NOVEMBER 2023

INITIAL ENVIRONMENTAL EXAMINATION (IEE)

OF

100MW AC SOLAR POWER PARK

OF

DYNAMIC SUN ENERGY PVT. LTD.

AT

PABNA, BANGLADESH

PREPARED FOR: DYNAMIC SUN ENERGY PVT. LTD.

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ABBREVIATION

ADB	Asian Development Bank
AECL	Adroit Environment Consultants Limited
AoI	Area of Influence
ARIMA	Acquisition and Requisition of Immovable Property Act 2017
ASA	Action for Social Advancement
BAT	Best Available Technologies
BBS	Bangladesh Bureau of Statistics
BDT	Bangladesh Taka (Currency)
BMD	Bangladesh Meteorological Department
BNBC	Bangladesh National Building Code
BOD	Biochemical Oxygen Demand
BOO	Build, Own and Operate
BPDB	Bangladesh Power Development Board
BMD	Bangladesh Meteorological Department
BNBC	Bangladesh National Building Code
BRAC	Bangladesh Rural Advancement Committee
BWDB	Bangladesh Water Development Board
CO	Carbon Monoxide
CO_2	Carbon Dioxide
COD	Chemical Oxygen Demand
COP	Conference of Parties
CSR	Corporate Social Responsibility
dBA	Decibels A
DMP	Disaster Management Plan
DO	Dissolve Oxygen
DoE	Department of Environment
DSEPL	Dynamic Sun Energy Private Limited

EBRD	European Bank of Reconstruction and Development
ECA	Environment Conservation Act 1995
ECC	Environmental Clearance Certificate
ECoP	Environmental Code of Practice
ECR	Environment Conservation Rules 2023
EHS	Environment, Health and Safety
EMS	Environmental Management System
EPC	Engineering, Procurement and Construction
EIA	Environmental Impact Assessment
ESMP	Environmental and Social Management Plan
FGD	Focus Group Discussion
GoB	Government of Bangladesh
GRC	Grievance Redress Committee
IA	Implementation Agreement
IEE	Initial Environmental Examination
IFC	International Finance Corporation
ILO	International Labour Organization
IUCN	International Union for Conservation of Nature
JICA	Japan International Cooperation Agency
KII	Key Informant Interviews
kV	Kilo Volt
LC	Least Concern
LRP	Livelihood Restoration Plan
MOEFCC	Ministry of Environment, Forest, and Climate Change
MOWR	Ministry of Water Resources
MoU	Memorandum of Understanding
MSDS	Material Safety Data Sheets
MW	Mega Watt
NEMAP	National Environmental Management Action Plan
NGO	Non-Government Organization
NOx	Oxides of Nitrogen

PAPs	Project Affected Persons
PPE	Personal Protective Equipment
$PM_{2.5}$	Particulate Matter < 2.5µm
PM_{10}	Particulate Matter < 10µm
PWD	Public Works Datum
RIC	Resource Integration Centre
RRP	Resettlement and Restoration Plan
SAP	Sampling and Analysis Plan
SDGs	Sustainable Development Goals
SEDA	Sustainable Energy Development Agency
SO_2	Oxides of Sulfur
SPARRSO	Bangladesh Space Research and Remote Sensing Organization
SPM	Suspended Particulate Matter
SPS	Safeguard Policy Statement
SREDA	Sustainable and Renewable Energy Development Authority
STP	Sewage Treatment Plant
TDS	Total Dissolve Solid
TOR	Terms of Reference
TSS	Total Suspended Solids
UNFCCC	United Nations Framework Convention on Climate Change
WARPO	Water Resources Planning Organization
WB	World Bank

GLOSSARY

Adverse impact: An impact that is considered undesirable.
Ambient air: Surrounding air.
Aquatic: Growing or living in or near water.
Bangla: Bengali language.
Baseline (or existing) conditions: The 'baseline' essentially comprises the factual understanding and interpretation of existing environmental, social and health conditions of where the business activity is proposed. Understanding the baseline shall also include those trends present within it, and especially how changes could occur regardless of the presence of the project, i.e., the 'No-development Option'.
Beneficial impacts: Impacts, which are desirable and useful.
Biological diversity: The variety of life forms, the different plants, animals and microorganisms, genes they contain and the ecosystems they form. It is usually considered at three levels: genetic diversity, species diversity and ecological diversity.
Char: Char a tract of land surrounded by the waters of an ocean, sea, lake, or stream; it usually means, any accretion in a river course or estuary.
Contractor: The legal entity that is party to and performs a works contract, the other party to the contract being the "Procuring Entity."
Ecosystem: A dynamic complex of plant, animal, fungal and microorganism communities and associated non-living environment interacting as an ecological unit.
Emission: The total amount of solid, liquid, or gaseous pollutant emitted into the atmosphere from a given source within a given time, as indicated, for e.g., in grams per cubic meter of gas or by a relative measure, upon discharge from the source.
Endangered species: Species in danger of extinction and whose survival is unlikely if the existing conditions continue to operate. Included among those are species whose numbers have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to suffer from immediate danger of extinction.
Environmental effects: The measurable changes, in the natural system of productivity and environmental quality, resulting from a development activity.
Environmental Impact: An estimate or judgment of the significance and value of environmental effects for natural, socio-economic, and human receptors.
Environmental and Social Management Plan (ESMP): A Plan to undertake an array of follow-up activities which provide for the sound environmental and social management of a project/ intervention so that adverse environmental impacts are minimized and mitigated; beneficial environmental and social effects are maximized; and sustainable development is ensured.
Environmental Management: Managing the productive use of natural resources without reducing their productivity and quality.
Erosion: Process in which wind and water removes materials from their original place; for instance, soil washed away from an agricultural field.
Evaluation: The process of looking back at what has been really done or accomplished.
Fauna: A collective term denoting the animals occurring in a particular region or period.
Flora: All the plants found in each area.
Guccha Gram: Normally known as "Clustered Village" is a Shelter Project of GoB dedicated for landless and homeless people to maintain uninterrupted flow of necessary credit through informal groups for implementation of productive activities.

Habitat: The natural home or environment for a plant or animal.
Household: A household is identified as a dwelling unit where one or more persons live and eat together with common cooking arrangement. Persons living in the same dwelling unit having separate cooking arrangements constitute separate household.
Khal: A natural creek, pool, or tank with a passage of inflow and outflow of water which relates to a nearby river or waterbody.
Land use: Types include agriculture, horticulture, settlement, pisciculture and industries.
Literacy: It denotes ability to write a letter in any language. Literacy status assessment is made for population 7 years and over.
Mitigation: An action, which may prevent or minimize adverse impacts and enhance beneficial impacts.
Mauza: A Bangla word for the smallest government administrative area corresponding to village revenue unit.
Mahalla: Lowest urban geographic unit having identifiable boundaries.
Negative Impact: Negative change from the existing situation due to the project.
Public consultation: A range of techniques that can be used to inform, consult, or interact with stakeholders affected / to be affected by a proposal.
Stakeholders: Those who may be potentially affected by a proposal, e.g., Local people, the proponent, government agencies, NGOs, donors and others, all parties who may be affected by the project or to take an interest in it.
Taka: Unit of Bangladeshi currency.
Terrestrial: Living on land like forests, grasslands, deserts, shorelines, and wetlands.
Union: Smallest unit of local self-government comprising several villages.
Upazila: Sub-district name. Upazila introduced in 1982.
Village: Lowest rural geographic unit either equivalent to a mauza or part of a mauza.
Ward: Smallest administrative urban geographic unit comprising of mahallas and having ward council institution.
Zila: Bengali word of district.

EXECUTIVE SUMMARY

1. INTRODUCTION

Electricity plays the most basic role in the economic growth through sustainable structure as well as poverty eradication and security of any country. Reliable electricity supply is a vital issue for the world today. Future economic growth crucially depends on the long-term availability of electricity, which are affordable, available and environment friendly. The present government's goal is to guarantee continuous and quality power supply for all by 2027 through change in generation, transmission, and distribution methods.

The present government's goal is to generate 40% electricity from renewable and clean sources by 2041 as Bangladesh is a signed country of United Nations Framework Convention on Climate Change (UNFCCC) which targets to reach net zero emission by 2050. Currently, the country has only 1183.63 MW renewable energy installed capacity where, 949.64 MW is solar energy according to Sustainable and Renewable Energy Development Authority (SREDA). Presently, 40 solar power plant projects are being incorporated, among them 10 are already in operation, 8 are on construction phase and 22 are under planning phase. GoB is requesting the business magnets of the country to invest in Solar Power Plants to fulfil the target of sustainable clean energy across the land.

Responding to the need and goal of the country, Dynamic Sun Energy Pvt. Ltd. planned the proposed 100 MW AC Solar Power Park which is in the village of Bhabanipur in the Hemayetpur Union which is situated at the south-west side of Pabna City, in Pabna District, Bangladesh. The project is planned on a Build, Own, and Operate (BOO) basis under the Implementation Agreement (IA) with the Government of Bangladesh (GoB). The proposed main power plant requires 400 acres of land [for the main power plant, substation area, worker camp, construction / laydown area]. At the time of data collection for this assessment, the proponent had purchased 229 acres of land through willing buyer and willing seller method with the rest of the land under process with anticipated acquisition completion date within September 2023. The electricity transmission line for this power plant has started from the proposed solar power plant (Bhabanipur, Hemayetpur Union) to existing 230/132 KV Grid PGCB Sub-station at Joynagar, Ishwardi, Pabna which is 21.5 km long and contains 79 towers. The width of the RoW has been considered as 10m along the TL and allowable height clearance is 8m from lower conductor. The transmission tower footings require 0.7642 acres of land which is purchased through negotiated settlement. Because land may be accessed through legal means if the land owner refuses access involuntary resettlement requirements are triggered according to ADB SPS 2009, Safeguard Requirement 2. At the time of data collection, footing areas for 76 towers had been purchased with 3 transmission tower footing areas pending. The assessment of prior project activities undertaken to date are covered in the allied Environmental and Social Compliance Audit Report (ESCAR) which is required by ADB under its provisions for financing projects with existing facilities.

Under this project, AECL has been appointed for providing consultancy service for conducting Environmental & Social Assessment by preparing IEE report, Environmental and Social Compliance Audit (ESCA) and Resettlement Plan (RP) / Livelihoods Restoration Plan (LRP) for the solar power plant, transmission line, and its associated facilities. This report only deals with the Environmental & Social Assessment for the solar power plant, transmission line, and its associated facilities which has been

prepared according to the ToR provided by the ADB to assess the impacts of the power plant and its associated facility in the surrounding area of the plant and suggest appropriate avoidance, mitigation, and management.

2. LEGISLATIVE REQUIREMENTS

According to the latest Environmental Conservation Rules, ECR 2023 the proposed project and its associated facilities falls under "ORANGE Category" as more than 50MW Solar power plant and Transmission line less than 25 km falls under "ORANGE Category". According to ECR, 2023, this project falls under "Orange" category and is required to obtain 'Site Clearance Certificate' by undertaking IEE study prior to any kind of construction activities at the project site. DSEPL has submitted an IEE study conducted by DSCL in September-October, 2023. The report was submitted to DoE in March 2023 (Submission copy is attached as Annexure 1). After few revisions the report was approved and SCC was provided (Certificate No.: 23-100875, valid from June 19, 2023 to June 18, 2024) in June 2023 against the final version of the IEE. The copy of SCC is attached as Annexure 2. This clearance is subject to renewal every year.

According to the Environmental categorization of ADB Safeguard Policy Statement (SPS) 2009, the proposed project is a "**Category B**" project which has few site impacts which can be mitigated and managed via mitigation measures. According to the ADB SPS 2009, "**Category B**" project requires an Initial Environmental Examination (IEE) per the requirement of ADB to assess the impacts of the project. This IEE study has been undertaken to comply with the ADB Safeguard Policy Statement (SPS). According to the Involuntary Resettlement categorization of ADB Safeguard Policy Statement (SPS) 2009, the project is categorized under "**Category B**", as land acquisition for the transmission line may have recourse to eminent domain type legislation in the event of failed negotiations with land holders which may, as a result lead to involuntary restriction on land use and economic displacement as result of lost or damaged crops and trees. For this a Resettlement Plan has been developed and implemented for any remaining land acquisition that occurs for the transmission line development. According to the indigenous people categorization of ADB Safeguard Policy Statement (SPS) 2009, this project falls under "**Category C**", as there is no sign of indigenous people in or around the project site.

In addition to ADB's SPS 2009 requirements, the applicable national and international policies, laws, rules, and guidelines, are followed for the preparation of this IEE study and are briefly discussed in this chapter 2.

3. DESCRIPTION OF THE PROJECT

Dynamic Sun Energy Private Ltd.is setting up the 100 MW ac solar power plant at Hemayetpur Upazila which will supply electricity to Bangladesh Power Development Board ("BPDB") for a period of 20 years on an off-take basis.

Table 1: The Basic Data of 100 MW ac Solar Power Project

1. Name of the Project	100 MW ac Solar Power Plant
2. Project Proponent	Dynamic Sun Energy Private Limited

3. Project Location	Bhabanipur & Ratanpur Mauza, Hemayetpur Union, Pabna Sadar Upazila, Pabna, Bangladesh
4. Fuel Type	Sunlight
5. Plant Type	Solar Power Plant
6. Net Plant Capacity	100 MW
7. No. of Solar PV Module	2,74,224 nos.
8. No. of Grid Tied Inverter	760 nos.
9. No. of Transformers	Total 36 nos.
10. Total Land Area	400 acres for power plant[1] 0.7642 acres for tower footing area
11. Transmission line	21.5 km from Hemayetpur to Ishwardi
12. Transmission tower	79 nos.
13. Total Manpower	Construction phase: 700 persons (200 residential and 500 non-residential) Operation phase: 550 persons (200 residential and 350 non-residential), see Annexure 5
14. Water Requirement	Construction phase: Domestic purpose 86 m^3/day Operation phase: Domestic purpose 71 m^3/day and PV module cleaning (twice) 2742 m^3/month
15. Power Evacuation System	Generated electricity will be evacuated through BPDB's 230/132 kV substation situated at Joynagar, Ishwardi, Pabna.

The proposed Power Plant is located within Bhabanipur and Ratanpur Mauza; Hemayetpur Union, Pabna Sadar Upazila, Pabna. Power transmission line will pass over Bhabanipur, Bhagiratpur, Bilkeda Khas, Khas Char Bagunda, Char Pratappur, Char Kudulia, Shimul Char, Ratanpur Mouza of Pabna Sadar Upazila and Dadapur, Joynagar, Kamalpur, Kaikunda, Maniknagar, Luxmikunda, Sahapur and Char Silimpur Mouza of Ishwardi Upazila. The project site is about 8.79 km from Pabna Sadar Upazila and 125.87 km from Dhaka. The project area is surrounded by a branch of Padma River at south and west side. Bhabanipur Upazila is located at the north side and Ghoshpur on the east side.

Power Plant Area

The project site is in Bhabanipur which is mainly a char land[2], at the side of the Padma River. There is no industry and factory around the project site. A khal originated from the Padma River is located adjacent to the southern side boundary of the project site and 0.5 km away from the west side boundary of the project. There is a guchha gram at the north-west side of the project area. The width of this khal varies from 100m to 130m. During monsoon season the local khal has very low flow but during dry season it becomes dry. Padma River is passing to the south side of the project area which is about 1.5 km from the project site.

[1] The project needs around 379 acres of land based on its design and drawings, however, BPDB approved around 400 acres of land. In revised FM, the Sponsors consider Land & Land Development Costs for 379 acres.

[2] Char is a tract of land, surrounded by the waters of an ocean, sea, lake, or stream; it usually means, any accretion in a river course or estuary.

According to the layout map (Figure 1 and Annexure 2) there will be office buildings, main substation control building, block sub-station building within the project area. Dormitory building, family quarter, swimming pool, playground, officer's club, child park, mothers' waiting zone, mosque, helipad will be at east side of the project area.

During the time of preparation of this report (March 2023) the project was under construction phase and already construction of sub-station building, office building, dyke or boundary road, pile driving work etc. are going on. There are temporary office buildings, labour shed, medical room, child care facility, kitchen, dining, sanitation facility, septic tank, water treatment plant, parking area, internal earthen road etc. facilities present at the site. Existing temporary office buildings and labour shade has been shown in the layout in **Figure 3.7**. 3D view of the project is shown in **Figure 3.8.**

According to the site elevation map (attached as Annexure 3) the highest elevation of the power plant site is 13.162m and lowest elevation is 7.487m. According to the Flood Study and Mitigation Report (attached as Annexure 4), the maximum water elevation for 10-year and 100-year ARI due to overtopping of Padma River is EL. 13.98 m PWD and EL.15.04 m PWD respectively and maximum water elevation for 100-year ARI due to flood from local rain is EL.12.3 m PWD. The entire land has already been developed. To raise the main power plant site at elevation 12.3m total 71555 m^3 sand was required where 67591 m^3 was procured from cutting of the main power plant site. Additional 3964m^3 was outsourced. In addition to that, 50300 m^3 (36575m^3 + 13725 m^3) was outsourced for platform development of substation and main control room and 156522 m^3 (135966 m^3 + 20556 m^3) was outsourced for dyke and internal road development. In total, 210786 m^3 sand was outsourced. Please see Annexure 33 & 34. Project proponent has distributed the project area into 15 Blocks. The solar panel will be mounted on tables and each table will be mounted on 10 PHC piles. 58 PV panels will be mounted per single table. There will be a total of 4728 tables and 48600 PHC piles. About 10775 piles out of 48600 have already been driven. About 5.6 m of the pile will be driven below the ground and 3.4 m will be above the ground. The elevation of lower and upper side of the PV panel will be at 15.485m and 16.50m respectively. Some solar panel has been installed in a trial basis to identify the yield of them in developed land. The project site is a vacant land with no settlements, but a small area is currently in use for banana cultivation for only this season. Fencing of 258.5 acres has been completed. The project solar power plant site is located on non-agricultural Char land and the proponent has already purchased 229 acres of land till August 2023 through willing buyer and willing seller method and the rest of the land is under process which will be purchased by end of September 2023 according to the latest schedule.

Transmission Line Area

The length of the transmission line is 21.5km and the transmission line from the power plant area will be stringed above the ground through transmission towers and toward the last end (near substation) about 0.5 km will go under the ground. Memorandum of understanding (MoU) has been made with the land owners for the land area of the transmission tower and compensation has been given to the project affected people for Row, standing crops and for access to the site. The construction of tower footing area has been started and out of 79 transmission towers (only footing) 75 had been completed by August 2023. The proponent has entered a JV with DRS-EPBL-Mukti for transmission line construction activity. They are using cast in situ piles for transmission tower base. There will be two

types of towers i.e., angle tower and suspension tower. For each angle tower 8 piles are casted and for each suspension tower 16 piles are casted for the construction of footing of the towers. Construction of angle tower footing takes 7~10 days and suspension tower footing take 4~5days. After completing the construction of each tower footing, the contractor cleans up and reinstate the site before leaving. During the construction of tower footing the DSEPL ensures environmental and social compliance by their two-tier mechanism. The first tier involves site supervisors and EHS manager who observes contractor's compliance to environmental and social issues and the second tier involves audit team who monitors whether the site supervisors and EHS manager is properly working or not. They reporting is maintained through a WhatsApp group and no written reporting is there. The contractors are required to confirm compliance with national labour laws as part of their contract agreement which is attached as Annexure 9. In the responsibility section of the Contract, it is mentioned that the contractor must follow the EHS Policy of DSEPL which is prepared following Bangladesh Labour Act. EHS Policy of DSEPL attached as Annexure 10. The adjacent land area of the transmission line is predominantly agricultural type. After Commissioning of the 132kV Transmission Line, Power Grid Company of Bangladesh (PGCB) will be responsible for operation & maintenance of the transmission Line. DSEPL will be responsible for coordination & liaison with PGCB's O & M team to ensure uninterrupted power evacuation from the DSEPL Solar Power Plant.

The layout of power plant area and project boundary area are shown in **Figure 1** (Annexure 2) and **Figure 2**.

