	NF	107.63	118.2	92.89	63.74	131.5	102.8
SO <sub>2</sub>	365 µg/m <sup>3</sup>	125 µg/m <sup>3</sup>	12.37	29.86	8.78	14.41	40.70	21.22
NO <sub>x</sub>	NF	200 µg/m <sup>3</sup>	9.14	12.06	11.82	19.34	8.72	12.22
CO	9 ppm	NF	0	2	6	4	0	2.4
<b>Comments</b>								
From the analysis it is observed that the concentrations of all these parameters are within the allowable limit of DoE, Bangladesh & IFC Standard.								

<b>PARTICULATE MATERIAL</b>	<b>LIMITS</b>		<b>OCTOBER 2019</b>					
PARAMETER	DoE (Bangladesh) Standard *	IFC/World Bank Standard	L1	L2	L3	L4	L5	AVERAGE OCTOBER
PM 2.5	65 µg/m <sup>3</sup>	75 µg/m <sup>3</sup>	33.84	56.65	27.23	44.45	31.87	38.81
PM 10	150 µg/m <sup>3</sup>	150 µg/m <sup>3</sup>	67.98	107.7	91.41	70.12	110.4	89.53
SPM	200 µg/m <sup>3</sup>	NF	123.29	190.4	130.33	131.46	167.7	148.66
SO <sub>2</sub>	365 µg/m <sup>3</sup>	125 µg/m <sup>3</sup>	32.47	19.51	22.48	13.57	44.62	26.53
NO <sub>x</sub>	NF	200 µg/m <sup>3</sup>	19.78	12.92	9.56	12.34	19.32	14.78
CO	9 ppm	NF	2	2	2	6	0	2.4
<b>Comments</b> From the result it is observed that the concentrations of all these parameters are within the allowable limit according to DoE and IFC/ World Bank Standard.								
<b>PARTICULATE MATERIAL</b>	<b>LIMITS</b>		<b>NOVEMBER 2019</b>					
PARAMETER	DoE (Bangladesh) Standard *	IFC/World Bank Standard	L1	L2	L3	L4	L5	AVERAGE NOVEMBER
PM 2.5	65 µg/m <sup>3</sup>	75 µg/m <sup>3</sup>	30.6	30.9	26.0	29.5	25.3	28.46
PM 10	150 µg/m <sup>3</sup>	150 µg/m <sup>3</sup>	102.4	97.6	101.7	121.9	108.8	106.48
SPM	200 µg/m <sup>3</sup>	NF	167.0	130.4	154.6	171.7	153.8	155.5
SO <sub>2</sub>	365 µg/m <sup>3</sup>	125 µg/m <sup>3</sup>	13.0	14.1	8.8	11.4	12.4	11.94
NO <sub>x</sub>	NF	200 µg/m <sup>3</sup>	17.8	16.6	12.5	23.9	18.4	17.84
CO	9 ppm	NF	0	2	6	4	0	2.4
<b>Comments</b> From the result it is observed that the concentrations of all these parameters are within the allowable limit of DoE, Bangladesh & IFC Standard.								
<b>PARTICULATE MATERIAL</b>	<b>LIMITS</b>		<b>DECEMBER 2019</b>					
PARAMETER	DoE (Bangladesh) Standard *	IFC/World Bank Standard	L1	L2	L3	L4	L5	AVERAGE DECEMBER
PM 2.5	65 µg/m <sup>3</sup>	75 µg/m <sup>3</sup>	15.91	18.35	28.21	20.62	33.64	23.35
PM 10	150 µg/m <sup>3</sup>	150 µg/m <sup>3</sup>	89.21	70.5	57.2	102.0	93.3	82.44
SPM	200 µg/m <sup>3</sup>	NF	128.22	100.3	90.26	140.43	128.0	117.46
SO <sub>2</sub>	365 µg/m <sup>3</sup>	125 µg/m <sup>3</sup>	9.3	12.3	14.72	10.4	10.3	11.4
NO <sub>x</sub>	NF	200 µg/m <sup>3</sup>	11.6	14.17	14.98	18.29	22.72	16.35
CO	9 ppm	NF	0	2	0	2	2	1.2
<b>Comments</b> From the analysis it is observed that the concentrations of all these parameters are within the allowable limit of DoE, Bangladesh & IFC Standard.								

**Table: 4.3.3: Test Result of Noise Quality**

NOISE		LIMITS		JULY 2019				
(LAeq) dBA	DoE (Bangladesh) Standard *	IFC/World Bank Standard	L1	L2	L3	L4	L5	AVERAGE JULY
DAY	75	70	66.2	61.3	62	63.5	58.9	62.38
NIGHT	70	70	68.9	67.3	65.9	68.6	62.3	66.6
<b>Comments</b> From these studies it was found that the ambient noise qualities of the Project area were found within the allowable limit of DoE, Bangladesh & IFC Standard.								
NOISE		LIMITS		AUGUST 2019				
(LAeq) dBA	DoE (Bangladesh) Standard *	IFC/World Bank Standard	L1	L2	L3	L4	L5	AVERAGE AUGUST
DAY	75	70	62.9	68.9	63.2	69.0	59.4	64.68
NIGHT	70	70	65.3	64	59.3	69.2	55.2	62.6
<b>Comments</b> From these studies it was found that the ambient noise qualities of the Project area were found within the allowable limit of DoE, Bangladesh & IFC Standard.								
NOISE		LIMITS		SEPTEMBER 2019				
(LAeq) dBA	DoE (Bangladesh) Standard *	IFC/World Bank Standard	L1	L2	L3	L4	L5	AVERAGE SEPTEMBER
DAY	75	70	62.5	52.5	60.1	62.8	52.6	58.1
NIGHT	70	70	59.1	52.1	51.9	59.2	49.2	54.3
<b>Comments</b> From these studies it was found that the ambient noise qualities of the Project area were found within the allowable limit of DoE, Bangladesh & IFC Standard.								
NOISE		LIMITS		OCTOBER 2019				
(LAeq) dBA	DoE (Bangladesh) Standard *	IFC/World Bank Standard	L1	L2	L3	L4	L5	AVERAGE OCTOBER
DAY	75	70	69.8	61.8	66.7	66.5	59.6	64.88
NIGHT	70	70	65.1	54.1	51.5	57.2	52.2	56.02
<b>Comments</b> From these studies it was found that the ambient noise qualities of the Project area were found within the allowable limit of DoE, Bangladesh & IFC Standard.								
NOISE		LIMITS		NOVEMBER 2019				
(LAeq) dBA	DoE (Bangladesh) Standard *	IFC/World Bank Standard	L1	L2	L3	L4	L5	AVERAGE NOVEMBER
DAY	75	70	61.2	69.4	51.2	59.2	60.2	60.24
NIGHT	70	70	62.2	59.9	52.0	64.8	56.2	59.02

<b>Comments</b>								
From these studies it was found that the ambient noise qualities of the Project area were found within the allowable limit of DoE, Bangladesh & IFC Standard.								
<b>NOISE</b>	<b>LIMITS</b>		<b>DECEMBER 2019</b>					
(LAeq) dBA	DoE (Bangladesh) Standard *	IFC/World Bank Standard	L1	L2	L3	L4	L5	AVERAGE DECEMBER
DAY	75	70	64.2	68.6	53.2	64.3	65.7	63.2
NIGHT	70	70	60.2	55.9	52.2	59.8	59.5	57.52
<b>Comments</b>								
From these studies it was found that the ambient noise qualities of the Project area were found within the allowable limit of DoE, Bangladesh & IFC Standard.								