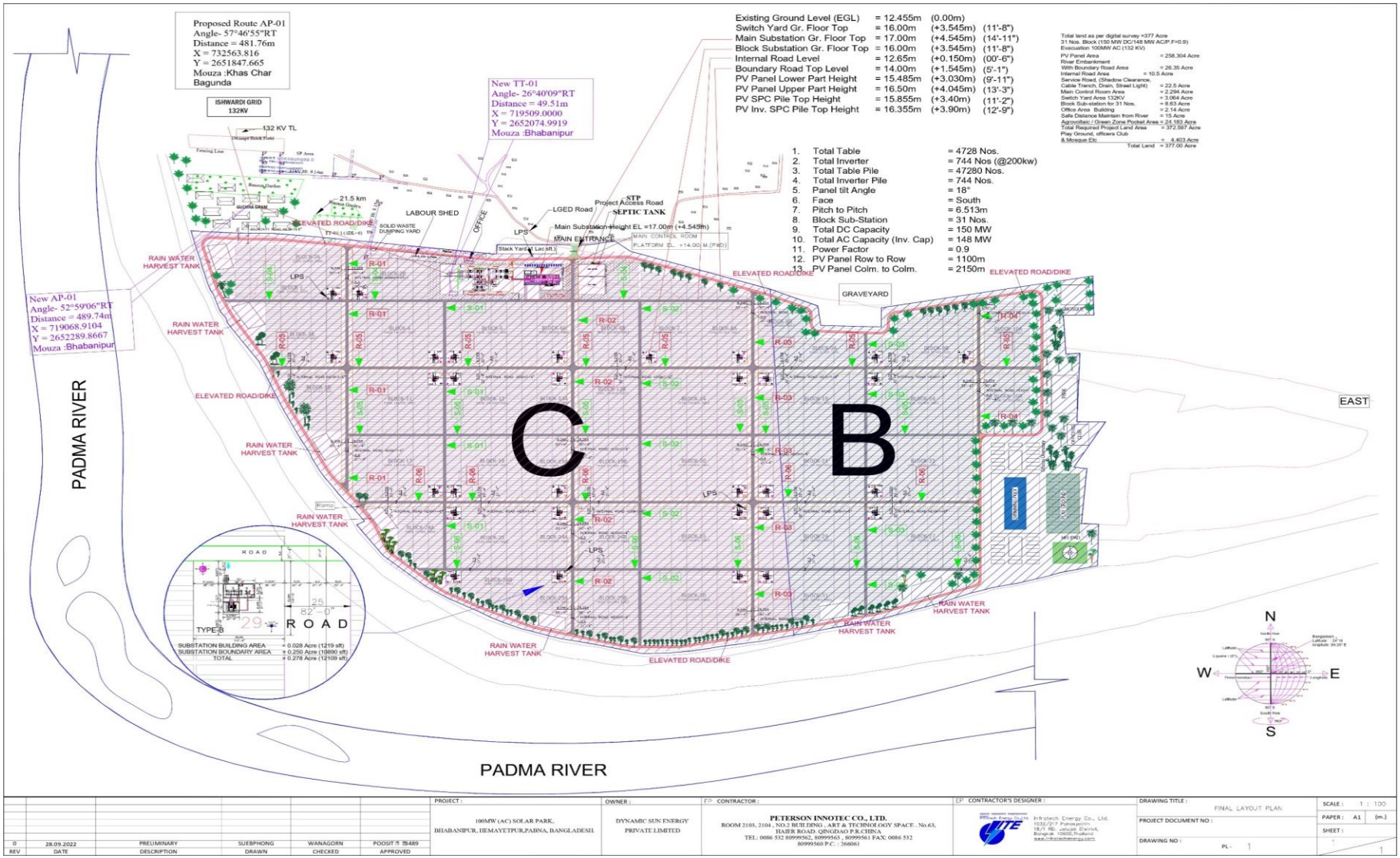


Figure 1: Layout of 100 MW Solar Power Plant Area

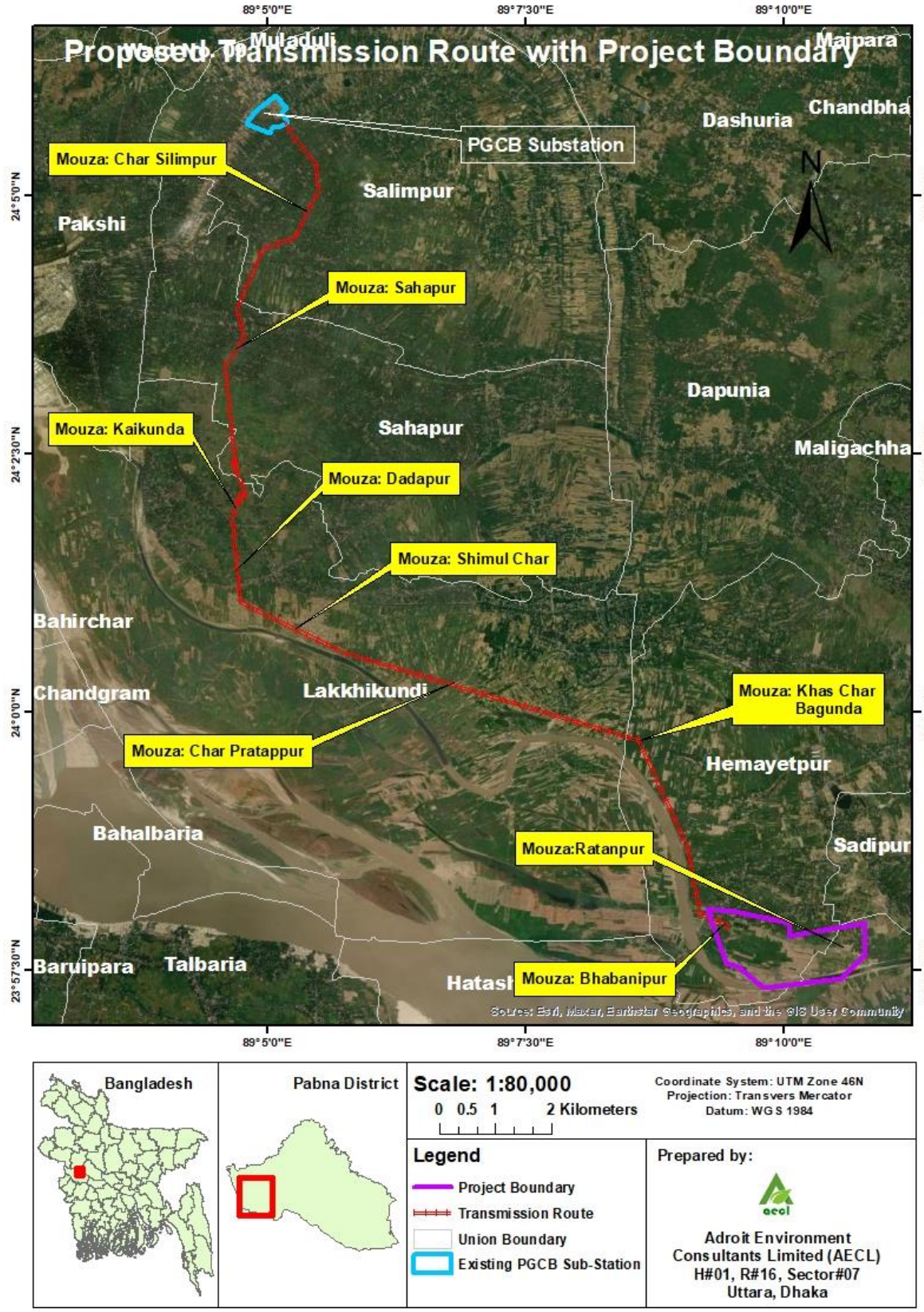


Figure 2: Project Location Map

4. BASELINE ENVIRONMENT

Baseline environment is concerned with existing physical, chemical, and biological conditions of the area where the project is going to be set up. The surface water, ground water, soil quality, ambient air quality and noise level have been analyzed to evaluate the primary baseline of the area. In addition to that, primary traffic count, ecological data, land use data has been collected, secondary data on meteorology, geology, hydrology, natural disasters, socio-economic data have been collected.

❖ Climate

Bangladesh is located in the tropical monsoon region, and its climate is characterized by high temperature, heavy rainfall, often excessive humidity, and fairly marked seasonal variations. January is the coolest month, and April is the warmest. Most rains occur during the monsoon (June-September) and a very little occurs in winter (November-February). According to the Climate map, the project area falls in **North-western zone (D)**.

Meteorological data was collected from Bangladesh Meteorological Department. According to it, the monthly average Dry Bulb Temperature (maximum) ranges from 28.5°C to 30.0°C during monsoon season, 16.4 to 22.3 °C during winter season and 24.4 to 30.3 °C during summer season. Average Monthly Relative Humidity (maximum) ranges from 80-85% at monsoon season, 75-79% at winter season and 65-75% at summer season. The maximum Monthly Average Rainfall is recorded 150-400 mm at monsoon season, 0-20 mm at winter season and 5-200 mm at summer season. The monthly prevailing wind speed is recorded 2.1-2.9 SE at monsoon season, 2-2.5 NW at winter season and 1.9-2.6 NW at summer season.

❖ Ambient Air Quality:

Air monitoring has been conducted at six different locations (4 within power plant area and 2 along the transmission route for 24 hours). The baseline levels for criteria pollutants i.e., PM2.5, PM10, SPM, SO2, NO2 and SO2 are compliant with DoE standard. Among the four locations, the maximum values of PM2.5, PM10, SPM, SO2, NOx, CO were found to be 33.52 $\mu g/m^3$ (location 2), 65.73 $\mu g/m^3$ (location 1), 105.84 $\mu g/m^3$ (location 1), 13.83 $\mu g/m^3$ (location 2), 11.49 $\mu g/m^3$ (location 2) and 2 ppm (location 3) respectively. These maximum values are well within the permissible limits of the DOE and IFC standards.

❖ Ambient Noise:

The ambient noise level data were collected from six locations within the project area and the transmission route. The highest noise level out of them was found in the 5^{th} location at 44.1 (LAeq) dBA (during daytime near Dadapur Purba para along the transmission route), which is within the permissible limits of the DOE standards.

❖ **Soil**

Most of the area of Bangladesh is a vast, low-lying alluvial plain, sloping gently to the south and southeast. According to Bangladesh Agricultural research council's Agro-Ecological Zoning map **[Figure 4.26 (a)],** the project area falls in High Ganges River Floodplain. This region includes the western part of the Ganges River floodplain which is predominantly highland and medium highland. Most areas have a complex relief of broad and narrow ridges and inter-ridge depressions. The upper parts of high ridges stand above normal flood level. Lower parts of ridges and basin margins are seasonally shallowly flooded. General soil types predominantly include calcareous dark grey floodplain soils and calcareous brown floodplain soils. Organic matter content in the brown ridge soils is low but higher in the dark grey soils. Soils are slightly alkaline in reaction. General fertility level is low. Soil sample was collected from the project site and the test result is provided in **Table 4.23**.

❖ **Surface Water Quality:**

The primary data for surface water quality parameters was collected from two different locations (one from Padma River and another from the adjacent khal) and the quality of the water has been analyzed and found satisfactory.

❖ **Groundwater Quality:**

To determine quality of ground water, water sample was collected from nearby tube wells and analyzed for different parameters. The result shows that all the parameters, except Lead (Pb) and Cadmium (Cd) remain within the allowable limits of drinking water value as per as Environmental Quality Standards for Bangladesh.

Ground water is used for drinking purpose during construction phase and they have treatment facility at site for that. The depth of the current tube well at project site is 70 ft. As a result, the water exceeds guiding value for Pb and Cd. DSEPL has set up new submersible pump at 220 ft depth along with water treatment plant which can treat 1000 litres of drinking water per hour for the supply of drinking water for the rest of the construction period and operation phase ahead. (Water sample testing results are attached as Annexure …. but the test results for Pb and Cd is yet to be received from the laboratory) pH, Colour, Turbidity, Total Hardness, Cl, TDS, Mn, As, Fe, TC, parameters are well within Bangladesh and WHO drinking water standards)

❖ **Traffic Study**

Traffic volume around the project site has been studied on 16th May, 2023. The traffic volume counts have been recorded continuously for 24 hours to assess the peak hour traffic and traffic composition. The traffic survey data shows that even during full-fledged construction phase the traffic flow is way less than saturation condition. The details of the traffic survey are presented in Section 4.7.

❖ **Seismicity:**

Based on distribution of earthquake epicenters and morpho-tectonic behavior of different tectonic blocks Bangladesh has been divided into three generalized seismic zones. This essentially means that Zone I is the most severe and Zone III is the least severe in seismic hazard. According to the Earthquake Zoning Map of Bangladesh (BNBC 2020), the project area falls in seismic **Zone II** where seismic intensity is Moderate and seismic zone coefficient (Z) is 0.2.

❖ **Flood:**

The project area falls in moderate to low river flooding area shown in **Figure 4.33**. Padma River is on the south side of the project site which is around 1.5km from the project site. According to the local people, the project area and the area between the Padma River and the project area is not seasonally flooded every year. Observing the maximum and minimum water level data from the year 1950 to 2019, it is found that the maximum highest level was 14.53m, minimum highest level was 13.09 and the danger level is considered as 14.53m. The proponent has already undertaken a flood study and has designed the project accordingly so that during flood the project does not get hampered due to water level rise. Details of flood study report and consideration of flooding in project design has been discussed in Section 3.8.1.

❖ **Socioeconomic Baseline:**

The Proposed Power Plant is in Pabna Sadar upazila, Pabna district which further comes under Rajshahi Division. Pabna is a district in North-western Bangladesh. The proposed Power Plant is located within Bhabanipur and Ratanpur Mauza; Hemayetpur Union, Pabna Sadar Upazila, Pabna. Power transmission line will pass over Bhabanipur, Bhagiratpur, Bilkeda Khas, Khas Char Bagunda, Char Pratappur, Char Kudulia, Shimul Char, Ratanpur Mouza of Pabna Sadar Upazila and Dadapur, Joynagar, Kamalpur, Kaikunda, Maniknagar, Luxmikunda, Sahapur and Char Silimpur Mouza of Ishwardi Upazila.

Pabna Sadar is the largest upazila of Pabna; occupies an area of 439.30 sq. km. It is located between 23˚53’ and 24˚05’ north latitudes and between 89˚09' and 89˚25’ east longitudes. The upazila is bounded on the north by Atgharia upazila, on the east by Santhia upazila and Sujanagar upazila, on the south by Pangsha upazila of Rajbari zila and Khoksha upazila and Kumarkhali upazila of Kushtia zila and on the west by Ishwardi upazila.

For this project, land of the main power plant area has been purchased following willing buyer and willing seller process and there were no informal land users who would have been involuntarily displaced, nor any structures been displaced. In addition to that, there was no informal land user, land sellers / users who will be worse off as a result of the land sale / loss. Involuntary resettlement is triggered for land acquisition along TL for transmission tower footing area. There is no informal land user or any structure along the TL route. Transmission Line runs mostly through agricultural land. So, there is no village along that route. A detailed survey of all the affected HH due to this Power Plant and TL has been conducted to establish the socio-economic conditions of the households within the power plant and TL, to identify

project impacts and their mitigating/management measures. Findings of the primary socio-economic survey of the affected HH is provided the sections 4.17.1 & 4.17.2.

Table 2: Demographic Characteristics of the Pabna Sadar Upazila

Upazila	Pabna Sadar
Total Area (Sq. km)	439.30
Total Household	1,38,439
Total population	6,15,468
Male	3,09,227
Female	3,06,241
Average Household	4.21
Literacy rate (%)	51.4
Sex ratio (M/F)	101
Population Density (Per Sq. km)	1345
Municipality	1
Union	10
Mouza	243
Village	291
Ward	15
Mahalla	46

(Community Report: Pabna, 2011)

A total of 1054 households (HHs) comprises of 3693 people has been surveyed for the purposes of the social assessments for the main power plant site. Of these HHs 97.55% are male headed and 2.53 female headed HHs are found during census period. 214 HHs have only 1-2 members. HH size of within 7 to 8 members was minimal in the area. According to the age band, the most prominent group is 30-60. At project area total of 3693 populations were surveyed where 2118 are male and 1575 are female, which represents that percentage of female population in the project area is less compared to the male population. It is found that 65.12% people are married against 34.88% unmarried or widowed. Islam is the predominant religion in the study area. Primary and secondary level education entrance is high in the area. A variety of occupational choices have been found in the project location, and majority are farmer. Female population are mostly employed in agriculture and husbandry sector. In addition to agriculture, the other significant occupations are involvement with business, service, day labor, service, and mason etc. In transmission line area, 74.19% of general households have got the facility of drinking tube well water, 1.43% tap water and the remaining 24.38% household gets water from other sources. 67.27% of general household use sanitary facility, 31.50% non-sanitary latrine and 1.23% have no toilet facility. According to Rural Electrification Program, a total of 73.50% of the survey households in transmission line area reported to have electricity connection.

A total of 79 households (HHs) comprises of 257 people has been surveyed for the purposes of the social assessments for the TL only. Of these HHs 100% are male headed. 14 HHs have only 1-2 members. HH size

of within 7 to 8 members was minimal in the area. According to the age band, the most prominent group is 30-60. At project area total of 257 populations has been surveyed where 142 are male and 115 are female, which represents that percentage of female population in the project area is less compared to the male population. It is found that 66.15% people are married against 33.85% unmarried. Islam is the predominant religion in the study area. Primary and secondary level education entrance is high in the area. A variety of occupational choices have been found in the project location, and majority are farmer. Female population are mostly unemployed and do not undertake unpaid labour activities outside of the HH. In addition to agriculture, the other significant occupations are involvement with business, service, day labour, service, doctor, and mason etc. In transmission line area, 92.04% of general households have got the facility of drinking tube well water, 4.1% tap water and the remaining 3.86% household gets water from other sources. 67% of general household use sanitary facility, 27.6% non-sanitary latrine and 4.3% have no toilet facility. According to Rural Electrification Program, a total of 68.7% of the survey households in transmission line area reported to have electricity connection.

- **Terrestrial Ecology & Aquatic Ecology (flora & fauna)**

During the field visit on and from 15th – 16th April, 2023 and 14th – 17th August, 2023, different kinds of flora such as Papaya (*Carica papaya*), Kachu (*Colocasia esculenta*), Bamboo (*Bambusa bambus),* Palm Tree (*Borassus flabellifer*), Coconut (*Cocos nucifera*), Kachuripana (*Eichhornia crassipes*), Helencha (*Enhydra fluctuans*) etc. were found during the AECL field visit.

Common Toad (Bufo melanostictus), House Lizard (Hemidactylus brookii), Common Kingfisher (*Alcedo atthis*), Common Myna (*Acridotheres tristis*), House Sparrow (*Passer domesticus*), House mouse (*Mus musculus*), Domestic Cow (*Bos Taurus*), Domestic Goat (*Capra aegagrus hircus*) etc. terrestrial fauna was found during the field visit. Ilish (*Tenualosa ilisha*), Shol (*Channa striatus*), Shing (*Heteropneustes fossilis*), Rui (*Labeo rohita*), Freshwater Shrimp (*Macrobrachium rosenbergii*) etc. aquatic fauna were found during AECL field survey.

According to the field survey, there is no critical and natural habitat present in and around the project area. Few aliens' invasive flora i.e., Eucalyptus and water hyacinth, some alien invasive fauna i.e., grass carp and silver carp are present in and around the project area. List of existing flora and fauna are mentioned in **Table 4.50 – Table 4.54** and they all fall under least concern category according to IUCN. Any endangered, vulnerable, or threatened faunal species were not found during the field visit around the main power plant area as well as transmission line area. There are some nocturnal animals around the project site, but their movement will not be hampered as the construction work will not be undertaken at night time. According to our study *Pteropus giganteus* (Indian Flying Fox) was found in the study area. But the population of them was not significant, it was rarely common and there is no large roost of them. According to a study (Hasan, M. K., Feerez, M. M., Datta, A. K., Saha, A., & Ahmed, T. (2014). Indian flying fox (*Pteropus giganteus*) roosts in north Bengal of Bangladesh.) *Pteropus giganteus* (Indian Flying Fox) roosters are not present in the Pabna District.

5. ENVIRONMENTAL & SOCIAL IMPACTS OF THE PROJECT

Major impact during pre-construction phase is acquisition of land for power plant and transmission line, disruption of earth surface and disturbance to the local ecology due to land development work.

Major impact during construction phase may include air pollution due to constructional activity and movement of vehicles. Noise generated from moving and idling vehicles, construction activity and movement of heavy machinery may cause hearing problem and create sudden panic to the adjacent people. Surface water quality deterioration due to dumping of solid waste may occur if not managed properly. Soil and ground water may be polluted by accidental spillage of waste lubricants from machineries and leaching from PV panels. Possibility of occurring accidents due to lack of safety and security, not using proper PPE, spread of several contagious and infectious diseases. Spread of contagious diseases due to unhygienic condition in labor shed. Beneficial impact is employment opportunity will be generated during construction.

The major impacts during operation phase may include air and noise emission from transformer and sub-stations. There might be leaching from faulty PV panels which will affect the soil and ground water quality if not timely mitigated. Leakage of electricity may take place which may cause occupational hazard to the cleaners. The main impact during operation phase will be due to usage of ground water for sanitation and kitchen purpose. In addition to that due to influx of residential officials and workers significant amount of solid waste and sewage waste will be generated. If they are not treated and discharged properly then it may cause several vectors (mosquito, flea) borne diseases (diarrhea, dysentery). There is possibility of occurring accidents and spread of several transmittable and infectious diseases among community people. Transmission line may pose potential hazards such as electrocution, bird electrocution etc.

Impact evaluation and identification has been presented in **Table 5.1**

6. PREDICTION, EVALUATION AND MITIGATION MEASURES OF IMPACTS

After evaluating the impacts and their effects on the surroundings, mitigation measures should be taken thoroughly to keep the environment less harmful and hazard free. In **chapter 6**, mitigation measures are suggested for the project proponent and contractor to ensure safety and security to the environment and social surroundings. Mitigation measures suggested has also been incorporated in the Table 3.

7. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

In the context of a project, Environmental & Social Management Plan (ESMP) is concerned with the implementation of the measures necessary to mitigate the adverse impacts and to enhance beneficial impacts. 10. A table (Table 7.1) incorporating all mitigation measures has been prepared for quick access. In addition to that Waste Management Plan, Labour Management Plan, Labour Accommodation Plan, Occupational Health & Safety Plan, Green belt development program, 3R policy, Corporate Social

Responsibility (CSR), ESMP implementation team, Cost of ESMP implementation, Contingency plan, Institutional Capacity building, ESMP monitoring and review has been discussed in detail in **Chapter 7**.

8. MONITORING, EVALUATION AND REPORTING

Monitoring programs have been proposed for this project, which include visual and analytical monitoring during both construction and operation phase. The objective of this monitoring program is to ensure that the various tasks detailed in the environmental and social management plan, particularly the mitigation measures are implemented in an effective manner, and to evaluate project's impacts on the key environmental and social parameters. The total estimated cost of monitoring would be around BDT 790,000.00 yearly during construction and BDT 790,000.00 yearly during operation respectively. Monitoring plan during construction and operation phase are described below in **Table 4 to Table 7.**

Table 3: Monitoring Plan during Construction Phase of the Project (Visual)

Issue	Key aspects	Monitoring Frequency	Responsibility
Traffic volume	Incoming & outgoing traffic, traffic movement records	Monthly	DSEPL
Site Security	Proper fencing, isolation of site from general access, marked passage for workers and visitors	Quarterly	
Personal Protective Equipment	Ensure every single person involved in the construction activity wear proper PPE	• daily inspection by supervisors • weekly/ monthly inspection by manager/ engineers	
Incident record & reporting	Documented record of all incident, accident and its remedial process.	Quarterly	
Solid waste	Quantity of solid waste, segregation, disposal process and transfer	Quarterly	
Access to medical facility	Check access to medical facility with contracted hospital and first aid facility at site	Quarterly	
Grievance Redress Mechanism	Any significant complaint from External (neighbours) and Internal (workers) and their remedial procedure	• Monthly for internal • Monthly on Community GRM	
Safety orientation & training of workers	Frequency of training & orientation of workers for safety	Quarterly	

Issue	Key aspects	Monitoring Frequency	Responsibility
Sanitation & drinking water facility to workers	Availability of safe drinking water and it's quality, septic tank/wastewater disposal and sanitation facility to the workers Septic tank/wastewater disposal, outlet characteristics and sanitation facility to the workers	Quarterly	
Chemical Storage and Management	Fuel tank and chemical storage operation, maintenance and leakage inspection	Monthly	
Hazardous Waste Storage	Storage area condition, availability of spill kit, inventory	Monthly	
Site Drainage	Maintaining proper drainage	Quarterly	
Occupational Health and Safety	Daily inspection on PPE usage Review of implementation records of specific high-risk procedures (including photos) Inspection of transmission tower construction contractor safety performance against OHS plan Documented record of all incident, accident and its remedial process	Daily for PPE usage Weekly inspection of transmission tower construction safety Monthly for others	
Community Health and Safety	Site inspection of implementation of the described measures Review of community GRM records	Weekly site inspection Monthly on community GRM	
Terrestrial Habitat	Implementation status of the mitigation measures	Quarterly	
Aquatic Habitat	Implementation status of the mitigation measures	Quarterly	
Labor and Working Condition	Implementation status of the mitigation measures	Quarterly	
Social acceptability of Construction workers to the host communities	Implementation status of the mitigation measures	Quarterly	
Employment Generation	Implementation status of the mitigation measures	Quarterly	

Issue	Key aspects	Monitoring Frequency	Responsibility
Increase in local business	Implementation status of the mitigation measures	Quarterly	

Table 4: Monitoring Plan during Construction Phase of the Project (Analytical)

Issue	Parameters	Applicable Standards	Monitoring Locations	Monitoring Frequency	Responsibility
Ambient Air Quality	SO_2, NOx, CO, SPM, PM_{10} and $PM_{2.5}$	Air Pollution (Control) Rules 2022 (Schedule-1) & IFC EHS Guideline, 2007	Given in Table 4.17	Once in 3 months	DSEPL and implemented by 3rd party consultant
Noise level	Noise at different locations at day and night	Noise Pollution (Control) Rules 2006 (Schedule-1) & IFC EHS Guideline, 2007	Given in Table 4.19	Once in 3 months	
Soil	pH, Cd, Cr, Pb, Zn, Al, Cu, Ni, and Si	World Health Organization (WHO) (1996) Permissible Limits of Heavy Metals in Soil and Plants.	Given in Table 4.23	Once in 6 months	
Surface water	Temperature, pH, TDS, TSS, DO, BOD, COD, EC, Fe, Cr, Pb, Cd, Zn, Al, Cu, Ni, Sulphate, Nitrate, and Phosphate.	Environment Conservation Rules (ECR) 2023 (Schedule-2 (Ka)(1)) and & IFC EHS Guideline, 2007	Given in Table 4.12	Once in 6 months	
Ground water	Temperature, pH, TDS, As, Hardness, Cr, Pb, Alkalinity, Fe, Cd, Sulphate, Zn, Al, Phosphate, Cu, Ni, Nitrate, TC, and FC.	Environment Conservation Rules (ECR) 2023 (Schedule-2 (Kha)) and & WHO Drinking Water Guidelines	Given in Table 4.14	Once in 6 months	
Drinking water	Temperature, pH, TDS, As, Hardness, Cr, Pb, Alkalinity, Fe, Cd, Sulphate, Zn, Al, Phosphate, Cu, Ni, Nitrate, TC, and FC.	Environment Conservation Rules (ECR) 2023 (Schedule-2 (Kha)) and & WHO Drinking Water Guidelines	Given in Table 4.16 (a), 4.16 (b)	Once in 3 months	
Waste water	pH, BOD5 at 20°C, COD, Total Nitrogen,	ECR 2023 (Schedule-3), WB EHS guidelines for	Outlet of Septic tank	Once in 3 months	

Issue	Parameters	Applicable Standards	Monitoring Locations	Monitoring Frequency	Responsibility
(Septic tank outlet)	Total Phosphorus, Oil and Grease, TSS, TC	treated sanitary sewage discharge			

Table 5: Monitoring plan during Operational Phase of the Project (Visual)

Issue	Key aspects	Minimum Monitoring Frequency	Responsibility
Hazardous Waste	Review hazardous waste inventory, Check and document PV module that leaches in an inventory, Storage area condition, availability of spill kit, inventory monthly	Monthly	DSEPL
Traffic volume	Incoming & outgoing traffic, traffic movement records	Once in 6 months	
Site Security	Proper fencing, isolation of site from general access, marked passage for workers and visitors	Once in 6 months	
Personal Protective Equipment	Ensure every single person involved in the construction activity wear proper PPE	• daily inspection by supervisors • weekly/ monthly inspection by manager/ engineers	
Incident record & reporting	Review the documented record of all incident, accident and its remedial process.	Monthly	
Solid waste	Monthly inspection of waste collection and storage areas, review of waste inventory and monitor final disposal location	Monthly	
Access to medical facility	Check access to medical facility with contracted hospital and first aid facility at site	Once in 6 months	
Grievance Redress Mechanism	Any significant complaint from External (neighbours) and Internal (workers) and their remedial procedure	• Monthly for internal • Monthly Community GRM	

Issue	Key aspects	Minimum Monitoring Frequency	Responsibility
Safety orientation & training of workers	Review implementation of training & orientation of workers for safety	Monthly	
Sanitation & drinking water facility to workers	Drinking water quality against Environment Conservation Rules (ECR) 2023 (Schedule-2 (Kha)) and & IFC EHS Guideline, 2007 Sewage treatment plant output sampling against ECR 2023 (Schedule-3), WB EHS guidelines for treated sanitary sewage discharge once in 3 months	Quarterly	
Chemical Storage and Management	Fuel tank and chemical storage condition and operation, maintenance and leakage inspection	Quarterly	
Site Drainage	Maintaining proper drainage	Quarterly	
Water inventory	Review water usage record, Make an inventory of water usage (groundwater and rainwater) and wastewater discharge	Monthly	
Occupational Health and Safety	Daily inspection on PPE usage Review of implementation records of specific high-risk procedures (including photos) Proper fencing, isolation of site from general access, marked passage for workers and visitors, Documented record of all incident, accident and its remedial process, OHS training records & orientation of workers for safety	Daily for PPE use Monthly for Others	
Community Health and Safety	Site inspection of implementation of the described measures Review of community GRM records	Weekly site inspection Monthly on community GRM	
Labor and Working Condition	Implementation status of the mitigation measures	Quarterly	
Terrestrial Habitat	Implementation status of the mitigation measures	Quarterly	
Aquatic Habitat	Implementation status of the mitigation measures	Quarterly	

Issue	Key aspects	Minimum Monitoring Frequency	Responsibility
Social acceptability of workers to the host communities	Implementation status of the mitigation measures	Quarterly	
Employment Generation	Implementation status of the mitigation measures	Quarterly	
Social and Economic Enhancement around project area	Implementation status of the mitigation measures	Quarterly	

Table 6: Monitoring plan during operational phase of the Project (Analytical)

Issue	Parameters	Applicable Standards	Monitoring Locations	Monitoring Frequency	Responsibility
Ambient Air Quality	SO2, NOx, CO, SPM, PM_{10} and $PM_{2.5}$	Air Pollution (Control) Rules 2022 (Schedule-1) & IFC EHS Guideline, 2007	Given in Table 4.17	Once in 6 months	Project company by 3rd party consultant
Noise level	Noise at different locations at day and night	Noise Pollution (Control) Rules 2006 (Schedule-1) & IFC EHS Guideline, 2007	Given in Table 4.19	Once in 6 months	
Soil	pH, Cd, Cr, Pb, Zn, Al, Cu, Ni, and Si.	World Health Organization (WHO) (1996) Permissible Limits of Heavy Metals in Soil and Plants.	Given in Table 4.23	Once in 6 months	
Surface water	Temperature, pH, TDS, TSS, DO, BOD, COD, EC, Fe, Cr, Pb, Cd, Zn, Al, Cu, Ni, Sulphate, Nitrate, and Phosphate.	Environment Conservation Rules (ECR) 2023 (Schedule-2 (Ka)(1)) and & IFC EHS Guideline, 2007	Given in Table 4.12	Once in 6 months	

Issue	Parameters	Applicable Standards	Monitoring Locations	Monitoring Frequency	Responsibility
Ground water	Temperature, pH, TDS, As, Hardness, Cr, Pb, Alkalinity, Fe, Cd, Sulphate, Zn, Al, Phosphate, Cu, Ni, Nitrate, TC, and FC.	Environment Conservation Rules (ECR) 2023 (Schedule-2 (Kha)) and & WHO Drinking Water Guidelines	Given in Table 4.14	Once in 6 months	
Drinking water	Temperature, pH, TDS, As, Hardness, Cr, Pb, Alkalinity, Fe, Cd, Sulphate, Zn, Al, Phosphate, Cu, Ni, Nitrate, TC, and FC.	Environment Conservation Rules (ECR) 2023 (Schedule-2 (Kha)) and & WHO Drinking Water Guidelines	Given in Table 4.16	Once in 3 months	
Wastewater	pH, BOD5 at 20°C, COD Total Nitrogen, Total Phosphorus, Oil and Grease, TSS, TC	ECR 2023 (Schedule-3), WB EHS guidelines for treated sanitary sewage discharge	2 Outlets of STPs	Once in 3 months	

9. ALTERNATIVE ANALYSIS

Bangladesh is facing the scarcity of electricity for many years. After the implementation of this project additional 100 MW electricity will be incorporated in national grid, which will be delivered to different industries, factories, offices nationwide. Moreover, the socio-economic condition of the project site will be developed. 'No build' alternative will not bring these huge changes and other benefits to the socio-economic condition of the adjacent project area. Considering the overall scenario, it is concluded that the 'No build' alternative is unacceptable, and the potential socio-economic benefits of implementation of such project far outweigh the adverse impacts, all of which can be controlled and minimized to an allowable level.

The power plant requires a huge amount of land, which will be bought from the local people following willing buyer and willing seller method and at GoB approved rate. The project is in construction phase

right now and the proponent has already bought 229 acres of land and the rest of the land is under process. There is also no alternative land for the proposed project right now as the location of the main power plant site was pre decided by the Bangladesh Power Development Board (BPDB) (attached as Annexure 22) while providing LOI for the said project and the TL route was finalized by Power Grid Company of Bangladesh (PGCB) (attached as Annexure 23) by conducting survey to find out the most suitable route. If the project chooses to relocate then it will be too expensive for the proponent to buy another land and develop the overall project. So, the selected location of 100 MW ac Solar Power Plant is quite expectable for the proposed project from environmental point of view.

Moreover, the fuel of the power plant is the most environment-friendly fuel. Fuel alternatives and technology alternatives have been also discussed in detail in Chapter 9 and the proposed project detail has been found more reliable and acceptable from environmental and social perspectives. The technology being offered by Dynamic Sun Energy Private Limited is state of the art in terms of being environment friendly, energy efficiency and modern plant & process design. The plant will be built according to the applicable Best Available Technologies (BAT) defined for similar plants.

10. EMERGENCY RESPONSE AND DISASTER MANAGEMENT PLAN

- **Emergency response plan**

Under the supervision of the Project company, all plant personnel will have responsibilities assigned to them during emergency. The documented responsibility will be included in a program manual which can constitute a part of the plant's operation manual. Compliance with the responsibilities should be monitored and if these are not carried out for any reason, corrective measures should be taken.

There should be trained emergency response teams, specific contingency plans, and specific equipment packages in place to cope with these types of emergencies. In case of an emergency incident occur, immediate action must be taken to mitigate the impacts. Details discussed in **Chapter 10**.

- **Disaster management plan**

Appropriate management plan should have to be taken by the project operator to prevent any unwanted disaster in the plant as per the suggestion made in **chapter 10**. In this regard, there should be a provision to stop the production immediately during any process failure or disaster.

11. RISK ASSESSMENT AND MANAGEMENT

Risk estimation and evaluation is a part of the process which aims at identifying all the potential hazards, exposure to hazardous condition or hazards, and their mitigation or safety measures. The approach of risk evaluation is in combination of qualitative and quantitative evaluation of hazard sources, exposures, consequences, and possible mitigation measures. Risk assessment and safety measures are suggested **Chapter 11**.

Potential hazard during construction stage might include occupational related hazards i.e., trips, falls, electrocution, accidents etc. During operation phase, potential hazard might include leaching from PV

panels, fire hazards due to mechanical failure and human toxicity. Other hazards might include occupational related hazards, fatal accidents etc. Mitigation measures include: careful handling and checking of PV panels to avoid leaching, use of personal protective equipment (PPE); proper training on health and safety and safety equipment; proper training on how to use machineries and tools for construction; regular checkup of instruments and machineries; awareness on personal hygiene and road traffic rules and regulation; monthly health inspection of workers and staff etc.

12. STAKEHOLDER CONSULTATION

Stakeholder consultations are very important and sensitive issues for setting up a new power plant in any area of Bangladesh. Three types of consultation were carried out which are Focus Group Discussion, Key Informant Interviews and Formal Public Consultation. Local people, fishermen, farmers, women, children, and vulnerable groups were communicated during the focus group discussion. Govt. offices of Pabna Sadar Upazila and Pabna District, such as, DoE, Department of Fisheries, Department of Agricultural Extension, Bangladesh Water Development Board, UNO and Upazila Parishad, officials were reached during the key informant interviews. Throughout these meetings a simple, non-technical, description of the project was given, with an overview of the project's likely human and environmental impact.

On 17th May 2023, a Formal Public Consultation program was organized by DSEPL and AECL, where local people, political leaders, govt. officials, project proponents along with the Environmental and Social Consultants Team of AECL joined. The stakeholder consultations were initiated with an open objective to ensure people's participation right from the planning stage of the project. More specially, this was aimed at improving the study considering opinions from the people of the impacted area. The consultation process was carried out in the Bangla languages. During these meeting a simple, non-technical, description of the project was given, with an overview of the project's likely human and environmental impact. The community consultations demonstrated that goodwill towards the project proponents indeed exists; approval for project activities by the communities was evident as it would create employment opportunity for skilled, semi-skilled and unskilled people. Implementation of this project would also enhance the region's standard of living because of the increased generation of electricity, contributing to further industrial set up (which further leading to more employment opportunities), etc. Some constructive suggestions were given by the concern personnel for the betterment and protection of the environment.

On 17th August 2023, 2nd Formal Public Consultation program was organized by DSEPL and AECL, where project affected people, project labourers, political leaders, govt. officials, project proponents along with Environmental Consultants Team of AECL joined. The aim of this consultation was to present the identified impacts and the ESMPs, highlighting how the concerns of the communities and stakeholders from previous consultations were addressed in the IEE and ESMP and so that stakeholders can convey their valuable opinions on the process to date and any additional comments. The consultation process was carried out in Bangla language. Land owners who already transferred the land ownership of the main power plant site confirmed that they have received their payments. Land owners of the tower footing area also received money according to the MoU prior to the initiation of the construction work. Local people are happy about the project as they perceive the opportunity to work on the project and manage

to increase the standard of their living. They are also happy as the local business has improved as DSEPL buys their daily necessary things from nearby shops and markets. Local people praised the company as they have improved road quality from Pabna Sadar Upazila to Bhabanipur. Details are provided in **Chapter 12**. The Project will also develop a Stakeholder Engagement Plan which will ensure the company has a structure for regular and ad hoc engagement with stakeholders throughout the project cycle.

13. GRIEVANCE REDRESS MECHANISM (GRM)

The Project Management will establish a procedure to answer to project-related queries and address complaints and grievances about any irregularities in application of the guidelines adopted for assessment and mitigation of environmental safeguards impacts. There will be two types of GRM, one is for internal workers and officials and the other one is for community or affected people. The complaints related to construction and plant operation that may create inconveniences to agency/individual should be addressed based on consensus, the procedure will help to resolve issues/conflicts amicably and quickly without resorting to expensive, time-consuming legal actions. To ensure impartiality and transparency, hearings on complaints will remain open to the public. A Grievance Redress Committee (GRC) will be created and they will record the details of the complaints and the reasons that led to acceptance or rejection of the particular cases. The ToR of GRM has been incorporated in Annexure 20. The GRC will keep records of all resolved and unresolved complaints and grievances and make them available for review as and when asked for by appropriate authority and any organizations known to be working with urban development issues. However, it should be noted that the GRC process will not pre-empt and aggrieved person's right to seek redress in the courts of law. Details provided in **Chapter 13**.

14. CONCLUSION AND RECOMMENDATIONS

The proposed power plant will supply uninterrupted power to national grid after the successful implementation. The proposed power plant will use renewable energy which reduces greenhouse gas emissions by providing carbon-free electricity generation, contributing to cleaner air and a healthier planet. The abundance and renewable nature of solar energy ensures its availability for generations to come, promoting long-term sustainability. The integration of solar power plants into existing electricity grids enhances grid stability and resilience.

The benefits of solar power plants, extend beyond environmental considerations. They encompass economic growth, job creation, energy security, and a cleaner, healthier future for all. Bhabanipur and Ratanpur Mauza are two remote places of Pabna Sadar Upazila with undeveloped roads and socio-economic facilities. After the implementation of the project, it will create employment opportunity to the local people and improve transportation system in the project area, which will ultimately play an important role in poverty reduction and develop social safety condition.

Though there are few negative impacts due to the implementation of the project but it has been designed to comply with the country's environmental laws and regulations especially on, air emissions, ambient air quality, wastewater effluent, and noise. The project management has taken steps to ensure that the plant will also meet the social compliance guideline. Given the management measures and monitoring

commitments by the Dynamic Sun Energy Private Limited for the project, environmental and social impact of the project will be manageable. By embracing renewable energy sources and investing in solar power plants, we can pave the way toward a more sustainable and resilient energy system, addressing the challenges of climate change and advancing toward a greener and brighter future.

Chapter 1

1 INTRODUCTION

1.1 Background

Power is the main driving force of current progress and the foundation of the growth rate. The vision of Bangladesh Government is to give access power to all by the year 2027 and in accordance with this present government's goal is to ensure continuous and quality power supply for all by 2027 through change in generation, transmission, and distribution methods. To fulfill the Government's plan, BPDB has come up with a comprehensive plan which envisages around 25,840 MW new generation addition by 2027. (BPDB, 2021-22).

The present government's goal is to generate 40% electricity from renewable and clean sources by 2041 as Bangladesh is a signed country of United Nations Framework Convention on Climate Change (UNFCCC) which targets to reach net zero emission by 2050. Currently, the country has only 1183.63 MW renewable energy installed capacity where, 949.64 MW is solar energy according to Sustainable and Renewable Energy Development Authority (SREDA). Presently, 40 solar power plant projects are being incorporated, among them 10 are already in operation, 8 are on construction phase and 22 are under planning phase. GoB is requesting the business magnets of the country to invest in Solar Power Plants to fulfil the target of sustainable clean energy across the land.

Responding to the need of the country, Dynamic Sun Energy Pvt. Ltd. planned the proposed 100 MW ac solar power project which is in the village of Bhabanipur in the Hemayetpur Union which is south-west outskirts of Pabna City, in Pabna District, Bangladesh. The project is planned on a Build, Own, and Operate (BOO) basis under the Implementation Agreement (IA) with the Government of Bangladesh (GoB). The proposed main power plant requires 400 acres of land [for the main power plant, substation area, worker camp, construction / laydown area]. At the time of data collection, the proponent had purchased 229 acres of land through willing buyer and willing seller method and the rest of the land is under process to be purchased within September 2023. Land acquisition is not required for the Project access road. The project location is beside the existing LGED Road which is 200m away from the main power plant site. DSEPL constructed a 200m herringbone road from the existing Local Government Engineering Department (LGED) road on their own land for accessing the nearby LGED Road. The electricity transmission line for this power plant has started from the proposed solar power plant (Bhabanipur, Hemayetpur Union) to existing 230/132 KV Grid PGCB Sub-station at Joynagar, Ishwardi, Pabna which is 21.5 km long and contains 79 towers. The width of the RoW has been considered as 10m along the TL and allowable height clearance is 8m from lower conductor. Because land may be accessed through legal means if the land owner refuses access involuntary resettlement requirements are triggered according to ADB SPS 2009, Safeguard Requirement 2. At the time of assessment, footing areas for 76 towers had been purchased with purchase of 3 transmission tower footing areas under process.

Dynamic Sun Energy Private Ltd. (DSEPL) will design, engineer, construct, test, commission, own, operate and maintain the plant for the purpose of generating and supplying electricity to Bangladesh Power Development Board (BPDB) for a period of 20 years on an off-take basis.

Under this project, AECL has been appointed for providing consultancy service for conducting IEE), Environmental and Social Compliance Audit (ESCA) and Resettlement Plan (RP) / Livelihoods

Restoration Plan (LRP) for the solar power plant, transmission line, and its associated facilities. This report only deals with the Environmental & Social Impact Assessment study for the solar power plant, transmission line, and its associated facilities which has been prepared according to the requirement and ToR provided by the ADB to assess the impacts of the power plant and its associated facility in the surrounding area of the plant and suggest the Mitigation measures, Environmental Management plan etc.

1.2 Objective of the Study

This study will identify and evaluate the potential environmental and socio-economic impacts due to construction and operation of the proposed power plant providing detail Environmental Management Plan (EMP) to mitigate the project oriented negative impacts. It is expected that the study will facilitate the planning and design of the proposed power plant in the way of mitigating the potential negative impacts and enhancing the project benefits. The specific objective of this study is to:

- Prepare a project IEE for the solar plant, transmission line, and its associated facilities;

1.3 Scope of Study

Department of Environment, (DoE), has categorized Solar Power plants over 50 MW capacity and Transmission line (gas, electricity) less than 25 km as "**ORANGE category**" as per Environment Conservation Rules 2023. According to ECR, 2023, this project falls under "Orange" category and is required to obtain 'Site Clearance Certificate' by undertaking IEE study prior to any kind of construction activities at the project site. DSEPL has submitted an IEE study conducted by DSCL in September-October, 2023 and obtained SCC (Certificate No.: 23-100875, valid from June 19, 2023 to June 18, 2024) in June 2023. The copy of SCC is attached as Annexure 1.

According to the ADB Safeguard Policy Statement 2009, the proposed project is a "**Category B**" project for environment which has few site impacts which can be mitigated and managed via mitigation measures. According to the ADB SPS 2009, "**Category B**" project requires an IEE study has been undertaken as per their requirement of ADB and according to the provided ToR to assess the impacts of the power plant in the surrounding area of the plant and suggest the Mitigation measures, Environmental and Social Management plan etc. The scopes of this study include but not limited to the following:

- Carrying out detail IEE study according to the ToR and provide Report to the client;
- Study of the relevant documents on Policy, Legal and Administrative framework, and their review;
- Carrying out an environmental baseline survey (Meteorology, Climate, Geology, Hydrology, Ambient air, Noise, Ecology, Land use pattern, Natural disasters, Socio-economic condition etc.) covering the project site and components i.e., study areas;
- Identification of environmental impacts due to project activities on the surrounding environment and suggest for mitigation measures in order to eliminate negative impacts and to enhance positive impacts;
- Arrangement of consultation meetings to consult with potentially affected people;

- Development of Environmental and Social Management Plan (ESMP) for both construction as well as operational phases of the project and propose environmental and social monitoring and implementation arrangement for pre-construction, construction, and operation stage of the project;
- Describes institutional or organizational arrangements, technical assistance programs, training programs, procurement of equipment and supplies related to environmental and social management and monitoring, and organizational changes;
- Identification of environmental, health and safety risks and impacts including direct, indirect, cumulative, and induced impacts and propose mitigation and management measures to minimize the identified impacts;
- Present the justification for the project, and to investigate alternatives explored for the project to reduce potential environmental impacts and increase potential benefits;
- Documentation of how stakeholders have been engaged during the IEE Process and feedback incorporation in the IEE.