**Table: 4.3.4: Drinking Water Quality**

<b>DRINKING WATER</b>	<b>LIMITS</b>		<b>JULY 2019</b>				
PARAMETER	DoE (Bangladesh) Standard *	IFC/World Bank Standard	D1	D2	D3	D4	AVERAGE JULY
pH	6.5 -8.5	6.5 -8.5	7.02	7.02	7.02	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	<1.0	<1.0	<1.0	<1.0	<1.0
Phosphate	6 mg/l	---	<0.04	<0.04	<0.04	<0.04	<0.04
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	<0.001	<0.001	<0.001	<0.001	<0.001
Mn	0.1 mg/l	0.5 mg/l	<0.001	<0.001	<0.001	<0.001	<0.001
Total Coliform	0/100 ml	0/100 ml	0	0	0	0	0
Faecal Coliform	0/100 ml	0/100 ml	0	0	0	0	0
<b>DRINKING WATER</b>	<b>LIMITS</b>		<b>AUGUST 2019</b>				
PARAMETER	DoE (Bangladesh) Standard *	IFC/World Bank Standard	D1	D2	D3	D4	AVERAGE AUGUST
pH	6.5 -8.5	6.5 -8.5	7.02	7.03	7.02	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	<1.0	<1.0	<1.0	<1.0	<1.0
Phosphate	6 mg/l	---	<0.04	<0.04	<0.04	<0.04	<0.04
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	<0.001	<0.001	<0.001	<0.001	<0.001
Mn	0.1 mg/l	0.5 mg/l	<0.001	<0.001	<0.001	<0.001	<0.001
Total Coliform	0/100 ml	0/100 ml	0	0	0	0	0
Faecal Coliform	0/100 ml	0/100 ml	0	0	0	0	0

<b>DRINKING WATER</b>	<b>LIMITS</b>		<b>SEPTEMBER 2019</b>				
PARAMETER	DoE (Bangladesh) Standard *	IFC/World Bank Standard	D1	D2	D3	D4	AVERAGE SEPTEMBER
pH	6.5 -8.5	6.5 -8.5	7.04	7.02	7.02	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	<1.0	<1.0	<1.0	<1.0	<1.0
Phosphate	6 mg/l	---	<0.04	<0.04	<0.04	<0.04	<0.04
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	<0.001	<0.001	<0.001	<0.001	<0.001
Mn	0.1 mg/l	0.5 mg/l	<0.001	<0.001	<0.001	<0.001	<0.001
Total Coliform	0/100 ml	0/100 ml	0	0	0	0	0
Faecal Coliform	0/100 ml	0/100 ml	0	0	0	0	0
<b>DRINKING WATER</b>	<b>LIMITS</b>		<b>OCTOBER 2019</b>				
PARAMETER	DoE (Bangladesh) Standard *	IFC/World Bank Standard	D1	D2	D3	D4	AVERAGE OCTOBER
pH	6.5 -8.5	6.5 -8.5	7.02	7.03	7.02	7.04	7.02
Ammonia	0.5 mg/l	---	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate	10 mg/l	50 mg/l	<1.0	<1.0	<1.0	<1.0	<1.0
Phosphate	6 mg/l	---	<0.04	<0.04	<0.04	<0.04	<0.04
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	<0.001	<0.001	<0.001	<0.001	<0.001
Mn	0.1 mg/l	0.5 mg/l	<0.001	<0.001	<0.001	<0.001	<0.001
Total Coliform	0/100 ml	0/100 ml	0	0	0	0	0
Faecal Coliform	0/100 ml	0/100 ml	0	0	0	0	0
<b>DRINKING WATER</b>	<b>LIMITS</b>		<b>NOVEMBER 2019</b>				
PARAMETER	DoE (Bangladesh) Standard *	IFC/World Bank Standard	D1	D2	D3	D4	AVERAGE NOVEMBER
pH	6.5 -8.5	6.5 -8.5	7.03	7.02	7.02	7.04	7.02
Ammonia	0.5 mg/l	---	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate	10 mg/l	50 mg/l	<1.0	<1.0	<1.0	<1.0	<1.0
Phosphate	6 mg/l	---	<0.04	<0.04	<0.04	<0.04	<0.04
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	<0.001	<0.001	<0.001	<0.001	<0.001
Mn	0.1 mg/l	0.5 mg/l	<0.001	<0.001	<0.001	<0.001	<0.001
Total Coliform	0/100 ml	0/100 ml	0	0	0	0	0
Faecal Coliform	0/100 ml	0/100 ml	0	0	0	0	0

DRINKING WATER	LIMITS		DECEMBER 2019				
PARAMETER	DoE (Bangladesh) Standard *	IFC/World Bank Standard	D1	D2	D3	D4	AVERAGE DECEMBER
pH	6.5 -8.5	6.5 -8.5	7.02	7.03	7.02	7.04	7.02
Ammonia	0.5 mg/l	---	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate	10 mg/l	50 mg/l	<1.0	<1.0	<1.0	<1.0	<1.0
Phosphate	6 mg/l	---	<0.04	<0.04	<0.04	<0.04	<0.04
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	<0.001	<0.001	<0.001	<0.001	<0.001
Mn	0.1 mg/l	0.5 mg/l	<0.001	<0.001	<0.001	<0.001	<0.001
Total Coliform	0/100 ml	0/100 ml	0	0	0	0	0
Faecal Coliform	0/100 ml	0/100 ml	0	0	0	0	0

**Table: 4.3.5: River Water Quality**

RIVER WATER	LIMITS		JULY 2019			
PARAMETER	DoE (Bangladesh) Standard	IFC/World Bank Standard	Upstream	Downstream	Outfall	AVERAGE JULY
Temperature	40°C	---	23.5	23.9	22.4	23.67
Dissolved Oxygen (DO)	4.5 -8 mg/l	---	5.3	6.4	5.6	5.76
BOD5	50 mg/l	50 mg/l	0.2	0.2	0.3	0.23
COD	200 mg/l	250 mg/l	2.5	3.2	4.8	3.5
Chromium (Total)	0.5 mg/l	0.5 mg/l	<0.02	<0.02	<0.02	<0.02
Cadmium	0.5 mg/l	0.1 mg/l	<0.002	<0.002	<0.002	<0.002
Lead (Pb)	0.1 mg/l	0.1 mg/l	<0.05	<0.05	<0.05	<0.05
Oil & Grease	10 mg/l	10 mg/l	<2.0	<2.0	<2.0	<2.0
<p style="text-align: center;"><b><u>Comments</u></b></p> <p>From the analysis, it has been observed that all parameters were found within the acceptable limit DoE and IFC. These indicate that the project is not posing any detrimental effect to surrounding environment by surface water pollution.</p>						