1.4 IEE Approach & Methodology

The IEE will collect baseline data and to identify anticipated environmental and social effects, both positive and negative that may result from the project. Predictions will consider all aspects and phases of the project. The methodology followed to undertake the IEE study is divided into several tasks elaborated below:

- **Project Data Compilation:** A generic description of the proposed activities relevant to environmental assessment has been compiled with the help of the proponent.
- **Legislative Review:** Information on relevant & prevailing national legislation, regulations, guidelines, and standards was reviewed and compiled.
- **Baseline Data Collection:** Extensive field visits have been conducted to collect primary and secondary data to ensure establishment of proper baseline information. Secondary data on weather, soil, water resources, wildlife and vegetation were reviewed and compiled. Terrestrial ecological and fisheries baseline has also been prepared. This section covers the following aspects comprehensively in addition:
    - Relevant physical, biological, and socioeconomic conditions within the study area;
    - Detail description of local geology, topography, Local climatic condition, hydrological (Surface and ground) condition, geography, extreme environment, wind pattern and soil condition;
    - Description of land use/ land cover has been provided including ecologically critical area, national parks, forest, orchard, cultural heritage site etc. (if any), in the selected project site. Landsat 8 image (Spatial Resolution: 30m*30m and color composite band: 1-7) has been used for Land use and land cover analysis.
    - While describing the meteorological condition, mean, minimum & maximum temperature, monthly & yearly total rainfall, humidity, wind speed & wind direction of last 5 years including several relevant distribution maps of Bangladesh have been collected from Bangladesh Meteorological department (BMD) and provided in the relevant section;

- Cyclones and alignment of cyclones has been provided with maps, figures, data, and information;
- Similarly, seismicity risk and flood risk have been described with relevant maps, figures, data, and information;
- Latest Primary and Secondary Socio-economic information have been collected from latest Bangladesh Bureau of Statistics (BBS);
- In describing ecology, aquatic flora, aquatic fauna, terrestrial flora, terrestrial fauna, and forest as are available in the site and site area have been described with photographs;
- Description of map unique sites or special features such as parks and protected areas, Heritage Rivers, historic sites, environmentally and culturally significant sites;
- Physical or cultural heritage (if any);
- Baseline representative data has been collected (air, noise, surface & ground water, and soil) and their test results have been presented.

- **Identification of potential impacts:** The information collected in the previous steps were reviewed and potential environmental issues were identified.
- **Impact Assessment:** The environmental, socioeconomic, and project information was collected to assess the potential impacts of the proposed activities. The impact assessment was considered for the project during pre-construction, Construction and Operation stage of the project.
- **Suggestion of Mitigation Measures for Adverse Impacts:** After identifying all negative impacts at all stages i. e. pre-construction, Construction and Operation stage of the project, suggestions for mitigation measures have been outlined as per the prevailing national guideline and ADB SPS.
- **Analysis of Alternatives:** Analysis of alternative options was considered to minimize impacts of the Project while undertaking this IEE study. Analysis of Alternatives chapter includes Site and Technology alternative. The "No Build" scenario is also discussed in this chapter.
- **Stakeholder Consultation:** Extensive consultation has been conducted with key stakeholders' including the local population, vulnerable groups including women, government departments/agencies, and NGOs. A formal public consultation has also been undertaken prior notifying through The Daily Asia Bani and The Muslim Times newspaper.
- **Grievance Redress Mechanisms:** Brief Description has been given of the grievance redress framework/mechanisms (both informal and formal channels), setting out the time frame and mechanisms for i) resolving complaints about environmental and social performance; and ii) worker / contractor related grievances.
- **Suggestion of Construction and Operational Environmental and Social Management and Plan (ESMP):** A structured environment and social management, institutional or organizational arrangements and monitoring plan has been suggested to mitigate all adverse impacts with appropriate monitoring suggestions to ensure the compliance of the local and international lender legislations. Detailed plans required under this framework to ensure implementation of the ESMP will be developed by the Company or its contractors for both remaining construction management and operations following commissioning.
- **Conclusion and Recommendations:** Presented the conclusions drawn from the assessment and provide recommendations.

1.5 Scientific Approach for Baseline Study

1.5.1 Particulate/Air Quality Monitoring

Particulate monitoring is accomplished with Respirable Dust sampler, which is a vacuum type device that draws air with particulate matter through a filter paper. Particles within the range of 100 to 0.1 microns' diameter are ordinarily collected on glass fiber filter. The instrument sucks the ambient air with a blower at a flow rate that allows suspended particles to pass to the filter surface. This sampling filter paper is dried up in the laboratory and the weight difference is the amount of $PM_{2.5}$ and PM_{10}, content measured in micro grams per cubic meter of air collected over a period of 24 hours.

CO Meter (KXL-801 Portable Carbon Monoxide (CO) Detector) is used to measure carbon monoxide. CO meter gives the data of carbon monoxide directly. The CO meter is shown in **Figure 1.1** below:

Respirable Dust Sampler

Carbon Monoxide (CO) Detector

Figure 1.1: Air Quality Monitoring Instrument

1.5.2 Monitoring of Noise Level

Noise level monitoring was performed for 24 hours (day and night) using Noise Meter (CEM Sound Level Meter). At the time of measurement, whenever there was an interfering effect like mike noise, human voice from house and bazaar, vehicular sound, sound of machine and tool from workshop etc., was also recorded. The level of sound is usually expressed in terms of the Sound Pressure Level (SPL) in decibels.

Figure 1.2: Noise Meter (CEM Sound Level Meter)

1.5.3 Water Sampling Method

The procedures described are to be used by field personnel when collecting and handling water samples in the field. On the occasion that field personnel determine that any of the procedures described in this section are either inappropriate, inadequate, or impractical and that another procedure must be used to obtain a water sample, the variant procedure will be documented in the field logbook, along with a description of the circumstances requiring its use. Prepare a Sampling and Analysis Plan (SAP) which describes the sampling locations, numbers, and types of samples to be collected, and the quality control requirements of the assigned project.

Equipment

1) Plastic Bottle 2) Gloves 3) Niskin sampler 4) Icebox

- **Surface Water sampling procedure**

1. Surface water samples shall be collected either by directly filling the container from the surface water body being sampled or by decanting the water from Niskin sampler;
2. Use a funnel to fill up the bottle. The collecting device i.e., Niskin sampler shall not touch the container;
3. Cap the bottle well and label the container prior to storing inside the icebox.

- **Ground / Drinking Water sampling procedure**

1. Select a cold-water faucet for sampling which is free of contaminating devices such as screens, aeration devices, hoses, purification devices or swiveled faucets. Check the faucet to be sure it is clean. If the faucet is in a state of disrepair, select another sampling location;
2. Open the faucet and thoroughly flush. Generally, 2 to 3 minutes will suffice;
3. Do not rinse or overfill container. Close the plastic bottle cap and store in the icebox.

1.5.4 Soil Sampling Method

Collection of large number of samples is recommended so that sample of desired size can be obtained by sub-sampling. For soil quality analysis work, samples are collected from a soil profile representative to the soil of the marked/affected area. Consultant will decide & monitor the sampling location, number of samples to be taken & the frequency of sampling.

- Material/Equipment
- Auger (post hole type)
- Hand spade
- Core sampler
- Sampling bags
- Plastic bucket

- **Soil sampling procedure**

1. Divide the field into different homogenous units based on the visual observation.
2. Remove the surface litter at the sampling spot.

3. Drive the auger to a plough depth of 15 cm and draw the soil sample.
4. Collect at least 5 samples from each sampling locations and place in the plastic bucket.
5. If auger is not effectively applicable, make a 'V' shaped cut to a depth of 15 cm in the sampling spot using spade.
6. Remove thick slices of soil from top to bottom of exposed face of the 'V' shaped cut and place in a clean container.

1.6 The IEE Team

Adroit Environment Consultants Ltd. (AECL) has prepared this report under the guidance and supervision of Dr. Nasir Uddin Khan. The total team composition and their expertise have been given in the table below:

Table 1.1: IEE Team

Professional	Name	Expected Expertise
Team Leader/Project Manager	Dr. Nasir Uddin Khan B.Sc. Engg. (Civil), M.Sc. Engg. (Environment), PhD (USA)	Environmental & Social Impact Assessment (IEE, EMP/ESIA), Industrial Wastewater Treatment, Environment monitoring, Solid waste management, Climate Change, Environmental Management System, Occupational Health & safety, Cleaner Production and Energy efficiency, Air & Noise modeling, environmental education & awareness.
Environmental Expert	Shanjana Haider B.Sc. Engg. (Civil, BUET), M.Sc. Engg. (Civil & Environment)	Analyze the impact of a project on the environment, identifying environmental issues, and recommending solutions. Engineering survey, site plan, Preparation of IEE, EMP & ESIA. Environmental Monitoring and Report preparation.
Environmental Expert	Md. Saiful Islam B.Sc. Engg. (Civil, RUET), M.Sc. Engg. (Civil & Environment)	Engineering survey, site plan, Preparation of IEE, EMP & ESIA. Environmental Monitoring
Ecologist	Dr. Abdul Jabber Howlader M. Sc. (Zoology) Entomology, Ph.D. (Zoology), Commonwealth Post-Doctoral Fellow	Ecological survey on the fauna (macro and micro invertebrates, fishes, birds) of the project area, Primary Aquatic and Ecological survey details analysis, Establishing baseline condition fisheries and aquatic resources.
Fisheries Expert	Dr. Baki Billah B.Sc. (Hons.) in Fisheries, MSc, Ph.D. in Biology.	Taxonomy, Fish culture, Fish population dynamics, Fish pathology and Fisheries Management
Social & Resettlement Expert	Mamun Ar Rashid	Resettlement Action Plan (RAP), Project Complaint Mechanism (PCM), Management of Resettled

Professional	Name	Expected Expertise
	MSS (Political Science, National University), Post Graduate Diploma in Disaster Management from Dhaka University.	Inhabitants, Implementation of Resettlement Action Plan (RAP).
Power Plant and Transmission Line Engineer	Md. Shamsul Alam B.Sc. Engg. (Mechanical, BUET)	Evaluation of interconnection standards and transmission feasibility, system impact and facility studies or testing new electrical components of solar panel designs.
GIS Analyst	Md. Golam Rasul (BURP, RUET)	Analyzing spatial data through mapping software and preparing digital maps with geographic data and various other data sets.
Chemist/Baseline Survey Co-ordinator	Md. Faisal Bin Mahmud	Environmental Monitoring, Laboratory analysis for different environmental parameters.
Field Investigator/Social	Raktim Banik	Base line data collection, secondary data collection, monitor, record, and assess individuals, places, and events.
Field Investigator/Social	Md. Kamal Uddin	Base line data collection, secondary data collection, monitor, record, and assess individuals, places, and events.
Field Investigator/ Environment	Md. Rubel Miah	Base line data collection, sample collection from site, sample preservation and laboratory analysis.

1.7 Limitations of the Study

Services performed by the consultant are conducted in a manner consistent with level of care and skill generally exercised by members of the engineering and consulting profession. The report may not exhaustively cover an investigation of all possible aspects and circumstances that may exist. However, an effort is made to discover all meaningful areas under the stipulated time available.

In evaluating subject site, consultant relies in good faith on information provided by client's management or Employees. The Consultant assume that the information provided is factual, accurate and accepts no responsibility for any deficiency, misstatement or inaccuracies contained in this report as a result of omission or misrepresentation of any person interviewed or contacted. However, the consultant notifies the contradictions and errors in the data, where it seems appropriate.

According to standard practice, all the seasonal viewpoints including a complete hydrological cycle ought to be considered amid the conduction of IEE study. However, due to time constraints, a complete hydrological cycle covering all the seasonal aspects could not be covered in this study. Secondary data was used in this study to overcome this issue. It should be recognized that the information given in the report is time specific and with the passage of time the relevancy of data and analysis may suffer. Specific circumstances and condition of site can change due to which conclusion and opinions may also change.

1.8 Acknowledgement

The IEE Report has been prepared basically with the support from Dynamic Sun Energy Private Ltd. and from various government agencies and NGOs including Department of Environment (DOE), Bangladesh Meteorological Department (BMD), Bangladesh Bureau of Statistics (BBS), Bangladesh Water Development Board (BWDB), Department of Fisheries, Department of Agricultural Extension, UNO Office and Upazila Parishad of Pabna Sadar Upazila, Hemayetpur Union Parishad, Local Representatives etc. We would like to express our gratitude to each organization and its employees for their contribution and kind co-operation in conducting the study.

Chapter 2

2 LAW AND LEGISLATION

2.1 Introduction

The emerging environmental scenario calls for attention on conservation and judicious use of natural resources. As an institutional arrangement, Government of Bangladesh has designated the "Department of Environment" (DOE) with the responsibility for the regulatory functions to enforce of the provisions of environmental laws, rules, and regulations to prevent environmental degradation in the country. Under these legal provisions, the industrial entrepreneurs/ project owner must take mitigation measures to protect the environment from pollution and adverse impacts and must get "Environmental Clearance" from DOE before setting up and running their industries/project.

Solar Power Plant over 50 MW capacity and Transmission line (gas, electricity) less than 25 km are listed under the "**Orange Category**" in ECR 2023 (i.e., serial no. 8 in the ECR 2023 Orange list in Schedule-1.). The environmental classifications for industrial projects in Bangladesh are based on "inclusion lists" given in the ECR 2023 with "**ORANGE**" being the second highest. According to ECR, 2023, this project falls under "Orange" category and is required to obtain 'Site Clearance Certificate' prior to any kind of construction activities at the project site. A nationally-required IEE study is required to obtain SCC from DoE. DSEPL has submitted an IEE study conducted by DSCL in September-October, 2023. The report was submitted to DoE in March 2023 (Submission copy is attached as Annexure 24). After few revisions the report was approved and SCC was provided (Certificate No.: 23-100875, valid from June 19, 2023 to June 18, 2024) in June 2023 against the final version of the IEE. The copy of SCC is attached as Annexure 1 . This clearance is subject to renewal every year.

According to the Environmental categorization of ADB Safeguard Policy Statement (SPS) 2009, the proposed project is a "**Category B**" project which has environmental impacts which can be mitigated and managed via mitigation measures. According to the ADB SPS 2009, "**Category B**" project requires an IEE study to assess the impacts of the power plant along with the transmission line and suggest the mitigation measures, environmental management plan etc. According to the Involuntary Resettlement categorization of ADB Safeguard Policy Statement (SPS) 2009, the project falls under "**Category B**", as land acquisition for TL will be done based on negotiation and land may be accessed through legal means if the land owner refuses access so, involuntary resettlement requirements are triggered according to ADB SPS 2009, Safeguard Requirement 2. For this a Resettlement Plan should be undertaken and followed by the Project Proponent. According to the indigenous people categorization of ADB Safeguard Policy Statement (SPS) 2009, this project falls under "**Category C**", as there is no sign of indigenous people in or around the project site

The prevailing national policies, strategies, laws, rules, action plans along with international guidelines i.e., ADB SPS 2009, World Bank EHS, IFC guidelines, JICA guidelines etc. on environment are discussed briefly in the following sections.

2.2 Implications of Policies and Regulations on the Proposed Project

Table 2.1 below presents an outline of other National legal instruments that will have relevance to the proposed Project with respect to the social and environmental considerations.

Table 2.1: National Legal Instruments relevant to the Project

Act/ Rule/ Law/ Ordinance/Policy/ Guidelines	Enforcement Agency - Ministry/ Authority	Key Features	Applicability to the Project
National Environmental Policy, 2018	Department of Environment Ministry of Environment, Forest, and Climate Change (MOEFCC)	• Natural equilibrium provision and overall development of the country through environmental protection and sustainable management; • The spread of adaptation programs to reduce the adverse effects of climate change in the country; • Encourage collection and promotion of low carbon emission technology in the country; • Identifying and controlling all types of environmental pollution and degradation activities; • Ensure sustainable, long-term and environment friendly use of all natural resources; • Ensure the Environmental Impact Assessment and Strategic Environmental Assessment in all necessary sectors; • Strengthen observations on proper compliance with environmental laws and regulations. • To maintain the ecological balance and overall progress and development of the country through protection and improvement of the environment.	According to the latest ECR 2023 the proposed project and its associated facilities falls under "ORANGE Category" and requires Site Clearance Certificate (SCC) from Department of Environment (DoE) to initiate construction work which the project authority has already received from DoE (Certificate No.: 23-100875, valid from June 19, 2023 to June 18, 2024) upon submission of IEE report on October 2022. The study was undertaken in September – October 2022. This SCC is subject to renewal every year prior to the operation of the project. According to the ECR 2023, DSEPL needs to apply for Environmental Clearance Certificate (ECC) from DoE prior to start operation of the project. Pre-condition to apply for an ECC is to submit the monitoring reports according to the approved IEE report from DoE and follow all the conditions mentioned in the SCC and EMP of the approved IEE.

Act/ Rule/ Law/ Ordinance/Policy/ Guidelines	Enforcement Agency - Ministry/ Authority	Key Features	Applicability to the Project
Industrial Policy, 1991	Ministry of Industry (MoI)	• To conserve ecological balance and prevent pollution during industrialization; • To take effective steps for pollution control and conservation of environment during industrialization; • To ensure embodying of necessary pollution control and preventive measures by industrial investment project endangering environment.	Applicable as the project type is an industrial development which may have impacts on ecology and may pollute the environment.
National Conservation Strategy, 1992	Ministry of Environment, Forest and Climate Change (MOEFCC)	• To use minimum possible area of land in exploration sites; • Rehabilitate site when abandoned; • To take precautionary measures against Environmental Pollution from liquid effluents, condensate recovery and dehydration Plants; and • Technology assessment for selection of appropriate technologies.	Applicable as the project is associated with land use and environmental pollution and appropriate technology should be implemented
National Environmental Management Action Plan (NEMAP), 1995	Department of Environment Ministry of Environment, Forest and Climate Change (MOEFCC)	• To identify the key environmental issues affecting Bangladesh; • To identify the actions necessary to halt or reduce the rate of environmental degradation; • To improve the natural and built environment; • To conserve the habitats and biodiversity; • To promote the sustainable development; • To improve the quality of life of the people.	Applicable as the project is related with environmental issues, may affect biodiversity and will promote sustainable development
The Environment Conservation Act, 1995	Department of Environment	• Define Applicability of environmental clearance;	Applicable as the proposed project is eligible to take environmental clearance and it's

Act/ Rule/ Law/ Ordinance/Policy/ Guidelines	Enforcement Agency - Ministry/ Authority	Key Features	Applicability to the Project
and subsequent amendments in 2000 2002 and 2010	Ministry of Environment, Forest and Climate Change (MOEFCC)	• Regulation on development activities from environmental perspective; • Framing applicable limits for emissions and effluents; • Framing of standards for air, water, and noise quality; • Formulation of guidelines relating to control and mitigation of environmental pollution, conservation, and improvement of environment; • Declaration of Ecologically critical areas.	activity associated with environmental issues and air, noise, soil and water quality of the project area should meet standard value
Environmental conservation Rules, 2023	Department of Environment Ministry of Environment, Forest and Climate Change (MOEFCC)	• Requirement of environmental clearance certificate for various categories of projects; • Requirement of IEE/ESIA as per category; • New Categorization of different Industries, Power Plants and Projects according to their impacts on environment; • Provides new standards for quality of surface water, coastal water, drinking water, sewage discharge and liquid waste discharge from factories; • Revised fee list has been provided for clearance certification, renewal, testing and others; • Procedures of Public Consultation; • Enlistment procedures of Environmental Consultants or Specialists.	Applicable as the Project falls under Orange Category and require site clearance certificate prior to start the construction work and environmental Clearance Certificate prior to start the operation of the plant
Air Pollution (Control) Rules, 2022	Department of Environment	• Provides the new standards of Ambient Air Quality and Smell;	Applicable for maintaining the standards of air quality and emissions from vehicles or any other sources.

Act/ Rule/ Law/ Ordinance/Policy/ Guidelines	Enforcement Agency - Ministry/ Authority	Key Features	Applicability to the Project
	Environment Pollution Control Section-1 Ministry of Environment, Forest and Climate Change (MOEFCC)	• National Air Standard Management Plan has been provided; • Air Pollution Resistance Plan has been initiated; • An Air Pollution Control related National Committee has been formed headed by Cabinet Secretary; • Provides new standards and acceptable limits for emissions/discharges from vehicles and other sources.	
Noise Pollution (Control) Rules 2006	Ministry of Environment, Forest and Climate Change (MOEFCC)	• Prevention of Noise pollution; • Standards for noise level.	Applicable as noise will be generated due to the construction and operation activity
Environmental Court Act, 2010	Ministry of Environment, Forest and Climate Change (MOEFCC) Ministry of Law, Justice and Parliamentary Affairs	• GoB has given highest priority to environment pollution; • Passed 'Environment Court Act, 2000 for completing environment-related legal proceedings effectively; • Provides the Jurisdictions of environment court, the penalty for violating court's order, trial procedure in special magistrate's court, the power of entry and search, the procedure for investigation, procedure and power of environment court, the authority of environment court to inspect, appeal procedure and formation of environment appeal court.	Applicable for following and completing environmental legal requirements effectively (if required)
National Land-use Policy, 2001	Ministry of Land	• To deal with several lands uses including agriculture (crop production, fishery, and livestock), housing,	Applicable as project activity involves land use alteration.