RIVER WATER	LIMITS		AUGUST 2019			
PARAMETER	DoE (Bangladesh) Standard	IFC/World Bank Standard	Upstream	Downstream	Outfall	AVERAGE AUGUST
Temperature	40°C	---	21.5	21.9	22.8	22.06
Dissolved Oxygen (DO)	4.5 -8 mg/l	---	5.67	7.17	5.12	5.99
BOD5	50 mg/l	50 mg/l	0.2	0.2	0.1	0.17
COD	200 mg/l	250 mg/l	3.7	6.2	4.8	4.9
Chromium (Total)	0.5 mg/l	0.5 mg/l	<0.02	<0.02	<0.02	<0.02
Cadmium	0.5 mg/l	0.1 mg/l	<0.002	<0.002	<0.002	<0.002
Lead (Pb)	0.1 mg/l	0.1 mg/l	<0.05	<0.05	<0.05	<0.05
Oil & Grease	10 mg/l	10 mg/l	<2.0	<2.0	<2.0	<2.0
<p align="center"><b><u>Comments</u></b></p> <p>From the analysis, it has been observed that all parameters were found within the acceptable limit DoE and IFC. These indicate that the project is not posing any detrimental effect to surrounding environment by surface water pollution.</p>						
RIVER WATER	LIMITS		SEPTEMBER 2019			
PARAMETER	DoE (Bangladesh) Standard	IFC/World Bank Standard	Upstream	Downstream	Outfall	AVERAGE SEPTEMBER
Temperature	40°C	---	20.5	21.2	24.2	21.97
Dissolved Oxygen (DO)	4.5 -8 mg/l	---	7.12	7.65	9.67	8.15
BOD5	50 mg/l	50 mg/l	0.3	0.2	0.8	0.43
COD	200 mg/l	250 mg/l	6.8	4.1	10.7	7.2
Chromium (Total)	0.5 mg/l	0.5 mg/l	<0.02	<0.02	<0.02	<0.02
Cadmium	0.5 mg/l	0.1 mg/l	<0.002	<0.002	<0.002	<0.002
Lead (Pb)	0.1 mg/l	0.1 mg/l	<0.05	<0.05	<0.05	<0.05
Oil & Grease	10 mg/l	10 mg/l	<2.0	<2.0	<2.0	<2.0
<p align="center"><b><u>Comments</u></b></p> <p>From the analysis, it has been observed that all parameters were found within the acceptable limit DoE and IFC. These indicate that the project is not posing any detrimental effect to surrounding environment by surface water pollution.</p>						

RIVER WATER	LIMITS		OCTOBER 2019			
PARAMETER	DoE (Bangladesh Standard)	IFC/World Bank Standard	Upstream	Downstream	Outfall	AVERAGE OCTOBER
Temperature	40°C	---	21.5	21.6	23.4	22.17
Dissolved Oxygen (DO)	4.5 -8 mg/l	---	7.86	7.82	7.39	7.69
BOD5	50 mg/l	50 mg/l	0.2	0.2	0.6	0.33
COD	200 mg/l	250 mg/l	4.9	4.5	11.4	6.93
Chromium (Total)	0.5 mg/l	0.5 mg/l	<0.02	<0.02	<0.02	<0.02
Cadmium	0.5 mg/l	0.1 mg/l	<0.002	<0.002	<0.002	<0.002
Lead (Pb)	0.1 mg/l	0.1 mg/l	<0.05	<0.05	<0.05	<0.05
Oil & Grease	10 mg/l	10 mg/l	<2.0	<2.0	<2.0	<2.0

#### Comments

From the analysis, it has been observed that all parameters were found within the acceptable limit DoE and IFC. These indicate that the project is not posing any detrimental effect to surrounding environment by surface water pollution.

RIVER WATER	LIMITS		NOVEMBER 2019			
PARAMETER	DoE (Bangladesh Standard)	IFC/World Bank Standard	Upstream	Downstream	Outfall	AVERAGE NOVEMBER
Temperature	40°C	---	27.6	26.3	32.5	28.8
Dissolved Oxygen (DO)	4.5 -8 mg/l	---	7.14	7.32	7.59	7.35
BOD5	50 mg/l	50 mg/l	0.1	0.2	0.4	0.23
COD	200 mg/l	250 mg/l	3.8	4.4	7.8	5.33
Chromium (Total)	0.5 mg/l	0.5 mg/l	0.004	0.005	0.001	0.003
Cadmium	0.5 mg/l	0.1 mg/l	<0.0001	<0.0001	<0.0001	<0.0001
Lead (Pb)	0.1 mg/l	0.1 mg/l	0.034	0.001	0.001	0.012
Oil & Grease	10 mg/l	10 mg/l	Not detected	Not detected	Not detected	Not detected

#### Comments

From the analysis, it has been observed that all parameters were found within the acceptable limit DoE and IFC. These indicate that the project is not posing any detrimental effect to surrounding environment by surface water pollution.

RIVER WATER	LIMITS		DECEMBER 2019			
PARAMETER	DoE (Bangladesh) Standard *	IFC/World Bank Standard	Upstream	Downstream	Outfall	AVERAGE DECEMBER
Temperature	40°C	---	27.6	26.3	32.5	28.8
Dissolved Oxygen (DO)	4.5 -8 mg/l	---	7.33	7.12	7.34	7.26
BOD5	50 mg/l	50 mg/l	0.2	0.2	0.5	0.3
COD	200 mg/l	250 mg/l	3.1	3.2	6.3	4.2
Chromium (Total)	0.5 mg/l	0.5 mg/l	<0.02	<0.02	<0.02	<0.02
Cadmium	0.5 mg/l	0.1 mg/l	<0.002	<0.002	<0.002	<0.002
Lead (Pb)	0.1 mg/l	0.1 mg/l	<0.05	<0.05	<0.05	<0.05
Oil & Grease	10 mg/l	10 mg/l	0.5	0.8	1.0	0.77
<b>Comments</b> From the analysis, it has been observed that all parameters were found within the acceptable limit DoE and IFC. These indicate that the project is not posing any detrimental effect to surrounding environment by surface water pollution.						

**Table: 4.3.6: Ground Water Quality**

GROUND WATER	LIMITS		JULY 2019				
PARAMETER	DoE (Bangladesh) Standard *	IFC/World Bank Standard	G1	G2	G3	G4	AVERAGE JULY
pH	6.5 -8.5	6.5 -8.5	6.87	7.36	7.08	7.27	7.15
TDS	1000 mg/l	1200 mg/l	355	323	359	391	357
Ammonia	0.5 mg/l	---	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate	10 mg/l	50 mg/l	<1	<1	<1	<1	<1
Phosphate	6 mg/l	---	0.1	0.1	0.1	0.1	0.1
As	0.05 mg/l	0.01 mg/l	0.003	0.135	0.092	0.075	0.076
Fe	0.3 - 1 mg/l	0.3 mg/l	0.34	1.05	0.62	0.086	0.52
Mn	0.1 mg/l	0.5 mg/l	0.1	0.1	0.1	0.2	0.12
Total coliform	0/100 ml	0/100 ml	0	0	18	0	--
Faecal Coliform	0/100 ml	0/100 ml	0	0	2	0	--
<b>Comments</b> From the analysis most of the parameters of ground water were found within standard limit of DoE, Bangladesh & WHO except: <ul style="list-style-type: none"> <li>➤ Concentration of Fe at G1 G2 and G3 points exceeds the limit to some extent.</li> <li>➤ Number of total coliform and faecal coliform at location G2, exceeds the limit of DoE (Bangladesh) Standard.</li> </ul>							

GROUND WATER	LIMITS		OCTOBER 2019				
PARAMETER	DoE (Bangladesh)	IFC/World Bank Standard	G1	G2	G3	G4	AVERAGE OCTOBER
pH	6.5 -8.5	6.5-8.5	7.07	7.17	7.23	7.10	7.14
TDS	1000 mg/l	1200 mg/l	324	345	347	322	334.5
Ammonia	0.5 mg/l	---	0.05	0.01	0.01	0.01	0.02
Nitrate	10 mg/l	50 mg/l	2.8	1	1	2.5	1.82
Phosphate	6 mg/l	---	0.1	0.07	0.07	0.08	0.08
As	0.05 mg/l	0.01 mg/l	<0.003	<0.004	<0.003	<0.003	<0.003
Fe	0.3 - 1 mg/l	0.3 mg/l	<b>7.0</b>	0.21	0.28	<b>5.54</b>	3.25
Mn	0.1 mg/l	0.5 mg/l	<0.1	<0.1	<0.1	<0.1	<0.1
Total coliform	0/100 ml	0/100 ml	0	0	0	0	0
Faecal Coliform	0/100 ml	0/100 ml	0	0	0	0	0
<b>Comments (OCTOBER 2019)</b> From the analysis most of the parameters of ground water were found within standard limit of DoE, Bangladesh & WHO except: <ul style="list-style-type: none"> <li>➤ Concentration of Fe at G1 and G4 points exceeds the limit to some extent.</li> </ul>							

**Table 4.3.7: Soil Quality Monitoring**

Name of the Parameter	Unit	Method of Analysis	Concentration Present (September 2019)		
			Location 1	Location 2	Location 3
Chromium	ppm	Atomic Absorption Spectrophotometer	11.35	34.18	15.06
Cadmium	ppm	Atomic Absorption Spectrophotometer	<0.5	<0.5	<0.5
Lead	ppm	Atomic Absorption Spectrophotometer	5.48	20.06	17.45
Oil & Grease	mg/kg	APHA 5520.B	<1.0	<1.0	<1.0

#### **4.3.4 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 this construction debris and wastes could create local waterlogging and ponding by blocking drainage lines and would be aesthetically displeasing. Proper disposal of these wastes is described in Section 4.4.5.

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 the unhealthy situation at the project site. These solid wastes are disposed of properly as outlined in Section 4.4.5.

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

Table 4.3.4.1 summarizes the effect of project activities on physicochemical environmental parameters during the construction phase of the project. The physicochemical 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 the construction phase would not be very significant, especially if mitigation measures as outlined in Section 4.3.4 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 the construction phase may result from the 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 4.3.4.

The likely noise level to be generated for different construction activities and its impact on the surrounding environment was assessed using a noise meter. Results of the assessment are presented in table 4.3.4.1 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 4.3.4.1: 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
Air Quality				X			
Noise Level				X			
Drinking Water Quality					X (Sh)		
River Water Quality				X			
Ground Water Quality					X (Sh)		

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

#### 4.4 Visual Monitoring and Observations

##### 4.4.1 Traffic Volume

The Project is under construction phase now. Construction activity has already started. The daily traffic details on day to day basis are being monitored and recorded in the registered book properly. Total 1472 Numbers of vehicles enter into the site in up to the month of December. It is suggested that the detail traffic management measures shall include:

- ✓ Recording details of regular inspections/audits for traffic management measures of cargoes/packages weighing more than 20Tons and long-body trailers from port to project site.
- ✓ Recording the delays and other disruptions resulting from slow-moving heavy-lift and/or oversized cargoes.
- ✓ Reporting of any incident/accident occurs during transportation of goods.

**Table-4.4.1: Total Number of Vehicles Based on their Categories**

Name of vehicle	December,19	November,19	October,19	September,19	August,19	July,19
	Number of Vehicle	Number of Vehicle	Number of Vehicle	Number of Vehicle	Number of Vehicle	Number of Vehicle
<b>Truck</b>	62	63	53	34	40	30
<b>Tailor (load&gt;20T)</b>	10	15	19	13	20	18
<b>Microbus</b>	154	135	93	55	50	48
<b>Motorcycles, Cars</b>	215	152	148	15	18	12
<b>Total</b>	441	365	313	117	128	108

#### 4.4.2 Site Security

CNTIC-CCOEC Consortium have already constructed of site boundary fencing to isolate the project site. Marked passages for workers and visitors have not yet been done, necessary action to be taken to accomplish the same. Elevated platforms, walkways and ramps will be installed and equipped with hand rails, toe-plates, and non-slip surfaces. Safe walkway will be marked by color in respective area such as Turbine hall, store etc. Proper sign boards and pictorial safety are given mentioning with caution for the area of petroleum, sprit & highly flammable materials & general awareness prohibiting smoking inside the power plant.

With the incorporation of the security system at the main entry gate, overall site security system will come into a good shape and eventually will be under proper control.



**Figure 4.7: Present Fencing Conditions of the Project Site**





**Figure 4.8: Sign Boards and Pictorial Safety at the Project Site**

#### **4.4.3 Personal Protective Equipment**

The working personnel involved in the construction activities has to be under the safeguard of PPE properly. Figure 4.9 shows that, the workers were found to involve in construction works of pile. The workers involved in with these works were found with PPE, such as Safety Jacket, Safety Shoes, Helmet and Hand Gloves etc.