Act/ Rule/ Law/ Ordinance/Policy/ Guidelines	Enforcement Agency - Ministry/ Authority	Key Features	Applicability to the Project
		forestry, industrialization, railways and roads, tea and rubber; • To identify land use constraints in all these sectors.	
Acquisition and Requisition of Immovable Properties Act 2017	Ministry of Land	• Current GOB Act and Guidelines, relating to acquisition and requisition of land.	Applicable as the project needs to acquire land
Bangladesh Labor Act, 2006 (amended in 2018)	Ministry of Labour and Employment	• Provides labour recruitment process, labour-employer relationships, minimum wages, wage payment, incidental costs, occupational hazards, collective bargaining, dispute resolution and workplace environment; • Standard facilities, size and environment of the labour camp has been mentioned; • Each employee can work for 8-hours per day. Any shift exceeding 6-hours should be coupled with a 1-hour lunch break, and a 5-hour shift should have a 30-minutes lunch break. • The minimum age to work is 14 (although a special clause states that children between the ages of 12 and 14 may be Employed to do “light work” that does not endanger their health, development, and education	Applicable as skilled, semi- skilled and day labors will work in the project in different phase
Bangladesh National Building Code (BNBC) 2020	Ministry of Housing and Public Works	• This code is followed in Bangladesh to build safe houses and buildings;	Applicable as the structures will be built in the project area

Act/ Rule/ Law/ Ordinance/Policy/ Guidelines	Enforcement Agency - Ministry/ Authority	Key Features	Applicability to the Project
		• Earthquakes and wind effect of different building systems are incorporated in this code.	
Bangladesh Water Act, 2013	Ministry of Water Resources (MoWR)	• All forms of water (e.g., surface water, ground water, sea water, rain water and atmospheric water) within the territory of Bangladesh belong to the government on behalf of the people; • The private landowners will be able to use the surface water inside their property; • Requirement for permits/licenses for large scale water withdrawal by individuals and organizations beyond domestic use.	Applicable as the proposed project will involve groundwater use.
The Protection and Conservation of Fish Act 1950 (amended in 1973, 1982, 1995 and 2002)	Ministry of Fisheries and Livestock	• Protection and conservation of fish in Government-owned water bodies; • prohibit the destruction of, or any attempt to destroy, fishes by the poisoning of waters or the depletion of fisheries by pollution by trade effluents or otherwise; • prohibit the destruction of, or any attempt to destroy, fishes by explosives, gun, bow and arrow in inland water or within coastal territorial waters; • prohibit the destruction of or any attempt to destroy fishes by drying or dewatering of any fishery.	As the Padma River is 1.5 km away and a branch of Padma rive passes by the project area so the conservation of fishes in the water bodies should be maintained.
National Water Policy, 2000	Ministry of Water Resources (MOWR)	• Protection, restoration, and enhancement of water resources;	Applicable for the protection of water resources and water quality of the water sources around the project area.

Act/ Rule/ Law/ Ordinance/Policy/ Guidelines	Enforcement Agency - Ministry/ Authority	Key Features	Applicability to the Project
		• Protection of water quality, including strengthening regulations concerning agrochemicals and industrial effluent; • Participation of local communities in all water sector development.	
National River Protection Commission Act 2013	Ministry of Land	• Manage and control water and environmental pollution, etc.; • Ensure socio-economic development of a multi-use and rational use of natural resources.	Project activity may involve water and environmental pollution
The Electricity Act, 1910 amended in 2006 and 2018	Ministry of Power, energy and Mineral Resources	• The Electricity Act 2018, repeals the provisions of Electricity Act 1910; • Ensure the supply and optimal use of electrical energy which is attainable through compensatory punishment.	Applicable as the project involves electricity use and generation
Electricity Rules, 2020	Ministry of Power, Energy and Mineral Resources	• Electricity Rules has been published by ministry on November 2020 based on Clause 59 of Electricity Act 2018 (SRO 297 of Act/2020). • The main observation is to provide compensation for the installation of transmission line towers to the land owners as per the applicable laws and policy.	Applicable as some household and agricultural land will be affected by this project.
The National Energy Policy, 1996 updated in 2004	Ministry of Power, Energy and Mineral. Resources	• To provide energy for sustainable economic growth so that the economic development activities of different sectors are not constrained due to shortage of energy;	Applicable as the proposed project is using indigenous and sustainable energy source

Act/ Rule/ Law/ Ordinance/Policy/ Guidelines	Enforcement Agency - Ministry/ Authority	Key Features	Applicability to the Project
		• To meet the energy needs of different zones of the country and socio-economic groups; • To ensure optimum development of all the indigenous energy sources; • To ensure sustainable operation of the energy utilities; • To ensure rational use of total energy sources.	
Energy Regulatory Commission Act (2003)	Ministry of Power, Energy and Mineral Resources	• Enhancing the efficient use of energy; • Resolve disputes relating to energy matters; • Ensuring efficient use, quality services determine traffic and safety enhancement; • Ensuring appropriate remedy for consumer disputes and; • Ensuring control of the environmental standards associated with the production of energy under existing laws.	Applicable as the project involves energy usage, traffic, and safety issues, environmental pollution
Solid Waste Management Rules 2021	Ministry of Environment, Forest, and Climate Change (MOEFCC)	• In the case of resource recovery from waste, considering the waste hierarchy, all steps of waste generation, rejection, waste reduction, reuse, recycling, recovery, purification, and residue management must be followed in sequence before final disposal. • The waste generated from the construction should be kept separately until it is handed over to the local government authorities so that the dust does not	Applicable as different kinds of solid waste will be generated due to project activities.

Act/ Rule/ Law/ Ordinance/Policy/ Guidelines	Enforcement Agency - Ministry/ Authority	Key Features	Applicability to the Project
		spread into the air or fall into the drains through rainwater.	
Hazardous Waste (E-waste) Management Rules, 2021	Ministry of Environment, Forest, and Climate Change (MOEFCC)	• Applicable to persons/organization engaged in manufacture, marketing, purchase, sale, import, export, storage, stocking for research in laboratories, disposal, repair, processing and transportation or all related activities of electrical and electronic products.	Applicable as different kinds of electrical and chemical wastes will be used during the project.
Fatal Accidents Act, 1855	Ministry of Labor and Employment	• This Act was promulgated to provide compensation to families for loss occasioned by the death of a person caused by actionable wrong. • The company will be liable to pay compensation in case of death of any worker/employee or damages in case death has not ensued but such circumstances could have resulted in death.	Applicable as during construction and operation phases accident/incidents can be occurred and compensation should be provided according to the act.
Guidelines for the Implementation of Solar Power Development Program, 2013	Power Division Ministry of Power, Energy and Mineral Resources	• Provisions for setting up a solar park; • Project site selection criteria; • Implementation of Solar Mini Grid Projects; • Financial benefits of the Proponent and Foreign Investors.	Applicable as the proposed project is a solar power plant project
National Solar Energy Roadmap (2021-2041)	Power Division Ministry of Power, Energy and Mineral Resources	• Described the most recent component-wise status of solar PV energy implementation in Bangladesh. • Proposed the component- and decade-wise solar PV capacity targets to be achieved in Bangladesh by the year 2041.	Applicable as the proposed project is a solar power plant project

Act/ Rule/ Law/ Ordinance/Policy/ Guidelines	Enforcement Agency - Ministry/ Authority	Key Features	Applicability to the Project
		• Suggested the general actions that can be undertaken to meet the targets as proposed • Elaborated the specific actions for each component of the solar PV sector. • Discussed the implementation challenges and the possible way outs.	
Renewable Energy Policy, 2008	Power Cell, Power Division, Ministry of Power, Energy & Mineral Resources	• Defined the necessity for the country to develop renewable energy technology; • Described the essentiality of commercial dimensions and rational policy dissemination on renewable energy usage; • Mentioned about the establishment of "Sustainable Energy Development Agency (SEDA)"; • The renewable energy includes solar, wind, biomass, hydro, geo-thermal, tidal wave.	Applicable as the proposed project is associated with renewable energy

2.3 Applicable Lenders' Requirements

2.3.1 ADB's SAFEGUARD POLICY STATEMENT, 2009

The SPS applies to all ADB-financed and/or ADB-administered projects and their components, regardless of the source of financing, including investment projects funded by a loan; and/or a grant; and/or other means, such as equity and/or guarantees. ADB works with borrowers and clients to put into practice the requirements of SPS. The objectives of ADB's safeguards are to:

- ✓ avoid adverse impacts of projects on the environment and affected people, where possible;
- ✓ minimize, mitigate, and/or compensate for adverse project impacts on the environment and affected people when avoidance is not possible; and
- ✓ Assist borrowers and clients to strengthen their safeguard systems and develop the capacity to manage environmental and social risks.

ADB's SPS sets out the policy objectives, scope and triggers, and principles for three key safeguard areas:

- ✓ Environmental safeguards;
- ✓ Involuntary Resettlement safeguards; and
- ✓ Indigenous Peoples safeguards.

To help borrowers and clients and their projects achieve the desired outcomes, ADB adopts a set of specific safeguard requirements that borrowers and clients are required to meet in addressing environmental and social impacts and risks. These safeguard requirements are as follows:

- ✓ Safeguard Requirements 1: Environment (Appendix 1 of SPS);
- ✓ Safeguard Requirements 2: Involuntary Resettlement (Appendix 2 of SPS);
- ✓ Safeguard Requirements 3: Indigenous Peoples (Appendix 3 of SPS); and
- ✓ Safeguard Requirements 4: Special Requirements for Different Finance Modalities (Appendix 4 of SPS).

In addition, ADB does not finance activities on the prohibited investment activities list (Appendix 5 of SPS). Furthermore, ADB does not finance projects that do not comply with its safeguard policy statement, nor does it finance projects that do not comply with the host country's social and environmental laws and regulations, including those laws implementing host country obligations under international law.

2.3.1.1 ADB Project Categorization

The ADB Safeguard Policy Statement 2009 sets out the requirements for ADB's operations to undertake an environmental assessment for projects funded by the bank. The environmental assessment requirements for projects depend on the significance of impacts on the environment by the project. Each proposed project is scrutinized as to its type; location; the sensitivity, scale, nature,

and magnitude of its potential environmental impacts; and availability of cost-effective mitigation measures. A project is classified as one of the environmental categories (A, B, C, or FI).

- **Category A:** A proposed project is classified as category A if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An ESIA is required.
- **Category B:** A proposed project is classified as category B if its potential adverse environmental impacts are less adverse than those of category A projects. These impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. An IEE is required.
- **Category C:** A proposed project is classified as category C if it is likely to have minimal or no adverse environmental impacts. No environmental assessment is required although environmental implications need to be reviewed.
- **Category FI:** A proposed project is classified as category FI if it involves investment of ADB funds to or through a FI.

According to this categorization, the proposed project falls under ***Category B***.

❖ **Basic Environmental Assessment Requirements**

Category B: An IEE is required for Category B projects to determine whether significant environmental impacts warranting an ESIA are likely. If an ESIA is not needed, the IEE is regarded as the final environmental assessment report. Public consultation must be undertaken during the IEE process. An IEE report is required to follow the recommended format. For Category B projects deemed environmentally sensitive, the SIEE should be submitted to the Board at least 120 days prior to the Board consideration. In addition to the SIEE, IEE will be made available to Board members upon request. The Bank may make the SIEE available to locally affected groups and NGOs, upon request, through the Board Member of the DMC concerned, or through the Bank's Depository Library program, except where confidentiality rules would be violated.

❖ **Involuntary Resettlement**

A project's involuntary resettlement category is determined by the category of its most sensitive component in terms of involuntary resettlement impacts. The involuntary resettlement impacts of an ADB-supported project are considered significant if 200 or more persons will experience major impacts, which are defined as (i) being physically displaced from housing, or (ii) losing 10% or more of their productive assets (income generating). The involuntary resettlement safeguards cover both physical and economic displacement as a result of (i) involuntary acquisition of land, or (ii) involuntary restrictions on land use or on access to legally designated parks and protected areas. Such displacement can be full or partial, permanent, or temporary. The level of detail and comprehensiveness of the resettlement plan are commensurate with the significance of the potential impacts and risks. A project is assigned to one of the following categories depending on the significance of the probable involuntary resettlement impacts:

- **Category A:** A proposed project is classified as category A if it is likely to have significant involuntary resettlement impacts. A resettlement plan, including assessment of social impacts, is required;
- **Category B:** A proposed project is classified as category B if it includes involuntary resettlement impacts that are not deemed significant. A resettlement plan, including assessment of social impacts, is required;
- **Category C:** A proposed project is classified as category C if it has no involuntary resettlement impacts. No further action is required; and
- **Category FI:** A proposed project is classified as category FI if it involves the investment of ADB funds to, or through, a financial intermediary (paragraphs 53–58).

This proposed project falls under ***Category B*** according to this categorization.

❖ **Indigenous Peoples**

ADB also screen all projects to determine whether they have potential impacts on Indigenous Peoples. For projects with impacts on Indigenous Peoples, an Indigenous Peoples Plan needs to be prepared. The degree of impacts is determined by evaluating (i) the magnitude of the impact on Indigenous Peoples' customary rights of use and access to land and natural resources; socio-economic status; cultural and communal integrity; health, education, livelihood systems, and social security status; or indigenous knowledge; and (ii) the vulnerability of the affected Indigenous Peoples.

There are no Indigenous people around the project site and therefore the Project is categorized as C for Indigenous People impacts.

2.3.2 ADB's Social Protection Strategy, 2001

Social protection is a key step in ADB's battle to have Asia and the Pacific region "free of poverty." The relevance and applicability of the social protection strategy is due to the requirement for borrowers to adhere to the ILO Core labour standards. The SPS spells out the scope of social protection and commitment of the ADB to develop priority interventions in five major elements:

- labor market policies and programs designed to generate employment, improve working conditions, and promote the efficient operations;
- social insurance programs to cushion the risks associated with unemployment, ill health, disability, work-related injury, and old age;
- social assistance and welfare service programs for the vulnerable groups with inadequate means of support, including single mothers, the homeless, or physically or mentally challenged people;
- micro and area-based schemes to address vulnerability at the community level, including micro insurance, agricultural insurance, social funds, and programs to manage natural disasters; and child protection to ensure the healthy and productive development of children.

2.3.3 ADB Access to Information Policy, 2019

The objective of the AIP is to promote stakeholder trust in ADB and to increase the development impact of ADB activities. The policy reflects ADB's commitment to transparency, accountability, and participation by stakeholders in ADB-supported development activities in Asia and the Pacific. It also recognizes the right of people to seek, receive, and impart information about ADB's operations. The AIP is based on the following principles:

i. **Clear, timely, and appropriate disclosure.** ADB discloses information about its operations in a clear, timely, and appropriate manner to enhance stakeholders' ability to meaningfully engage with ADB and to promote good governance.
ii. **Presumption in favor of disclosure.** ADB discloses information unless that information falls within the exceptions to disclosure specified in the policy.
iii. **Limited exceptions.** Full disclosure of information is not always possible. For example, ADB needs to explore ideas, share information, hold candid discussions, and freely debate ideas internally and with its members or clients. In other cases, ADB needs to consider the special requirements of its non-sovereign operations and clients, 8 protect personnel's right to privacy, or safeguard its own and its clients' legitimate business interests. The policy provides a limited set of exceptions that balances the rights and interests of various parties. However, ADB reserves the right, under exceptional circumstances, to override the policy exceptions or not to disclose information that it would normally disclose.
iv. **Proactive disclosure.** ADB proactively shares its knowledge products and information about its operations in a timely manner to facilitate participation in ADB decision-making. While the ADB website remains the primary vehicle for proactive disclosure, ADB also uses other appropriate means to disclose and communicate information.
v. **Sharing of information and ideas.** The AIP includes processes by which people may equally seek, receive, and convey information and ideas about ADB operations. Effective communications and exchange of information and ideas with stakeholders is a vital component of effective and sustainable development.
vi. **Providing information to project-affected people and other stakeholders.** ADB works closely with its borrowers and clients to ensure two-way communications about ADB projects with project affected people and other stakeholders. This is done within a time frame, using relevant languages,9 and in a way that allows project affected people and other stakeholders to provide meaningful inputs into project design and implementation.
vii. **Country and client ownership.** ADB borrowers and clients own the projects that ADB supports or in which the bank invests. Thus, in some cases, the views of borrowers and clients regarding the content and timing of disclosure are considered before documents are disclosed.
viii. **Clear appeals process.** A clear process to appeal an ADB decision not to disclose requested information is an important part of a meaningful disclosure framework.
ix. **Continuous monitoring.** ADB monitors the effectiveness of the policy, learns lessons from its successes and shortcomings, and stays abreast of new technologies and practices.

2.4 JICA Guidelines for Environmental and Social Considerations, January 2022

JICA clearly states the requirements regarding environmental and social considerations in the JICA Guidelines, which project proponents must meet. JICA provides the project proponents with support for meeting the requirements through cooperation projects. JICA reviews the fulfillment of the

requirements by the project proponents, and makes decisions based on the results of the review. JICA recognizes that the following eight principles are particularly important:

1. A wide range of impacts must be addressed; JICA covers a wide range of environmental and social impacts as items to be considered.
2. Environmental and social considerations must be implemented from an early stage until monitoring stage. JICA applies a Strategic Environmental Assessment (SEA) when conducting Master Plan studies etc. JICA encourages project proponents to ensure environmental and social considerations from an early stage until monitoring stage.
3. JICA reviews the environmental and social considerations in accordance with the mitigation hierarchy. JICA confirms that environmental and social impacts are avoided to the extent possible, and if this is not possible, the impacts are minimized, reduced, then mitigated, and if significant impacts remain, compensations are considered.
4. JICA is responsible for accountability when implementing cooperation projects. JICA ensures accountability and transparency when implementing cooperation projects.
5. JICA requests stakeholders for their participation; JICA ensures meaningful participation of stakeholders and incorporates stakeholder opinions into decision-making processes, in order to implement environmental and social considerations that are appropriate to the local situation and to reach a consensus. JICA responds to suggestions raised by stakeholders. Stakeholders who participate should be responsible for their own statements.
6. JICA discloses information; JICA actively discloses information on environmental and social considerations in collaboration with project proponent, in order to ensure accountability and to promote
7. participation of various stakeholders.
8. JICA enhances its organizational capacity. JICA makes efforts to enhance the capacity of its organizations and operations, in order to sufficiently and effectively implement environmental and social considerations.
9. JICA considers promptness; JICA addresses requests for acceleration of its process towards project implementation, while undertaking environmental and social considerations.

2.5 World Bank EHS Guidelines

2.5.1 General Environment, Health & Safety (EHS) Guidelines, 2007

The Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). These General EHS Guidelines are designed to be used together with the relevant Industry Sector EHS Guidelines which provide guidance to users on EHS issues in specific industry sectors. Effective management of environmental, health, and safety (EHS) issues entails the inclusion of EHS considerations into corporate and facility-level business processes in an organized, hierarchical approach that includes the following steps:

- Identifying EHS project hazards and associated risks as early as possible in the facility development or project cycle, including the incorporation of EHS considerations into the site selection process, product design process, engineering planning process for capital requests,

engineering work orders, facility modification authorizations, or layout and process change plans.

- Involving EHS professionals, who have the experience, competence, and training necessary to assess and manage EHS impacts and risks, and carry out specialized environmental management functions including the preparation of project or activity-specific plans and procedures that incorporate the technical recommendations presented in this document that are relevant to the project.
- Understanding the likelihood and magnitude of EHS risks, based on:
    - The nature of the project activities, such as whether the project will generate significant quantities of emissions or effluents, or involve hazardous materials or processes;
    - The potential consequences to workers, communities, or the environment if hazards are not adequately managed, which may depend on the proximity of project activities to people or to the environmental resources on which they depend.
- Prioritizing risk management strategies with the objective of achieving an overall reduction of risk to human health and the environment, focusing on the prevention of irreversible and / or significant impacts.
- Favoring strategies that eliminate the cause of the hazard at its source, for example, by selecting less hazardous materials or processes that avoid the need for EHS controls.
- When impact avoidance is not feasible, incorporating engineering and management controls to reduce or minimize the possibility and magnitude of undesired consequences, for example, with the application of pollution controls to reduce the levels of emitted contaminants to workers or environments.
- Preparing workers and nearby communities to respond to accidents, including providing technical and financial resources to effectively and safely control such events, and restoring workplace and community environments to a safe and healthy condition.
- Improving EHS performance through a combination of ongoing monitoring of facility performance and effective accountability.

2.5.2 Guidelines for electric power transmission and distribution, 2007

The EHS Guidelines for Electric Power Transmission and Distribution include information relevant to power transmission between a generation facility and a substation located within an electricity grid, in addition to power distribution from a substation to consumers located in residential, commercial, and industrial areas. Electric power transmission and distribution systems are often located in conjunction with highway, road, and other rights-of-way to minimize both costs and disturbance to ecological, socioeconomic, and cultural resources. Other factors, including land value, view sheds, archaeological resources, geotechnical hazards, accessibility, parks, and other important features also contribute to the locating of transmission and distribution line right-of-way alignments. This document is organized according to the following sections:

- Section 1.0 — Industry-Specific Impacts and Management
- Section 2.0 — Performance Indicators and Monitoring
- Section 3.0 — References and Additional Sources
- Annex A — General Description of Industry Activities

2.6 International Covenant on Economic, Cultural and Social Rights

The International Covenant on Economic, Social and Cultural Rights (ICESCR) commits all State parties (currently 160) to protect the economic, social, and cultural rights of all individuals. It was adopted in 1966 and entered into force in 1976. Bangladesh ratified ICESCR on 1998. ICESCR protects the right to:

- an adequate standard of living;
- highest attainable standard of physical and mental health;
- education;
- social security;
- work and fair treatment at work.

The Convention recognizes the right of all persons to self-determination, including the self-determination of political status; economic, social, and cultural goals; and the management and disposal of their resources. It also sets out the principle of "progressive realization" which underpins the whole Covenant.

ICESCR, when combined with the International Covenant on Civil and Political Rights (ICCPR) and the Universal Declaration of Human Rights (UDHR), makes up what is referred to as the International Bill of Human Rights. There are currently 23 General Comments which clarify the scope and content of ICESCR's provisions.