**Table-4.4.3.1: List of Personal Protective Equipment Used in Project Site**

SI No.	Type of work	Personal Protective Equipment used in site
1	Excavation	Safety Jacket, Safety Shoes, Safety Helmet, Respiratory Protection and Hand Gloves.
2	Construction	Safety Jacket, Safety Shoes, Safety Goggle, Full Body Safety Harness with Shock Absorber, Safety Belt, Helmet, Respiratory protection and Hand Gloves.
3	Welding	Safety Helmet, Safety shoes, Welding Full Face Shield, Welding Hand Shield, Welding Goggle, Protective Clothing, Welding Leather Apron with Leg Guard, Hand Gloves, Ear Plug, Ear Muff, Respiratory Protection etc.
4	Scaffolding	Safety Jacket, Safety Helmet, Safety Shoes, Slush Boots, Safety Belt, Rain Coat, Hand Gloves, Safety Goggle, Full Body Safety Harness with Shock Absorber, Respiratory Protection.







**Figure 4.9: At the Site, Construction Workers are Working with Proper Personal Protective Equipment.**

#### 4.4.4 Incident Record & Reporting

Coordination of CNTIC-CCOEC Consortium with APSCL authority has been developed to monitor any incident, accident, near misses recording and reporting system with proper format. It was observed that the Incident Record & Reporting are being properly monitored and recorded in the register book. There is two minor accident occur in the site on 22<sup>nd</sup> August and 29<sup>th</sup> August, 2019. The minor accident was properly investigated and documented for achieving the target with no fatality and other accident (Zero accident philosophy). APSCL is committed to keeping the accident level in Zero by implementing its proper occupational health and safety management system. If any incidental issue arises, immediately it has to be reported & recorded properly in the prescribed format. Remedial measures are to be proposed for such incident and accident.

#### 4.4.5 Solid Waste

Solid wastes are generated from construction works (construction waste) and workers activities (kitchen waste, paper waste) at the project site. Solid waste log book for keeping record of this wastes in this plant are being properly maintained. It is necessary to erect all kinds of relevant signs regarding waste minimization in respective places of the project and main gate of APSCL. Transfer notes for all solid waste to be transported outside the project site is recorded.

**Table-4.4.5.1: Waste Inventory Log of CNTIC-CCOEC Consortium**

SI	Wastage Name	Wastage Classification	Wastage Type	Source of wastage	Wastage storage area	Storage quantity (kg)	Delivery quantity (kg)	Agreement	Remarks
1	Plastic Pipe	Hazardous	Solid	Construction Site	On site	2.5	2.5	Ok	Ok
2	Brick	Non-Hazardous	Solid	Construction Site	On site	12.4	12.4	Ok	Ok
3	Rubbish	Non-Hazardous	Solid	Construction Site	On site	3.5	3.5	Ok	Ok
4	Scrab	Hazardous	Solid	Construction Site	On site	4.5	4.5	Ok	Ok
5	Cable	Non-Hazardous	Solid	Construction Site	On site	1.8	1.8	Ok	Ok
6	Aggregate	Non-Hazardous	Solid	Construction Site	On site	15.5	15.5	Ok	Ok

#### **Solid Waste Management Plan**

##### **Step-01: Collection System**

All solid wastes including construction wastes, waste generated by workers activities (kitchen waste, paper waste) and other waste will be accumulated on site after collecting from the source of generation.

##### **Step-02: Segregation**

There are various types of solid wastes; these will be segregated in the project site according to their natures as described below.

**Construction waste:** Electrical wiring, rebar, wood, plaster, scrap metal, cement, and bricks.

**Organic waste:** kitchen waste, vegetables, flowers, leaves, fruits.

**Toxic waste:** old medicines, paints, chemicals, bulbs, spray cans, fertilizer and pesticide containers, batteries, shoe polish.

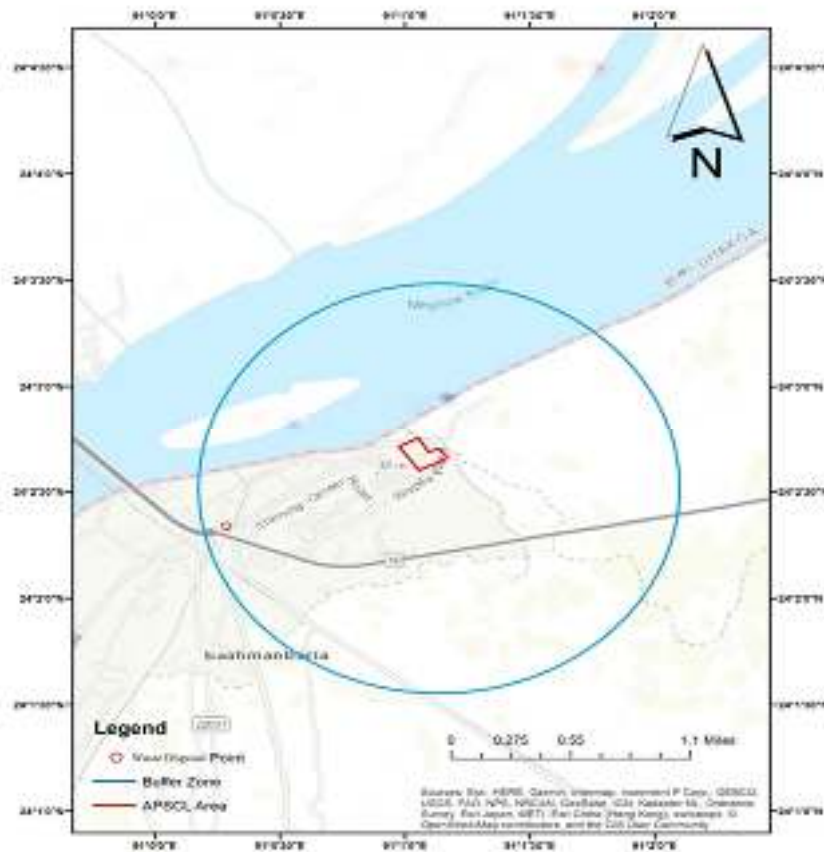
**Recyclable waste:** paper, glass, metals, plastics.

### Step-03: Transportation

After segregation of solid waste from the project site, proper solid waste log is maintained and transported to disposal point by trucks.

### Step- 04: Disposal System

From the transported solid waste, the recyclable inorganic solid waste will be recycled and biodegradable organic solid waste will be deposited in open space and disposed with municipal solid waste and remaining non-biodegradable waste will be sold to secondary vendors. The disposal location has been shown in **figure 4.9**.



**Figure 4.10: Solid Waste Disposal Location**

### 4.4.6 Worker's Health

The CNTIC-CCOEC consortium will provide all kinds of treatment facilities and pay compensation according to Bangladesh Labor Law 2006. It is suggested that worker's health have to be checked properly once in a year. Besides, an understanding has to be built with a local



hospital for the emergency incident related to the worker's health of the plant. CNTIC-CCOEC Consortium has established health monitoring system by appointing a Doctor for the workers. In addition, necessary steps to be taken for arrangement of ambulance service in the plant area to support any emergency medical aid and shifting to the hospital/ medical centre. On site first aid, Doctor and Ambulance facilities are available at project site. First Aid Box medicine list are-

- adhesive tape
- adhesive bandages (Band-Aids) in several sizes
- elastic bandage
- Splint
- antiseptic wipes
- antibiotic ointment
- antiseptic solution (like hydrogen peroxide)
- hydrocortisone cream (1%)
- acetaminophen and ibuprofen
- tweezers
- sharp scissors
- safety pins
- calamine lotion
- alcohol wipes or ethyl alcohol
- thermometer
- Saline



**Figure 4.11: Photograph of Furnished First Aid Box and Ambulance**

#### **4.4.7 Grievance Redress Mechanism**

CNTIC-CCOEC consortium assured that they already established mechanism for grievance redress. Its suggested that complain from neighbours has to be duly recorded & adequate measures should be taken accordingly. Though the project site is within the APSCL boundary, the North West side of the project site is near to some houses of neighbors. CNTIC-CCOEC Consortium is

suggested to set up a suggestion box in front of the gates to facilitate the neighbours to raise complains and take immediate measure to resolve the complaints.



**Figure 4.12: Photograph of Suggestion/Complain Box**

#### **4.4.8 Safety Orientation & Training of Workers**

Training is essential to maintain the employees' health and safety. Both theoretical and practical training will be conducted for the employees on the hazards, precautions, and procedures for the safe storage, handling, and use of all potentially harmful materials. Safety orientation & training for the workers have to be provided to all working personnel during the fresh enrolment / employment. Routine safety training on regular basis has to be maintained. It is suggested that CNTIC-CCOEC Consortium will arrange routine safety training at definite time interval for the workers throughout the construction phase of the project. In addition, Training procedure will incorporate information from the Material Safety Data Sheets (MSDS) for potentially harmful materials.



**Figure 4.13: Daily Toolbox Meeting & Safety Orientation for Workers**

#### **4.4.9 Sanitation & Drinking Water Facility to Workers**

Ground water is being supplied through the arrangement of piping network in the construction site and this water is available for the workers for the washing and toilet facilities. Besides, CNTIC-CCOEC Consortium Management supply potable water Jar for drinking purpose of the workers. At present five potable water Jar is available in project site for drinking purpose. Robust drinking water purification system with reverse osmosis or UV and hot and cool water system will be installed at various locations in adequate number at the plant site during operational phase. Adequate toilets for male and female workers have already been constructed. It is suggested that toilet have to cleaned once in a day otherwise it will be unhygienic.



**Figure 4.14: Drinking water facility to workers**



**Figure 4.15: Water Jar Location at Project Site**

#### **4.4.10 Site Drainage**

In the Construction site, proper drainage system has to be developed for outer/inter drainage in the project site. At present, inside drainage has not yet constructed. As pilling work is going on, rainy water is stored in a pilling spoils water reservoir. After completion of pilling works, necessary drainage will be constructed.



**Figure 4.16: Existing Outer Drainage and Rain Water Reservoir**



#### 4.4.11 Surface Water Drainage

The surface water drainage system should collect all run off of the project site through a system of underground pipes, manholes and finally discharge into the surface water body subject to ensuring the quality standard of Bangladesh.

#### 4.4.12 Dust Control

There is dust around the project site due to on-going construction work. To control the dust nuisance during dry weather, CNTIC-CCOEC Consortium sprays water at three or four times in a day and necessary times when needed. The workers involved in dust control works have to use proper PPE, such as Safety Jacket, Safety Shoes, Helmet and Ear defense, Respiratory protection etc.



**Figure 4.17: Water Spraying for Dust Control**



#### **4.4.13 Monthly HS&E Management**

##### **4.4.13.1 Safety Management**

- ✓ Performing regular toolbox meeting for all of the workers.
- ✓ Performing site visit in the premises regularly.
- ✓ Checking and monitoring the Proper Personal Protective Equipment (PPE) of the workers in the premises.
- ✓ Performing safety report weekly and monthly.
- ✓ Checking the performance equipment that is being used in the premises.
- ✓ Checking adequate intensity of light, ventilation in the workplace.
- ✓ Checking the workplace pathways okay or not.

##### **4.4.13.2 Health Management**

- ✓ Checking the hygiene of the workplace as well as worker's health.
- ✓ Ensure PPE for all of the workers in the workplace.
- ✓ Inspection area tidy, clean and well organized.
- ✓ Checking the proper drinking water supply to the workers.
- ✓ First Aid Box, Ambulance are to be available at the project site and Doctor are available on project site to meet up emergency occurrences.

##### **4.4.13.3 Environmental Management**

- ✓ Checking the workplace for dust free.
- ✓ Checking the workplace air quality.
- ✓ Checking the workplace free from environmental pollution.
- ✓ Checking the workplace that is not creating pollution that is harmful for the environment.
- ✓ Installing fencing at construction site for dust control.
- ✓ Installing water pipe line for proper housekeeping and dust control.

#### **4.5 Mitigation Measure**

##### **4.5.1 Air Quality**

Construction materials at the site are properly covered while hauled and stored, roads properly cleaned and water sprayed in order to minimize the concentration of dust in the air when dust increases. Vehicle movement to and from the site is properly managed to ensure that 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 has monitored regularly at the Health Center established at the project site.

#### 4.5.2 Water Quality

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

#### 4.5.3 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 remaining unused.

#### 4.5.4 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.

#### 4.6 Progress of Work

**Ambient Air Quality Monitoring:** Measurements of selected air quality parameters for PM<sub>2.5</sub>, PM<sub>10</sub> and SPM has been carried out (July–December 2019) during the ongoing construction work. Air samples were collected for measurements of selected air quality parameters for PM<sub>2.5</sub>, PM<sub>10</sub> and SPM.

**Drinking Water Monitoring:** Drinking water sample was collected from supply water in July–December 2019 for analyzing pH, Ammonia, nitrate, phosphate, As, Fe, Mn, Fecal and total coliform.

**River Water Monitoring:** River water sample was collected from Meghna River in July–December 2019 for analyzing temperature, dissolved oxygen (DO) along with BOD<sub>5</sub>, COD, Oil and Grease, and selected heavy metals (Cr, Cd, Pb).

**Groundwater Monitoring:** Groundwater sample was collected from supply water in July-December 2019 for analyzing pH, TDS, Ammonia, nitrate, phosphate, As, Fe, Mn, Fecal and Total Coliform.

**Noise Level Monitoring:** Noise level monitoring is also necessary during the construction period, because the use of heavy construction equipment may increase the noise level at the work location. So, Noise level data were collected from selected 5 locations.

**Waste Management and Process Waste Monitoring:** Disposal of construction debris away from the site and their appropriate disposal sanitary landfill are ongoing. Hazardous waste and non-hazardous waste are also disposing of by proper way.