2.7 ILO Core Labour Standards Convention

International labour standards are legal instruments drawn up by the ILO's constituents (governments, employers, and workers) and setting out basic principles and rights at work. In many cases, a Convention lays down the basic principles to be implemented by ratifying countries, while a related Recommendation supplements the Convention by providing more detailed guidelines on how it could be applied. Recommendations can also be autonomous, i.e., not linked to a Convention. The eleven fundamental instruments are:

- Freedom of Association and Protection of the Right to Organize Convention, 1948 (No. 87)
- Right to Organize and Collective Bargaining Convention, 1949 (No. 98)
- Forced Labour Convention, 1930 (No. 29) (and its 2014 Protocol)
- Abolition of Forced Labour Convention, 1957 (No. 105)
- Minimum Age Convention, 1973 (No. 138)
- Worst Forms of Child Labour Convention, 1999 (No. 182)
- Equal Remuneration Convention, 1951 (No. 100)
- Discrimination (Employment and Occupation) Convention, 1958 (No. 111)
- Occupational Safety and Health Convention, 1981 (No. 155)
- Promotional Framework for Occupational Safety and Health Convention, 2006 (No. 187)

The four governance Conventions are:

- Labour Inspection Convention, 1947 (No. 81)
- Employment Policy Convention, 1964 (No. 122)
- Labour Inspection (Agriculture) Convention, 1969 (No. 129)
- Tripartite Consultation (International Labour Standards) Convention, 1976 (No. 144)

2.8 IFC and European Bank for Reconstruction and Development (EBRD) Guidance Note on Workers' Accommodation: Processes and Standards (September 2009)

This guidance note, developed jointly by IFC and the EBRD, looks at the provision of housing or accommodation for workers by employers and the issues that arise from the planning, construction, and management of such facilities. This publication aims to provide practical guidance to IFC and EBRD specialists, consultants and clients on appropriate policies and standards relating to workers' accommodation.

At the initial stage of any project, there is a need to assess whether accommodation for workers is required, and if so, whether this can be provided within existing local communities or whether new facilities should be constructed. The likely impact on local communities and the housing market of either option should be assessed.

Before constructing any facilities, other potential impacts should be evaluated. These may include the impact of construction, and the effect of a new housed labour force on community services, such as health, and on community cohesion and safety. These assessments should form part of a project's Environmental and Social Impact Assessment.

The next step is to consider the standards to be applied for the location, arrangement, and construction of any facilities. Issues here include consideration of a safe and healthy location, application of appropriate construction standards, provision of adequate and sanitary living conditions and provision of appropriate leisure and health facilities.

Lastly, when the accommodation has been completed, there are issues around its operation and management. These include the type of staff who will manage it, development of appropriate management policies, such as security and grievance procedures, and ongoing liaison with local communities. All such policies should be subject to regular review.

Chapter 3

3 DESCRIPTIONS OF THE PROJECT

3.1 The Project

The proposed 100 MW ac solar power project located in the village of Bhabanipur in the Hemayetpur Upazila which is south-west outskirts of Pabna City, in Pabna District, central Bangladesh. The project is planned on a Build, Own, and Operate (BOO) basis under the Implementation Agreement (IA) with the Government of Bangladesh (GoB). The proposed project requires 400 acres of land [for the main power plant, substation area, worker camp, construction / laydown area]. The proponent has already acquired 229 acres of land till August 2023 and the rest of the land is under acquisition process which will be acquired within September 2023. Proposed transmission line is 21.5 km from Hemayetpur to Ishwardi.

DSEPL will design, engineer, manufacture, finance, construct, complete, test, commission, insure, own, operate and maintain the plant for the purpose of generating and supplying electricity to Bangladesh Power Development Board ("BPDB") for a period of 20 years on an off-take basis.

Table 3.1: The Basic Data of 100 MW ac Solar Power Project

1. Name of the Project	100 MW ac Solar Power Plant
2. Project Proponent	Dynamic Sun Energy Private Limited
3. Project Location	Bhabanipur & Ratanpur Mauza, Hemayetpur Union, Pabna Sadar Upazila, Pabna, Bangladesh
4. Fuel Type	Sunlight
5. Plant Type	Solar Power Plant
6. Net Plant Capacity	100 MW
7. No. of Solar PV Module	2,74,224 nos.
8. No. of Grid Tied Inverter	760 nos.
9. No. of Transformers	Total 36 nos.
10. Total Land Area	400 acres for power plant 0.7642 acres for tower footing area
11. Transmission line	21.5 km from Hemayetpur to Ishwardi
12. Transmission tower	79 nos.
13. Total Manpower	Construction phase: 700 persons (200 residential and 500 non-residential) Operation phase: 550 persons (200 residential and 350 non-residential), see Annexure 5
14. Water Requirement	Construction phase: Domestic purpose 86 m^3/day from groundwater Operation phase: Domestic purpose 71 m^3/day from groundwater and PV module cleaning (twice) 2742 m^3/month from rain harvesting

15. Power Evacuation System	Generated electricity will be evacuated through BPDB's 230/132 kV substation situated at Joynagar, Ishwardi, Pabna.

3.2 Location of the project

The Proposed Power Plant is located at Bhabanipur and Ratanpur Mauza in Hemayetpur Union. The proposed electricity transmission line has started from the proposed solar power plant (Bhabanipur, Hemayetpur Union) to existing 230/132 KV Grid PGCB Sub-station at Joynagar, Ishwardi, Pabna which is 21.5 km long and contains 79 towers. The width of the RoW has been considered as 10m along the TL and allowable height clearance is 8m from lower conductor. This power transmission line will pass over Bhabanipur, Bhagiratpur, Bilkeda Khas, Khas Char Bagunda, Char Pratappur, Char Kudulia, Shimul Char, Ratanpur Mouza of Pabna Sadar Upazila and Dadapur, Joynagar, Kamalpur, Kaikunda, Maniknagar, Luxmikunda, Sahapur and Char Silimpur Mouza of Ishwardi Upazila. The project site is about 8.79 km from Pabna Sadar Upazila and 125.87 km from Dhaka.

South and West side of the project area is surrounded by a branch of Padma River. Bhabanipur Upazila is located on the North and Ghoshpur on the East side. Pabna Medical College is only 6.5 km and Pabna Mental Hospital is only 6.0 km from the project site.

The project location in District map and Upazila map are presented in **Figure 3.1** and **3.2** respectively. The power plant area with transmission line is shown in **Figure 3.3**.

3.3 Accessibility to Project Site

There is a good roadway accessibility from Dhaka to Pabna Bus Terminal through highway. Then local easy bikes, battery-run rickshaw and vans are available to reach the Project Site from Pabna Bus Terminal. The connected road from Pabna Bus Terminal to Heliboard Bazar is of 15ft wide and is bitumen road. After that the road is quite narrow, undulated, zigzag and kacha till the project site. The width of that kacha road is about 10-12 ft varies from place to place. It takes more than 45 minutes to reach the project site from the Bus Terminal.

The road connectivity of the project site from Dhaka city and Pabna Sadar Upazila is shown in **Figure 3.4** and **3.5** respectively.

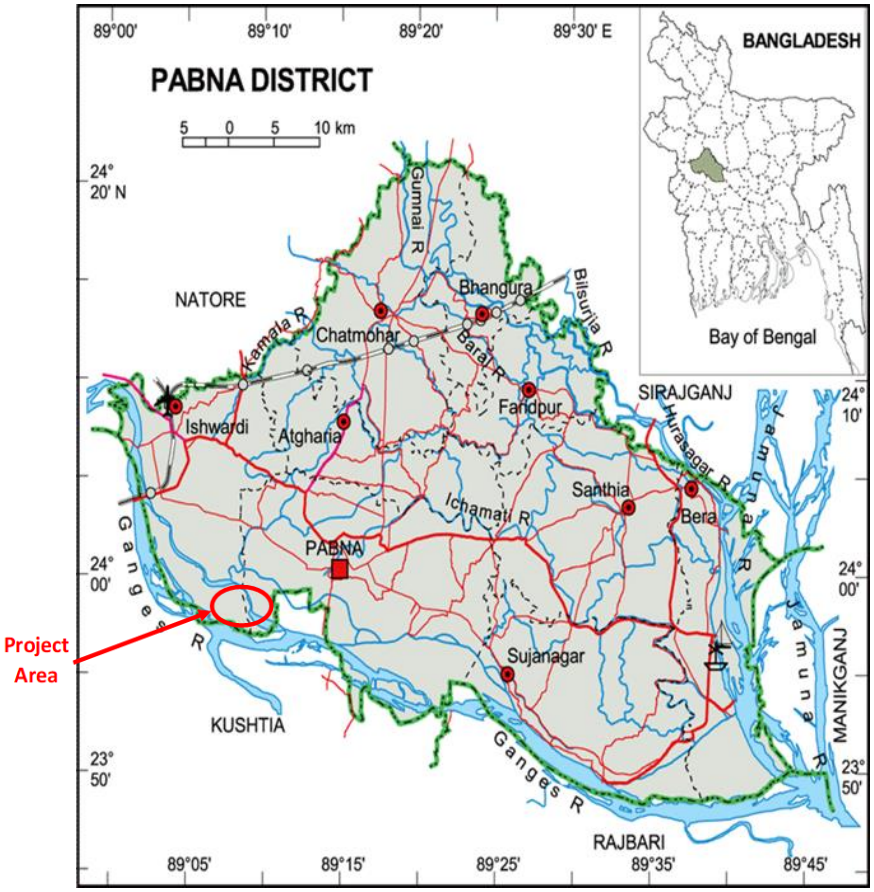


Figure 3.1: Pabna District Map

Figure 3.2: Pabna Sadar Upazila Map

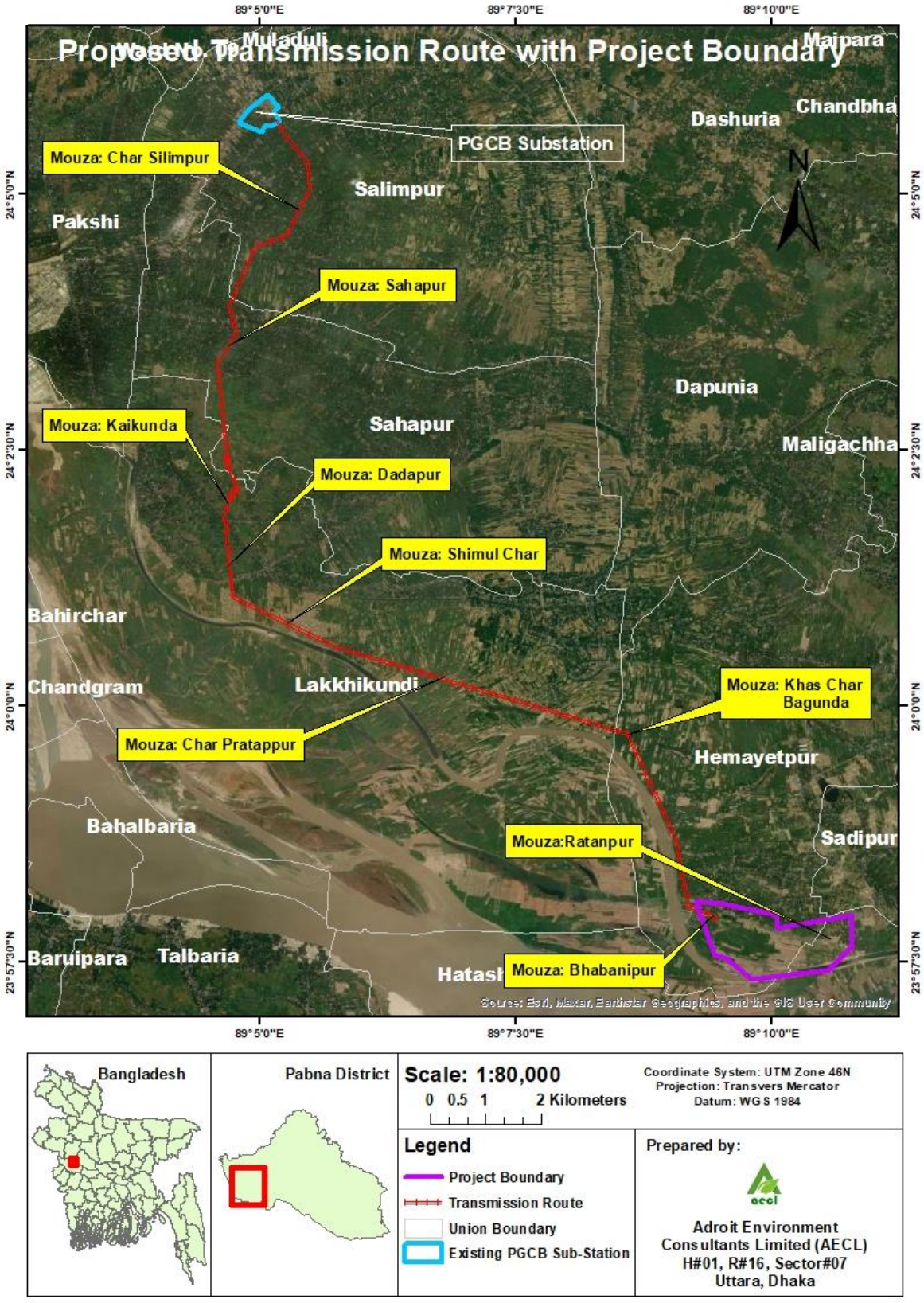


Figure 3.3: Project Location Map

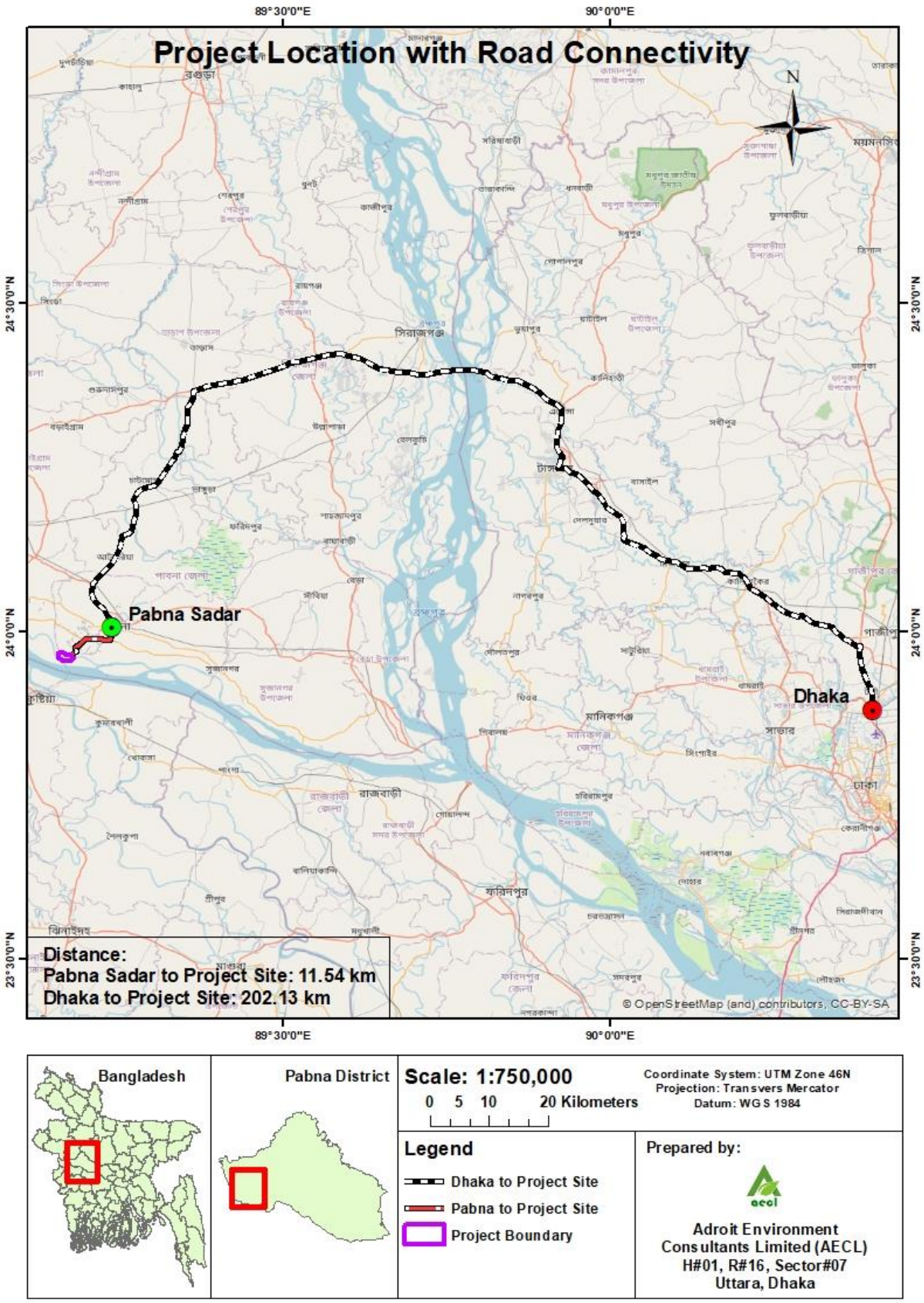


Figure 3.4: Project location with road connectivity from Dhaka city.

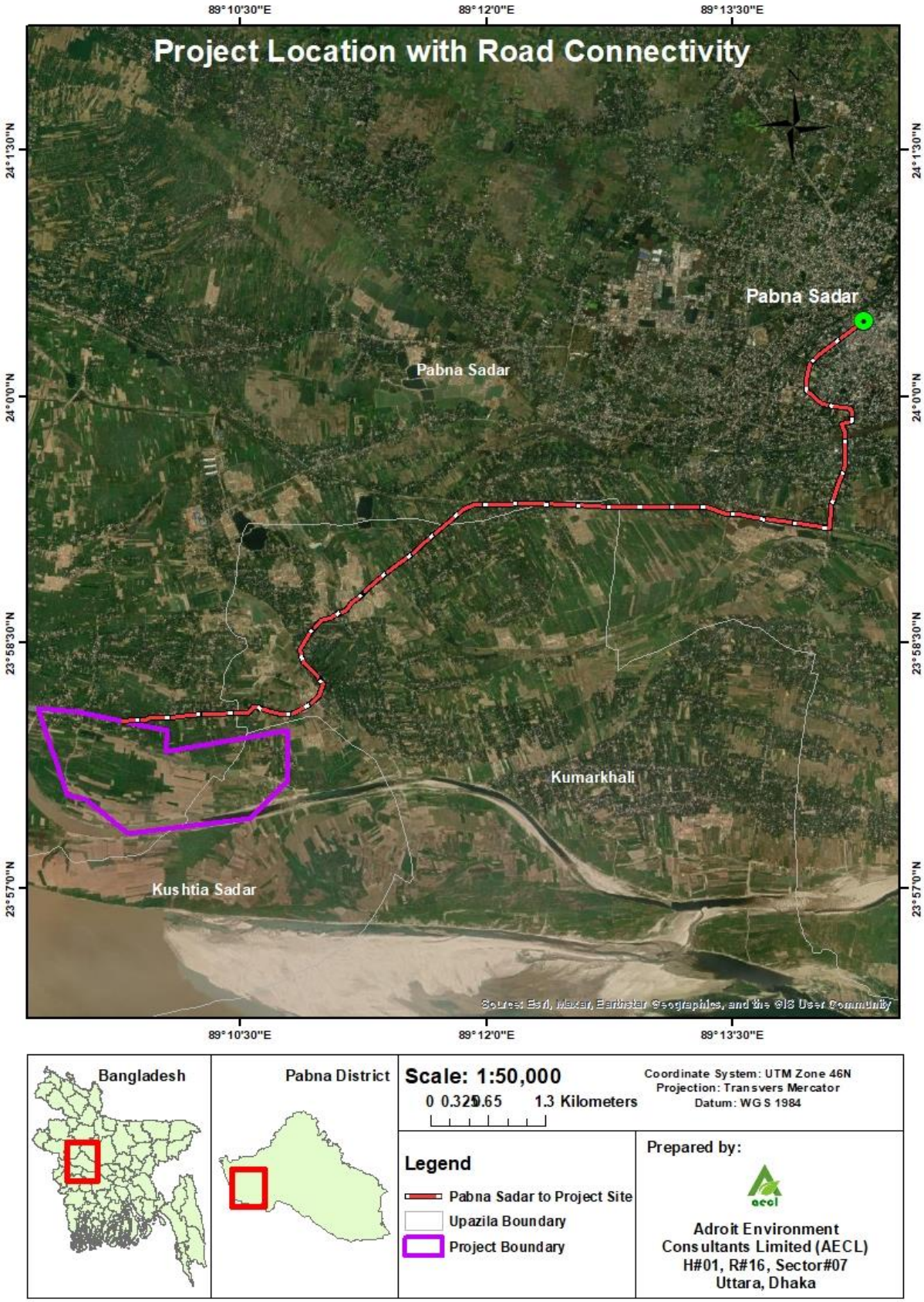


Figure 3.5: Project location with local road connectivity from Pabna Sadar Upazila.

3.4 Present Site Condition

3.4.1 Power Plant Area

The project site is located in Bhabanipur which is mainly a char land, at the side of the Padma river. There is no industry and factory around the project site. A khal[3] originated from the Padma River is located adjacent to the southern side boundary of the project site and 0.5 km away from the west side boundary of the project. There is a guchha gram at the north-west side of the project area. The width of this khal varies from 100m to 130m. During monsoon season the local khal has very low flow but during dry season it becomes dry. Padma River is passing to the south side of the project area which is about 1.5 km from the project site.

According to the layout map (Figure 1 and Annexure 2) there will be office buildings, main substation control building, block sub-station building within the project area. Dormitory building, family quarter, swimming pool, playground, officer's club, children park, mothers' waiting zone, mosque, helipad will be at east side of the project area.

Now the project is under construction phase and already construction of sub-station building, office building, dyke or boundary road, pile driving work etc. are going on. There are temporary office buildings, labour shed, medical room, child care facility, kitchen, dining, sanitation facility, septic tank, water treatment plant, parking area, internal earthen road etc. facilities present at the site. Existing temporary office buildings and labour shade has been shown in the layout in **Figure 3.7**. 3D view of the project is shown in **Figure 3.8.**

According to the site elevation map (attached as Annexure 3) the highest elevation of the power plant site is 13.162m and lowest elevation is 7.487m. According to the Flood Study and Mitigation Report (attached as Annexure 4), the maximum water elevation for 10-year and 100-year ARI due to overtopping of Padma River is EL. 13.98 m PWD and EL.15.04 m PWD respectively and maximum water elevation for 100-year ARI due to flood from local rain is EL.12.3 m PWD. The land elevation has been kept as 12.3 m PWD using cutting and filling method within the project boundary. The entire land has already been developed. The elevation of lower and upper side of the PV panel will be at 15.485 m and 16.50 m above sea level respectively. For flood management DSEPL will construct dyke/ elevated road (Elevation 14.0 mPWD) around the project boundary which will act as Cofferdam (Figure 3.6 (b)). The dyke will be made of sand and geotextile. There will be flap gates (one-way drains) and pumps along the dykes. The one-way drains will discharge the flood water from inside the power plant area to the outside if the inside water level is above the outside flood water level. If the flood water level outside is higher than the inside only in that case pumps will be used. Internal drainage and

[3] A natural creek, pool, or tank with a passage of inflow and outflow of water which is connected with a nearby river or waterbody

water discharge plan is attached as Annexure 25. This year the monsoon season has already passed and there was no flooding. The construction of the Boundary Road/dyke is ongoing and will be completed before the next monsoon period. The new drainage study shows that there will be ditch on the north side of the power plant connected to the southern sumps to dispose the extra water easily. So that, the water can't cause any flood to the community area. Ditch no. 6, 7, 8 and 9 will be responsible to dispose the water.

Table 3.2: Ditch Type and Specifications

Type	Section	Side Slopes	Depth (m)	Base (m)
6	Trapezoidal	1V:2H	0.90	0.90
7	Trapezoidal	1V:2H	1.00	1.00
8	Trapezoidal	1V:2H	1.10	1.10
9	Trapezoidal	1V:2H	1.10	4.90

The land elevation has been kept as 12.3 m PWD using cutting and filling method within the project boundary. The entire land has already been developed. Both internal cutting sand and external sand has been used for land development work. To raise the main power plant site at elevation 12.3m total 71555m3 sand was required where 67591 m3 was procured from cutting of the main power plant site. additional 3964m3 was outsourced. In addition to that, 50300 m3 (36575m3 + 13725m3) was outsourced for platform development of substation and main control room and 156522 m3 (135966m3 + 20556m3) was outsourced for dyke and internal road development. In total, 210786 m3 sand was outsourced. Please see Annexure 26 & 27. The sand is transferred by vessel to the nearest khal and then the sand is pumped to the power plant site through overland pipes. The pipelines are temporary and laid over the land for sand transfer.

Project proponent has distributed the project area into 15 Blocks. The solar panel will be mounted on tables and each table will be mounted on 10 PHC piles. 58 numbers of PV panels will be mounted per single table. There will be total 4728 tables and 48600 PHC piles. About 10775 piles out of 48600 have already been driven. About 5.6 m of the pile will be driven below the ground and 3.4 m will be above the ground. The elevation of lower and upper side of the PV panel will be at 15.485m and 16.50m respectively. Some solar panel has been installed in a trial basis to identify the yield of them in developed land. The project site is a vacant land with no settlements, but a small area is currently in use for banana cultivation for only this season. Fencing of 258.5 acres are has been completed. The project site is located on non-agricultural Char land and the proponent has already purchased 229 acres of land till August 2023 through willing buyer and willing seller method and the rest of the land is under process which will be purchased within September 2023. Total 315 number of plots are at main power plant site and DSEPL has purchased plots to date is 254 numbers. A total of 1054 households (HHs) and 3693 population will be affected due to land purchase of main power plant site. Land acquisition information is given in Annexure 6.

3.4.2 Transmission Line Area

The length of the transmission line is 21.5km and the transmission line from the power plant area will be stringed above the ground through transmission towers and toward the last end (near substation) about 0.5 km will go under the ground. Memorandum of understanding (MoU) has been made with the land owners for the land area of the transmission tower and compensation has been given to the project affected people for Row, standing crops and for access to the site. Already footing area for 76 towers has been purchased till August 2023 and only purchase of 3 transmission tower footing areas are under process. The construction of tower footing area has been started and out of 79 transmission towers 75 have been completed. A total of 79 HHs comprises of 257 people with average HH size 3.25 will be affected due to land acquisition of the transmission tower footing. The proponent has entered into a contract with JV of DRS-EPBL-Mukti for transmission line construction activity. They are using cast in situ piles for transmission tower base. There will be two types of towers i.e., angle tower and suspension tower. For each angle tower 8 piles are casted and for each suspension tower 16 piles are casted for the construction of footing of the towers. Construction of angle tower footing takes 7~10 days and suspension tower footing take 4~5days. After completing the construction of each tower footing, the contractor cleans up and reinstate the site before leaving. During the construction of tower footing the DSEPL to ensure environmental and social compliance. The adjacent land area of the transmission line is predominantly agricultural (one crop land area) type. Once in a year local people cultivate crops on this land. After Commissioning of the 132kV Transmission Line, PGCB will be responsible for operation & maintenance of the transmission Line. DSEPL will be responsible for coordination & liaison with PGCB O & M team to ensure uninterrupted power evacuation from the DSEPL Solar Power Plant. Land acquisition information is given in Annexure 6.

Photographs of project site and transmission area is given in **Figure 3.6 (c)**.

East Side

South Side

South-western Side

North Side

West Side

North - Western Side

(a) Project Site

West Side

North Side

East Side

Adjacent Khal and Project Boundary

South Side

Dyke, Project Boundary and Adjacent Khal

(b) Around the Project Site

North Side

East side

North - Eastern Side

South Side

West Side

South - Eastern Side

(c) Transmission Route

Nameplate

North Side

East Side

North-western side

South Side

South-eastern side

(d) **PGCB Sub-Station, Ishwardi**

Figure 3.6: Surrounding Picture of the Project Site

3.5 Project Component

A brief of project component & equipment are given in table below:

Table 3.3: Project Information

SERIAL NO.			Project Segment	Total QTY./WORK VOLUME	Location Address	Segment Category
A	LAND	A1	Main Power Plant Land	400 Acres	Inside the Project Map	Project Component
B	CIVIL WORK	B1	Foundation for 132kV AIS Switchyard [PLANT END]	3.0 Acres / 120 Nos. Pile	Inside the Project Map	Project Component
		B2	Foundation for 132kV AIS Switchyard [PGCB END]	15 Sq. Meter / 120 Nos. Pile	Inside the PGCB Grid Substation, Joynagar, Iswardi	Project Component
		B3	Main Control Building	Full Package (61000 SFT)	Inside the Project Map	Project Component
		B4	Mini Sub Station Building	31Nos. X (each 1500 SFT)	Inside the Project Map	Project Component
		B5	Administrative Office Building	1	Inside the Project Map	Project Component
		B6	Dormitory Building	1	Inside the Project Map	Project Component
		B7	Plant Internal Road	Full Package	Inside the Project Map	Project Component
		B8	River Embankment & Boundary Fencing	5.5km	Project Boundary River Side	Project Component
		B9	Septic Tank, Soak Well & STP	2 Septic tanks, capacity of each septic tank is 26.5 m^3. STP of capacity 40 m^3/day	Inside the Project Map	Project Component
		B10	Water Drainage Network	Full Package	Inside the Project Map	Project Component
		B11	Rain Water Harvesting Pond	7 Nos. Pond	Inside the Project Map	Project Component
		B12	132KV Transmission Line Tower Foundation	79 Nos.	Out Side the Project Map	Project Component
		B13	PHC Pile	47280 Nos.	Inside the Project Map	Project Component

SERIAL NO.			Project Segment	Total QTY./WORK VOLUME	Location Address	Segment Category
C	TL	C1	132KV Transmission Line Tower	79 Towers	Out Side the Project Map	Project Component
		C2	Stringing Conductors	21.0km	Out Side the Project Map	Project Component
		C3	132KV Under Ground Line	0.580km	Inside the PGCB Grid Substation, Joynagar, Iswardi	Project Component
D	PV AREA	D1	MMS (Module Mounting Structure)	4728 tables	Inside the Project Map	Project Component
		D2	PV MODULE	274224 Nos.	Inside the Project Map	Project Component
		D3	DC cable	1300km	Inside the Project Map	Project Component
		D4	33kV XLPE cable	86km	Inside the Project Map	Project Component
		D5	Mesh Earthing & LPS in PV Area	350km	Inside the Project Map	Project Component
		D6	INVERTERS	744 Nos.	Inside the Project Map	Project Component
		D7	33kV SUBSTATION & SWITCHGEAR PANEL	31 Set	Inside the Project Map	Project Component
E	SUBSTATION	E1	132kV Feeder Bay Extension [PGCB END]	Double Ckt (Full Package)	Inside the PGCB Grid Substation, Joynagar, Iswardi	Project Component
		E2	132kV AIS Switchgear, and POWER TRANSFORMER	Double Ckt (Full Package)	Inside the Project Map	Project Component
		E3	110Vdc Battery Banks and Charger Set	2 Set	Inside the Main Substation Building	Project Component
		E4	33kV GIS Switchgear Panel	43 Sets	Inside the Main Substation Building	Project Component
		E5	33kV RMU & 33/0.415kV Transformers	31 Sets	Inside the Block Substation Building	Project Component

SERIAL NO.			Project Segment	Total QTY./WORK VOLUME	Location Address	Segment Category
		E6	SCADA & PPC	1 Lot	Inside the Main Substation Building	Project Component
		E7	Cable Tray	Full package	Inside the Main Substation Building	Project Component
F	BoP	F1	Weather Station	16 Nos.	Inside the Project Map	Project Component
		F2	Fire Protection System	Full Package	Inside the Project Map	Project Component
		F3	Plant Illumination System	Full Package	Inside the Project Map	Project Component
		F4	LPS	Full Package	Inside the Project Map	Project Component
		F5	BSDG	2 Sets	Inside the Project Map	Project Component
		F6	CC Camera & Surveillance Camera System	Full Package	Inside the Project Map	Project Component

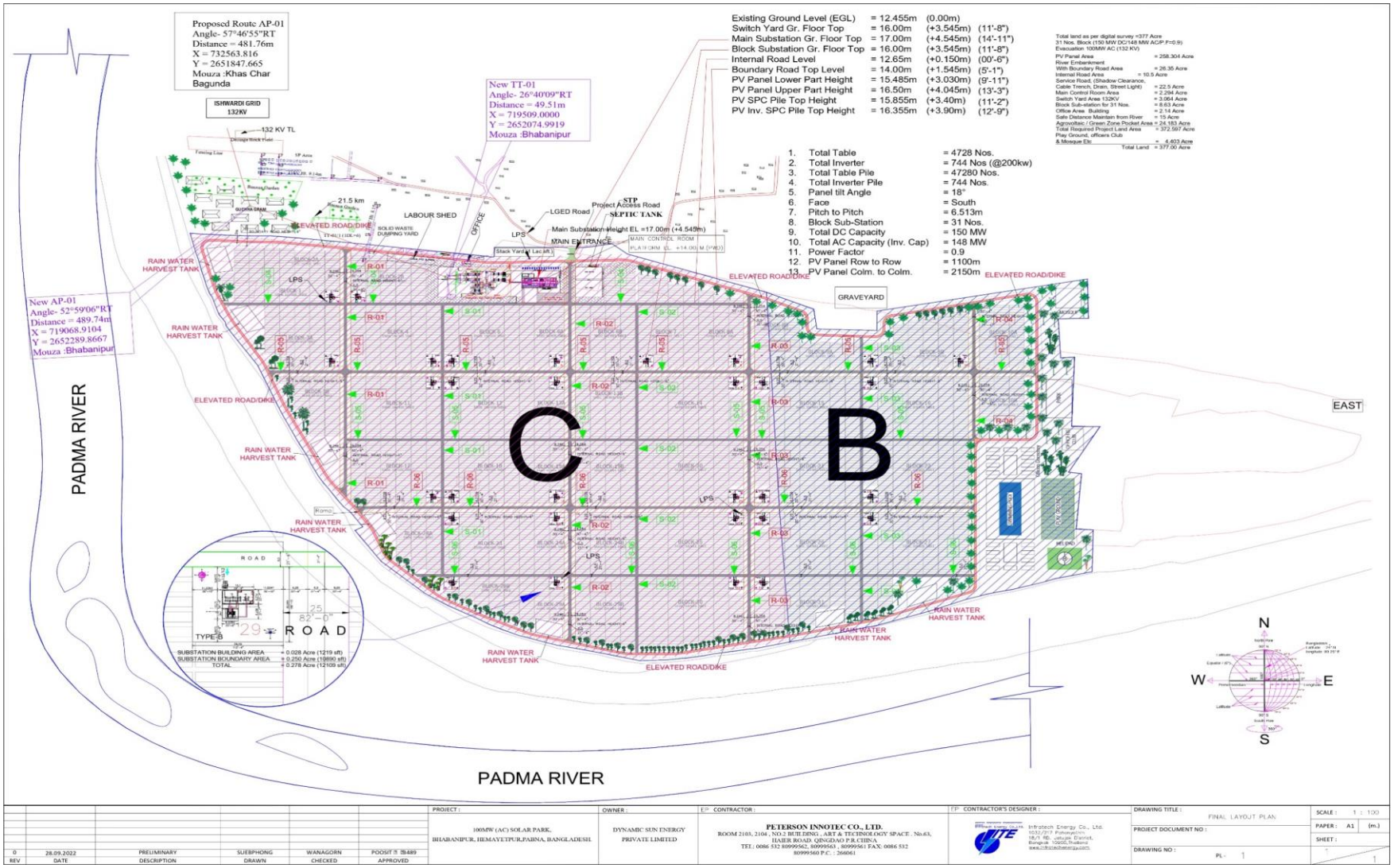
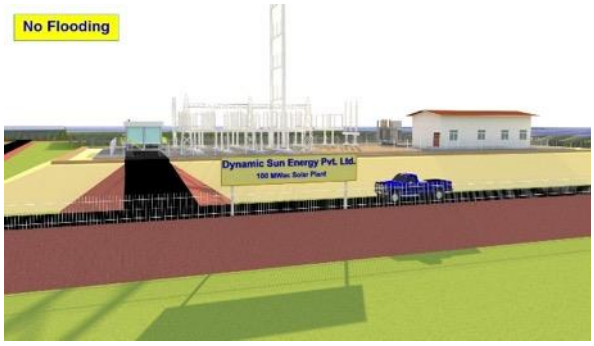


Figure 3.7: Layout of Project Area

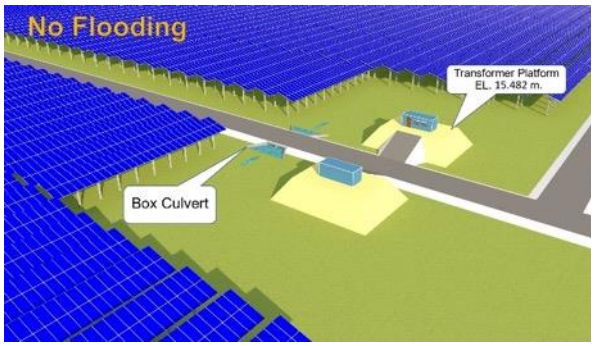
3D Model Drawing of (132kV/33kV) Main Substation Control Building

3D Model Drawing of Block-Substation (0.8/33kV) Building

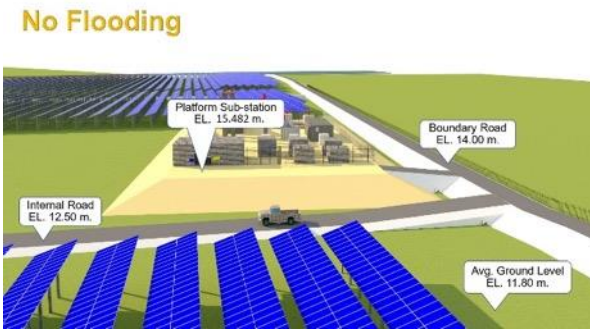


3D view from the outer area

3D view of Platform Sub-station and nearby PV panels



3D view of Transformer Platform and Box Culvert



3D view of Platform Sub-station, Boundary road and Internal road

Figure 3.8: 3D view of the project

3.6 Project Detail

The proposed power plant will be installed to serve uninterrupted electricity to the national grid. Dynamic Sun Energy Private Ltd.is going to generate and supply electricity to Bangladesh Power Development Board ("BPDB") for a period of 20 years on an off-take basis.

3.6.1 Solar PV Module

Detail of Solar PV module is presented below in **Table 3.4** & **3.5** and a layout is given on **Figure 3.9.**

Table 3.4: Mechanical Parameters of Solar PV Module

Mechanical Parameters	Specifications
Supplier	JA Solar Technology Co. Ltd.
Cell	Mono
Weight	31.2 kg
Dimension	2278±2mm x 1134±2mm x 35±1mm
Cable Cross Section Size	$4mm^2$ (IEC), 12 AWG (UL)
No. of cells	144 (6x24)
Junction Box	IP68, 3 diodes
Connector	MC4-EVO2/ QC 4.10-351
Cable Length (Including Connector)	Portrait: 200mm (+)/300mm (-); Landscape: 1300mm (+)/1300mm (-)
Front Glass/Back Glass	2.0mm/2.0mm
Packaging Configuration	36pcs/Pallet 720pcs/40HQ Container

Table 3.5: Operating Parameters of Solar PV Module

Operating Parameters	Specifications
Maximum System Voltage	1500V DC
Operational Temperature	-40˚C ~ +85˚C
Maximum Series Fuse Rating	30A
Maximum Static Load, Front Maximum Static Load, Back	5400Pa (112 lb/ft^2) 2400Pa (50 lb/ft^2)
Nominal Operating Cell Temperature	45±2˚C
Bifaciality	70%±10%
Fire Performance	UL type 29

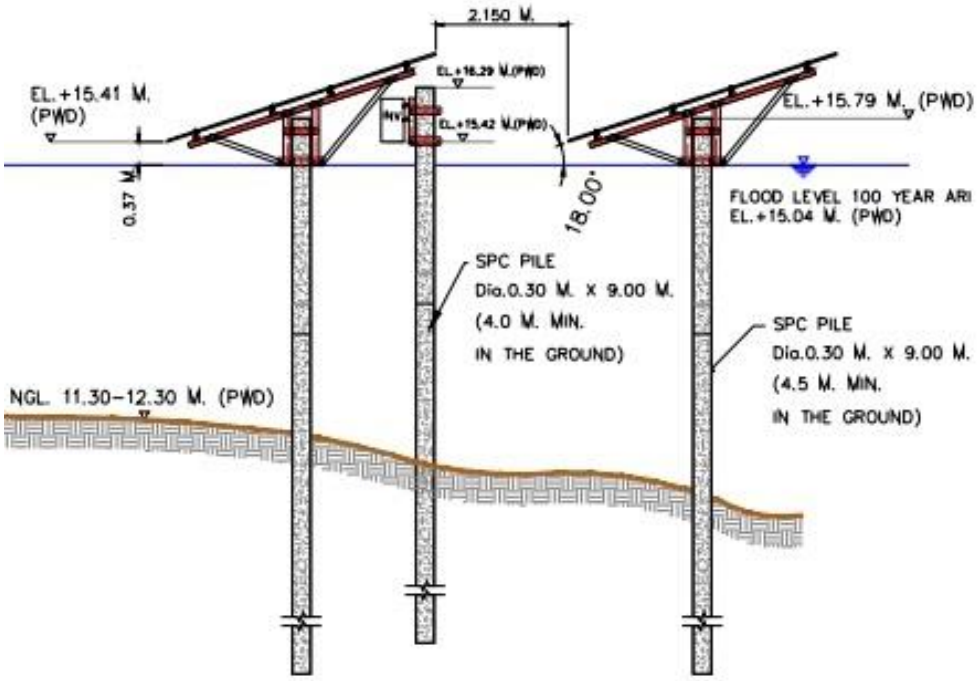


Figure 3.9: Layout of the PV Panel

3.6.2 Inverter

Table 3.6: Technical data of Inverter

Technical Parameters	Specifications
Efficiency	
Max. Efficiency	99.00%
European Efficiency	98.60%
Input	
Max. Input Voltage	1500V
Max. Current per MPPT	30 A
Max. Short Circuit Current per MPPT	50 A
Start Voltage	550 V
MPPT Operating Voltage Range	550 V ~ 1500 V
Nominal Input Voltage	1080 V
Number of Inputs	18
Number of MPP Trackers	9
Output	
Nominal AC Active Power	200,000 W
Max. AC Apparent Power	215,000 VA
Max. AC Active Power (cosϕ=1)	215,000 W
Nominal Output Voltage	800 V, 3W + PE
Rated AC Grid Frequency	50 Hz / 60 Hz
Nominal Output Current	144.4 A

Technical Parameters	Specifications
Max. Output Current	155.2 A
Adjustable Power Factor Range	0.8 LG … 0.8 LD
Max. Total Harmonic Distortion	<3%
Protection	
Input-side Disconnection Device	Yes
Anti-islanding Protection	Yes
AC Overcurrent Protection	Yes
DC Reverse-polarity Protection	Yes
PV-array String Fault Monitoring	Yes
DC Surge Arrester	Type II
AC Surge Arrester	Type II
DC Insulation Resistance Detection	Yes
Residual Current Monitoring Unit	Yes
Communication	
Display	LED Indicators, WLAN + APP
USB	Yes
MBUS	Yes
RS485	Yes
General	
Dimensions (WxHxD)	1035x700x365 mm (40.7x27.6x14.4 inch)
Weight (with mounting plate)	≤86kg (189.63 lb)
Operating Temperature Range	-25˚C ~ 60˚C (-13˚F ~ 140˚F)
Cooling Method	Smart Air Cooling
Max. Operating Altitude without Derating	4000 m (13123 ft)
Relative Humidity	0 ~ 100%
DC Connector	Staubli MC4 EVO2
AC Connector	Waterproof Connector + OT/DT Terminal
Protection Degree	IP66
Topology	Transformer less

3.6.3 Transformer

Table 3.7: Technical data of Transformer

GENERAL TECHNICAL DESCRIPTION			
1	Manufacturer type	:	ORF 120/275
2	Standard	:	IEC 60076
3	Frequency/ phase	:	50 Hz / 3 Phase
4	Installation	:	Outdoor
5	Altitude above sea level (m)	:	< 1000
6	Type of cooling	:	ONAN/ONAF
7	Rated power (MVA)	:	80/120
8	Connection symbol	:	YNd11
9	Nominal ratio of transformation (kV)	:	132/33
10	Insulation class of windings	:	A
11	Winding conductor material	:	Copper
12	High voltage winding	:	
	- Highest voltage for equipment/Neutral (kV)	:	145/17.5
	- Power frequency withstand voltage (kV)	:	275/38
	- Full wave lightning impulse voltage (kV peak)	:	650/95
	- Winding connection	:	Star
	- Type of termination	:	Outdoor
13	Low voltage winding	:	
	- Highest voltage for equipment (kV)	:	36
	- Power frequency withstand voltage (kV)	:	70
	- Full wave lightning impulse voltage (kV peak)	:	170
	- Winding connection	:	Delta
	- Type of termination	:	Air Filled Cable box
14	Uniform/ graded design of	:	
	- High voltage winding	:	Graded Insulation
	- Low voltage winding	:	Uniform Insulation
15	Tap changing device	:	On Load tap changer
16	Tapping regulation range (%)	:	+12x1.25 % to -12x1.25 %
17	Category of tapping voltage variation	:	Constant flux voltage variation
18	No load loss at rated voltage, rated frequency (kW)	:	54
19	Load loss at rated ratio, 75 °C, 120 MVA (kW)	:	380
20	Impedance at nominal tap, 75 °C, 120 MVA (%)	:	14
21	Short circuit duration (IEEE Standard) (second)	:	2
22	Maximum permissible temperature rise	:	
	- Top oil (by thermometer) (°C)	:	55
	- Average winding (by resistance) (°C)	:	65; HS : 75
23	Sound Pressure Level	:	
	- ONAN rating at 1 m (dB)	:	70
	- ONAF rating at 2 m (dB)	:	80
24	Overall dimension (approximately)	:	
	- Length (mm)	:	8000