**Trees Cutting:** The project site is in a bare field. So, there was no scope of tree cutting. But tree plantation program and landscaping are going on for providing a 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 the in-house monitoring system**

APSCL is being set up of the in-house monitoring system and require manpower with its own staffs. In-house environmental monitoring system with manpower 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. Independent Environmental Specialist – 1 nos.

#### **Environmental Clearance Certificate /Renewal of Environment Clearance:**

ASPCL received an exemption of IEE and approval of Term of Reference (ToR) for EIA for Implementation of APSCL 400 MW CCPP (East) from DoE. APSCL also received the EIA approval letter from the DoE, Bangladesh on 08.10.2015.

Based on the EIA approval letter from DoE, APSCL has started bidding work and after successful completion of that construction activities will be started. 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 arises.

#### **4.7 Workshop and Training Meeting and Discussion**

At present an environmental team headed by Md. Atiqur Rahman, Manager (Health, Safety & Environment of APSCL) looking after an overall supervising the monitoring of 400 MW CCPP East Project environmental issues. The consultant conducted a training programmed on environmental issues for APSCL personnel and EPC contractors.

A training program for capacity building program of APSCL personnel and EPC contractors will be arranged upon the availability of requiring manpower. There will be environmental meeting performed in every month and will be discussed the overall performance of the environmental issues of under construction power plant. Beside this Mock drill on Fire and Earth Quake, Electric shock, Acid and chemical spillages are continuing regularly as per set schedule in the power plant.

Various training related to HSE usually conducted in this time period. The main topic of these training is headed by waste management, good housekeeping, induction, environmental issues, PPE and so on.

Some meetings have conducted in this time frame among EPC contractor, APSCL, Subcontractors regarding emergency cases, PPE, good housekeeping and so on. Also, some meetings regarding HSE monitoring have done between the consultants of APSCL and HSE representative of EPC contractor.

##### **4.7.1 Audit and Visit**

ADB's Executive and Alternative Executive Directors team has visited the project site in the date of 16<sup>th</sup> October 2019. Deputy Secretary of Power Division also visited the project site on 14<sup>th</sup> December, 2019. In this visit he mentioned some topics regarding legal documents

of vehicles and drivers. He also discussed regarding the improvement of Fire protection. He also mentioned about safety sign, environmental parameter monitoring, waste management. Few pictures have attached in the Annex-I.

## **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 all appropriate personal protective equipment (PPE), 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. There is two minor accident occur in the site on 22nd August and 29th August, 2019. The minor accident was properly investigated and documented for achieving the target with no fatality and other accident (Zero accident) and detail of safety issue is described in the HSE Statistics chart. HSE statistics from July to December 2019 is given following-

## 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 until now there is not received any grievance to address.

## **7.0 CONCLUSION AND RECOMMENDATION**

The environmental monitoring report is consisting of 8<sup>th</sup> 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 CNTIC-CCOEC Consortium performed for the period of July to December 2019. 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 value is cumulative with surrounding ambient air and noise level. SO<sub>x</sub> and CO are not a problem of the construction period of the power plant. But SPM, PM<sub>2.5</sub>, PM<sub>10</sub> level during the construction period of the power plant is controlled by taking proper mitigation measures and spraying of water. So, the project construction activities do not hamper the air quality in the project area. 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 day and also at night time. The noise level is controlled by using modern, new and fine-tuned equipment. It is also observed that last six-month of 2019 noise level results are not exceed the previous year (2018) last six-month results. So, the project construction activities do not hamper the noise quality in the project area.

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 colour changes of the water, etc.). Drinking and groundwater quality is also found good.

House-keeping is also in good condition at the plant site. All solid, liquid and hazardous waste are disposed of the designated container at the plant site. Most of the solid wastes are disposed of by landfill. The usable solid wastes are handed over to proper party for recycling.

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



## ANNEX-I: PHOTO APPENDIX



**Tool box meeting**



**Tool box meeting**



**Wash Room/Sanitation Facilities**



**Wash Room/Sanitation Facilities**



**Existing outer drainage**



**Traffic Volume Record Register**



**Noise Quality Monitoring Location in front of Admin Building, APSCL at night time**



**Noise Quality Monitoring Location at Day time**



**Air Quality Monitoring Location in front of Admin Building, APSCL**



**Air Quality Monitoring Location at PDB School**



**River water sampling from upstream side**



**River water sampling from downstream side**





**Drinking Water Sampling Point near the Project**



**Drinking Water Sampling inside the project**



**Soil Sample Collection from inside the project**



**Soil Sample Collection from inside the project**



**Photograph of Ground Water Sampling**

## Construction Photograph of the Month July, 2019





## Construction Photograph of the Month August, 2019



## Construction Photograph of the Month September, 2019





## **Construction Photograph of the Month October, 2019**



**Photograph of CCB construction works at project site**



**Sub structure construction has been completed in HRSG portion**



**Sub structure construction work at the project site**



**Shuttering Form work at the project site**



**Super structure work of construction**



**Scaffolding work for column construction at the project site**



**Scaffolding for construction of column at project site**







**Batching Plant**



**Construction of Water Treatment Plant**



**Construction of CW Pump Station**



## **Construction Photograph of the Month November, 2019**



**Photograph of construction works at project site**



**Photograph of Sub structure and Super structure construction**





**Construction of control room**



**Construction of water treatment plant**



**Site preparation of RMS**



**Scaffolding works of construction site**



**Construction of generator hall**



**Welding work of construction site**

## **Construction Photograph of the Month December, 2019**



**Photograph of superstructure construction of Generator Hall**



**Photograph of Sub structure and Super structure construction**





**Construction of control room**



**Construction of main building**



**Water Discharge Pipe**



**Scaffolding works of construction site**



**Construction of generator house**



**Welding work of construction site**

### Site Visit by SDG Coordinator of Prime Minister Office



### Site Visits by Deputy Secretary of Power Division





## Site Visit & Meeting with Executive Director and Alternative Executive Director of ADB



## ANNEX-II: DoE Clearance of EIA

Government of the People's Republic of Bangladesh  
Department of Environment  
Head Office, Parihesh Bhaban  
E-16 Agargaon, Dhaka-1207  
[www.doe.gov.bd](http://www.doe.gov.bd)

Memo No : DoE/Clearance/5484/2015/ 491

Date: 08/10/2015

**Subject:** Approval of Environmental Impact Assessment (EIA) Report for Ashuganj 400 MW Combined Cycle Power Plant (East) at Ashuganj under Brahmanbaria District.

**Ref:** Your Application dated 06/08/2015.

With reference to the above, the Department of Environment (DOE) is pleased to approve Environmental Impact Assessment (EIA) Report for Ashuganj 400 MW Combined Cycle Power Plant (East) at Ashuganj under Brahmanbaria District subject to fulfilling the following terms and conditions.

1. This EIA report is approved only for 400 MW Combined Cycle power plant. Any expansion or extension of this power plant will be required further/fresh EIA study for the Environmental clearance from the Department of Environment (DOE).
2. Project Proponent may undertake activities for land development and infrastructural development of the project.
3. Project Proponent may open L/C (Letter of Credit) for importing machineries for the project which shall also include machineries relating to waste treatment plant and other pollution control devices.
4. The activity under the Power Plant Construction Project shall not result in the loss of containment of any materials that would affect health or will have damaging impact on the environment or natural resources.
5. Proper and adequate mitigation measures shall be ensured throughout preparation, construction and operation period of the proposed Power Plant Construction Project activities.
6. Any heritage sight, ecological critical area, and other environmentally and/or religious sensitive places shall be avoided during project construction phase.
7. Proper construction and development practices shall be followed that minimize loss of habitats and fish breeding, feeding & nursery sites.
8. Construction works shall be restricted to day time hours so as to avoid/mitigate the disturbance of local lives as well as implementation schedules of the works shall be notified in advance to nearby residents.
9. Proper and adequate sanitation facilities shall be ensured in labor camps throughout the proposed project period.





10. In order to control noise pollution, vehicles & equipment shall be maintained regularly; working during sensitive hours and locating machinery close to sensitive receptor shall be avoided.
11. No solid waste can be burnt in the project area. An environment friendly solid waste management should be in place during the whole period of the project in the field.
12. Proper and adequate on-site precautionary measures and safety measures shall be ensured so that no habitat of any flora and fauna would be demolished or destructed.
13. All the required mitigation measures suggested in the EIA report along with the emergency response plan are to be strictly implemented and kept operative/functioning on a continuous basis.
14. To reduce dust, spraying of water over the earthen materials should be carried out from time to time.
15. Storage area for soils and other construction materials shall be carefully selected to avoid disturbance of the natural drainage.
16. Adequate considerations should be given to facilitate drainage system for run off water from rain.
17. Adequate facilities should be ensured for silt trap to avoid clogging of drain/canal/water bodies.
18. Construction material should be properly disposed off after the construction work is over.
19. The project authority shall submit a detail work plan with time schedule of development activities at least 7 (seven) days ahead of the work commences in the field to the Brahmanbaria District Office, Chittagong Regional Office and Headquarters of the Department of Environment simultaneously.
20. Environmental Monitoring Reports shall be made available simultaneously to DOE Brahmanbaria District Office, Chittagong Regional Office and Headquarters on a monthly basis during the construction period of the project.
21. The following records must be kept in respect of any samples required to be collected for the purposes of environmental monitoring activities :
  - (a) the date(s) on which the sample was taken;
  - (b) the time(s) at which the sample was collected;
  - (c) the point at which the sample was taken; and
  - (d) the name of the person who collected the sample.
22. The results of any monitoring required to be conducted under this EIA report must be recorded.
23. In case of any emergency, the following information shall immediately be reported to Brahmanbaria District Office, Chittagong Regional office and Headquarters of the Department of Environment (DOE) simultaneously
  - a) Nature of incident (land slides, fire, accident, collision, etc.)
  - b) Personnel affected (injured, missing, fatalities, etc.)
  - c) Emergency support available and its location (standby transport, medical facilities, etc.)
  - d) Weather conditions

*John A.*

- e) Current operations (abandoning the site, fire fighting, etc.)
24. Appropriate permission would require to be obtained from the Forest Department in favor of cutting/felling of any plant/tree/sapling forested by any individual or government before doing such type of activity.
  25. The project authority shall extend active cooperation to DOE officials to facilitate their visit to the site as and when necessary.
  26. The project authority shall, after land development, infrastructural development and installation of the power plant, apply for Environmental Clearance to the Brahmanbaria District Office of DOE with a copy to the Head Office of DOE in Dhaka.
  27. Without obtaining Environmental Clearance, the project authority shall not start the operation of the project.
  28. Violation of any of the above conditions shall render this approval void.
  29. The project authority shall, after land development, infrastructural development and installation of the plant, apply for Environmental Clearance Certificate without which proponent shall not start operation of the project.
  30. This EIA Approval has been issued with the approval of the appropriate authority.

*(Signature)*  
08/10/2015

(Syed Nazmul Ahsan)  
Director (Environmental Clearance)  
Phone # 02-8181778

Managing Director  
Ashuganj 400 MW Combined  
Cycle Power Plant (East)  
Sunarampur, Ashuganj  
Brahmanbaria.

Copy Forwarded to :

- 1) PS to Secretary, Ministry of Environment and Forests, Bangladesh Secretariat, Dhaka.
- 2) Director, Department of Environment, Chittagong Divisional Office, Chittagong.
- 3) Deputy Director/Office In-charge, Department of Environment, Brahmanbaria District Office, Brahmanbaria.
- 4) Assistant Director, Office of the Director General, Department of Environment, Head Office, Dhaka.

## Annex-III: Carbon Footprint Analysis

### BAN: Power System Expansion and Efficiency Improvement Investment Program-Tranche 3

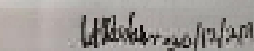
#### Ashuganj 400 MW CCPP East Project


##### Methodology

SI	Description		SI	Description		
1	Electricity Outputs Grid electricity:	MW 146	7	New Plant Efficiency:	58.75%	
2	Existing power plant's output:	254	8	Emission factor for gas:	56.1 kgCO <sub>2</sub> /GJ	0.0561 tCO <sub>2</sub> /GJ
3	Project Output:	400	9	Grid emission factor for BAN:		0.648 tCO <sub>2</sub> /MWh
4	Time (hrs/yr):	8,760	10	fuel consumption per year, GJ/year:		3.6
5	New plant availability:	85%				
6	Old plant availability:	36%				

##### Calculation

SI	Description	MWh/yr	
1	Baseline generation from the old power plant (Existing Output*Time*New Plant Availability):	1,891,284	
2	Baseline generation from Grid (Grid*Time*New Plant Availability):	1,087,116	
3	Baseline generation from the old power plant:		
4	Fuel consumption-old power plant: (GJ/year)	19093164	
5	Baseline emission—old power plant:	1071127	tCO <sub>2</sub> /yr
6	Baseline emission—grid:	704451	tCO <sub>2</sub> /yr
7	Total baseline emission:	1,775,578	tCO <sub>2</sub> /yr
SI	Description		
1	Project electricity generation:	2,978,400	MWh/yr
2	Project fuel consumption:	18250621	GJ/yr
3	Project Emission:	1,023,860	tCO <sub>2</sub> /yr
	<b>Emission Reduction from the Project (Tentative)</b>	<b>751,718</b>	<b>tCO<sub>2</sub>/yr</b>

  
 A.R.M. Hossain, Senior Engineer  
 Ashuganj 400 MW CCPP (East) Project  
 Ashuganj Power Station, Gopibandhu, M.  
 Ashuganj, Brahmanbaria, HUL

  
 13.01.2020  
 Md. Atiqur Rahman  
 Manager (Health, Safety & Environment)  
 Ashuganj Power Station Co. Ltd.  
 Ashuganj, Brahmanbaria