GENERAL TECHNICAL DESCRIPTION			
	- Width (mm)	:	5500
	- Height (mm)	:	6400
25	Untanking part (kg)	:	6600
26	Oil weight (kg)	:	25000
27	Total weight (kg)	:	123400
28	Maximum transport weight (kg)	:	106000
ACCESSORIES DATA			
1	On load tap changer	:	MR VM III 650Y
2	Motor drive unit	:	MR – ED 100
3	Off circuit tap changer	:	NA
4	Over pressure relief device :	:	-
	-for main transformer tank	:	Messko or equiv.
	-for OLTC diverter tank	:	Messko or equiv.
5	Gas actuated (Buchholz) relay	:	Taijin/Maier or equiv.
6	Protection relay for OLTC with trip contact	:	MR – RS2001
7	Magnetic oil level indicator	:	-
	- for main conservator	:	Elmek/Maier or equiv.
	- for OLTC conservator	:	Elmek/Maier or equiv.
8	Oil temperature indicator	:	Messko or equiv.
9	Winding temperature indicator	:	Messko or equiv.
10	Painting in accordance with EEI standard painting system	:	Epoxy base painting
11	Transformer oil in accordance with IEC 296	:	
12	Transformer base	:	Skid base
13	Lifting lugs, jacking bosses, towing lugs and earthing tmnl.	:	Provided
14	Oil valves		
	- Filter valves (sluice type)	:	Provided
	- Sampling valves (sluice type)	:	Provided
	- Drain valve on tank (sluice type)	:	Provided
	- Shut-off valve between buchholz and conservator	:	Provided
	- Butterfly valves between radiators and tank	:	Provided
15	Thermometer pocket DIN 42553	:	Provided
16	Rating & schematic plate	:	Provided
17	Oil preservation system	:	Provided
18	Arrangement of cooler	:	
19	Impact recorder for transport	:	Provided
LIST OF TESTS			
Routine Test			
1	Measurement of winding resistance	:	Yes
2	Measurement of voltage ratio and check of phase displacement	:	Yes
3	Measurement of short circuit impedance and load loss	:	Yes
4	Measurement of No-Load Loss and Current	:	Yes
5	Lightning impulse test	:	Yes

GENERAL TECHNICAL DESCRIPTION			
6	Applied voltage test	:	Yes
7	Induce voltage withstand test	:	Yes
8	Partial Discharge	:	Yes
	Test on load tap changer, where appropriate	:	Yes
9	Leak testing with pressure	:	Yes
10	Check of the ratio and polarity of built-in current transformers	:	Yes
11	Check of core and frame insulation	:	Yes
12	Determination of capacitances windings-to-earth and between windings	:	Yes
13	Measurement of D.C. insulation resistance between each winding to earth and between windings	:	Yes
14	Measurement of dissipation factor (tan δ) of the insulation system capacitances	:	Yes
15	Measurement of dissolved gasses in dielectric liquid from each separate oil compartment except diverter switch compartment	:	Yes
16	Measurement of no-load loss and current at 90 % and 110 % of rated voltage	:	Yes
Type Test			
1	Temperature-rise type test	:	Yes
2	Dielectric type tests	:	Yes
3	Determination of sound level	:	Yes
4	Measurement of the power taken by the fan	:	Yes
Special test			
1	Measurement of zero-sequence impedance	:	Yes
2	Measurement of frequency response (Frequency Response Analysis or FRA	:	Yes

3.6.4 SPC-Pole Specification

Table 3.8: Technical data of Transformer

SPS/PHC Pile in PV Module Area		
Description	**External**	**Internal**
Amount (No.)	14160	33120
Length (m.)	9.0	9.0
Diameter (mm.)	300	300
Wall thickness (mm.)	70	70
No. of pre-stressed steel	10 dia. 9 mm.	7 dia. 7 mm.
Crack Moment (KN. m)	42.0	28.0
Weight (Ton)	1.2	1.2
Concrete		
Min. Compressive Fc', MPa (cube)	70	70
Young's Modulus (MPa)	40000	40000
Bending Strength	7	7
Steel Bar		

SPS/PHC Pile in PV Module Area		
Description	**External**	**Internal**
PC bar diameter (mm.)	9.0	7.0
Ultimate Tensile strength (MPa)	1420	1420
Yield Strength	1280	1280

3.7 Resources and Utilities Demand

3.7.1 Electricity

During construction phase electricity from Palli Bidyut (a subsidiary of Bangladesh Rural Electrification Board (BREB) and supplies electricity to rural areas of Bangladesh) is used and during operation phase own generated power will be used for plant and its associated facility operation.

3.7.2 Water

There are around 700 laborers working during construction phase among them 200 are residential and 500 are non-residential. They require 86 m^3/day of water considering 180 liter/day/capita for residential worker and 100 liter/day/capita for non-residential worker consumption. From the baseline study it was found (Table 4.15) Lead (Pb) and Cadmium (Cd) of the ground water sample is beyond the Bangladesh drinking water standard value extracted from shallow tube well. The depth of the sampled tube well at project site was 70 ft. DSEPL had treatment facility at site for treating ground water for drinking purpose. Right now, they have drinking water treatment facility at site for the supply of drinking water for the labours and its officials. DSEPL has set up new submersible pump at 220 ft depth along with water treatment plant (WTP) which can treat 1000 litres of drinking water per hour (24m^3/day) for the supply of drinking water for the rest of the construction period and operation phase ahead. Water sample testing results of the new treatment facility is attached as Annexure 10 and all the parameters (pH, Color, Turbidity, Total Hardness, Cl, TDS, Mn, As, Fe, TC, FC, Total Alkalinity, SO_4, Nitrate, Cr, Pb, Cd, Zn, Cu) of the supplied drinking water is well within Bangladesh and WHO drinking water standards.

During operation phase, ground water and rainwater harvesting ponds will be used. There will be around 550 laborers working during operation phase among them 200 will be residential and 350 will be non-residential. They will require 71 m^3/day of water considering 180 liter/day/capita for residential worker and 100 liter/day/capita for non-residential worker consumption. Approximately 2742 m^3/month of water will be required for PV modules cleaning during operation phase. Total capacity of the 7 rainwater harvesting ponds is 22750.00 m^3 and according to the water balance calculation which includes estimated seasonal rainfall data, the rainwater harvesting ponds will provide sufficient PV panel cleaning water storage all through the year. Water balance diagram is attached as Annexure 7.

3.7.3 Fuel

Approximately 2000 liters of diesel is required per month for emergency backup by Generators and 1000 litres per month octane is required for the vehicles. DSEPL requires permission from Bangladesh Energy Regulatory Commission (BERC) and DC office for storing diesel at site. Generators are refilled onsite. DSEPL procure diesel and octane from diesel pump stations. Diesel is brought to the site in drums and then refilled to the generators. Vehicles are not refilled onsite. During construction phase, there will be 3 nos. of DG Sets (60kVA, 100kVA & 150kVA) are available for emergency purposes. During operation phase, there will be 2 nos. of DG Sets for emergency purpose. Capacity of each DG Set will be 630kVA. For storing fuel at site for backup generators, DSEPL requires to take approval from Bangladesh Energy Regulatory Commission (BERC) and the application to BERC by DSEPL is attached as Annexure 35. There is no threshold value for storing Fuel at site.

3.7.4 Infrastructure (road, drains)

The project location is beside the existing LGED Road (see Annexure 2 Figure 3.7). A 200m herringbone road has been constructed and developed for accessing the Project from the nearby LGED Road. No land was acquired for this purpose and this 200m long access road is constructed on DSEPL's own land by themselves. This 200m access road is not accessible to local people. The LGED Road starts from the Pabna Highway and runs through Heli board Bazar to Project Site. The road is bituminous road up to Bhabanipur and after that the rest of the LGED road is earthen and damaged. DSEPL has improved the quality of road for the transportation of the constructional materials, machineries, and equipment. The width of this roads is almost 10-12 ft. Normally local vehicles i.e., motorcycles, easy bikes and auto rickshaw runs along the road. No heavy traffic or transport is seen at this road. DSEPL uses pilot car and flushing lighting system for carrying the Solar PV mounting piles by large lorries through local narrow roads from the nearest highway to the project site as local people are not habituated with this kind of heavy vehicles. There will be internal roads within the project area for regular movement of the project personnel. According to the Flood Study and Mitigation Report, elevation of the internal roads will be 12.65 m. Natural drainage system is available (khal) around project site. There will be box culverts and internal drains for internal drainage. In addition to that flap gates will be installed along the boundary line which are one-way gate. During flooding, excess water will be discharged to the adjacent canal but no water from outside can move in through it. Internal drainage and water discharge plan is attached as Annexure 25 with outflow points which are all along the southern boundary of the main power plant site.

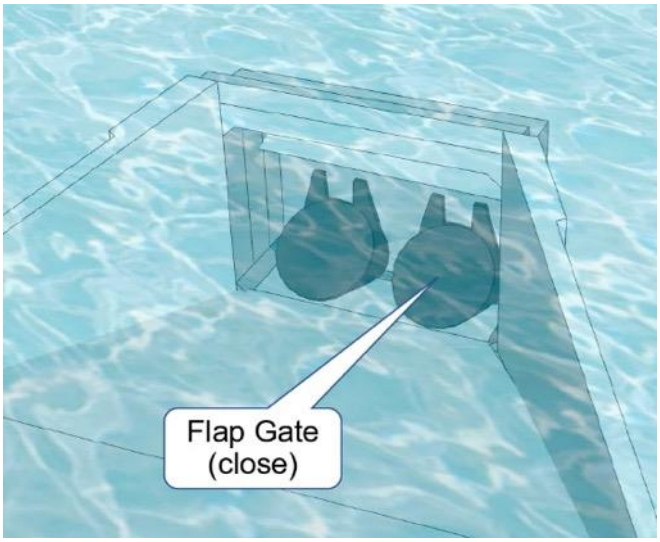


Figure 3.10: Flap gates

3.8 Adaptation / Enhancement/ Abatement Measures

3.8.1 Climate change and adaptation measures

As the project site is beside the Padma River so there is vulnerability of flooding due to overtopping of Padma River and local rain. The proponent already conducted Flood Study and Mitigation Report and designed the power plant according to the study so that during the 100 years return period the solar PV panels, transformers and substations are above the flood level. In addition to that, flood dyke will be constructed with freeboard to protect PV module from Flooding in 100-year ARI. The elevation of lower and upper side of the PV panel will be at 15.485m and 16.50m respectively. The elevation of main sub-station building will be 17.0 m, block sub-station will be 16.0 m. The boundary road / dyke will be used for flood protection (dyke) from the overtopping of the Padma River and flooding due to rainfall. The dyke will be made of sand and geotextile to prevent any kind of seepage. No concrete structures will be made for boundary road/dyke. Details shown in **Figure 3.11**. The elevation of the boundary road / dyke will meet the flood level at 10-year ARI (EL.14.00 m). No river bank / embankment works will be done.

In addition to that, to minimize the ground water use there will be rainwater harvesting ponds at different locations which will be used for PV module washing.

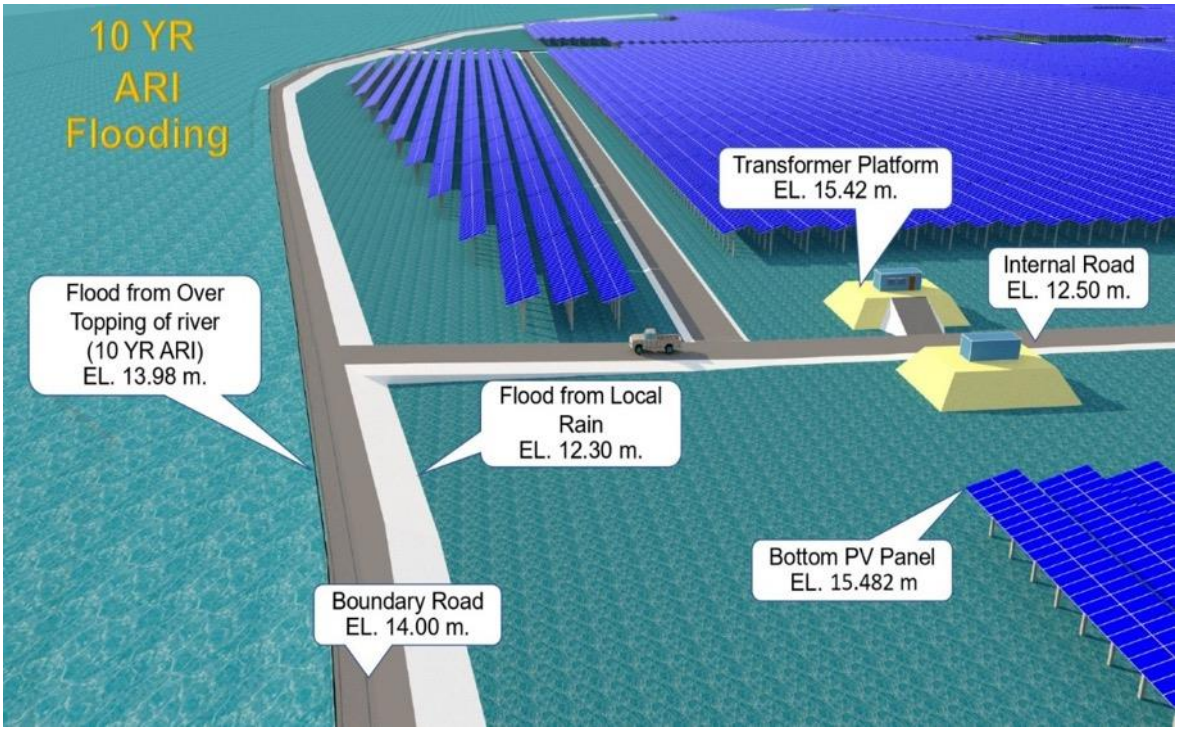


Figure 3.11: 3D view of 10-year ARI Flooding

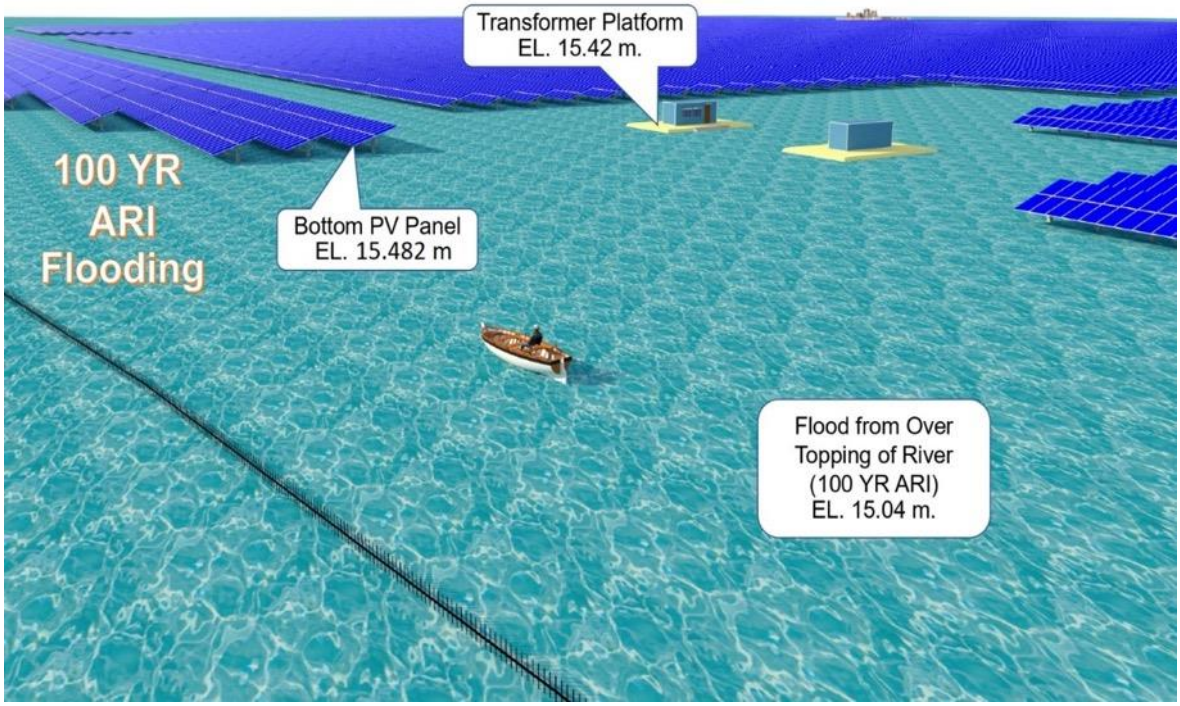


Figure 3.12: 3D view of 100 years ARI Flooding

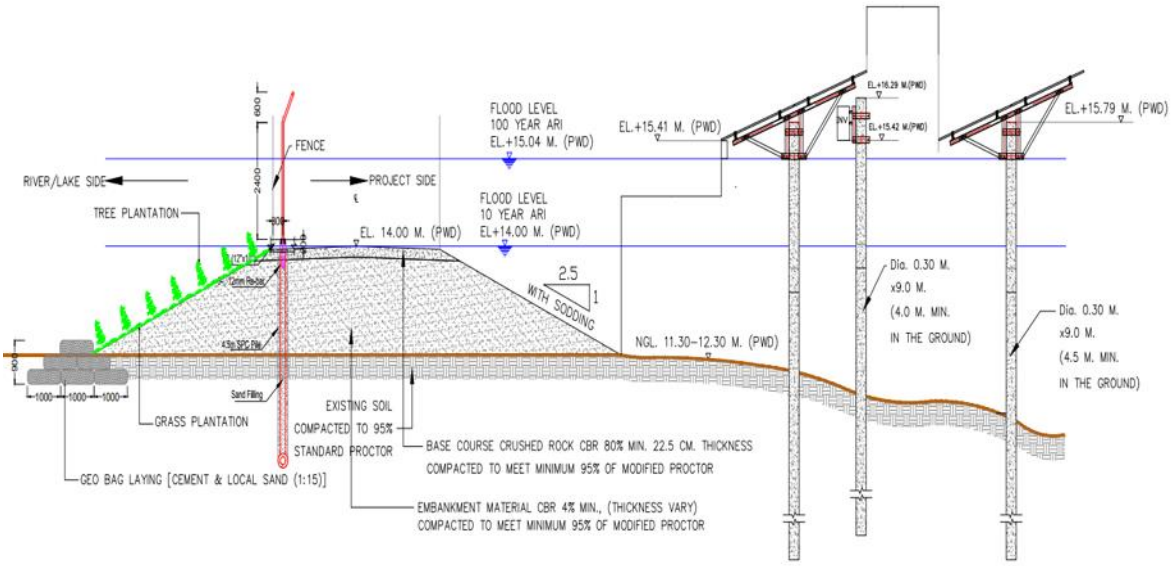


Figure 3.13: Details of Dyke and PV Panel Mounting

3.8.2 Ground Water Management

The project proponent is going to install 7 rain water harvesting ponds to minimize the usage of ground water. Capacity of each rainwater harvesting pond will be 3250 m^3. They will reserve 22750 m^3 of water for PV panel cleaning whereas the requirement will be only 2742 m^3/month. In addition to that there will be water collection system to collect PV panel washing water for further use in irrigation. No chemicals will be used for PV panel cleaning. Details of rainwater harvesting pond is shown below.

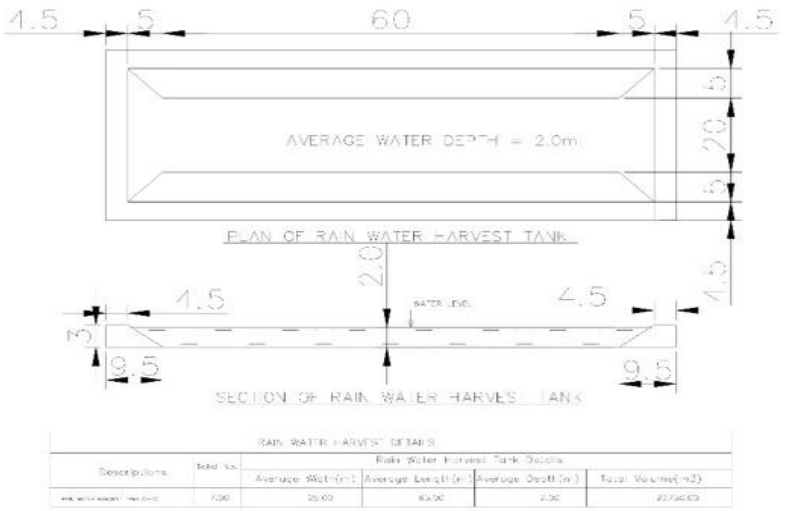


Figure 3.14: Details of Rainwater Harvesting Ponds

3.8.3 Agricultural Enhancement

The project is designed as such so that the land beneath the PV panels can be used for crop cultivation which will enhance the land use opportunity where electricity and crops will be generated all together. It is still to be concluded how and if this can be undertaken, and the specific details and planning are out of scope of this assessment.

3.8.4 Enhancement of Employment Opportunity

The proponent intents to engage local people (at least 30%) in project related activity at all stages. In addition to that, local people will be also be employed for crop cultivation work during the project operation beneath the PV panel area.

3.8 Project Schedule

The project schedule and implementation status has been shown below.

Table 3.9: Implementation Plan of Remaining Works of Main Plant Construction

SL	Sub-Segment of Project	Total Qty./Work Volume	Work Plan	
			Start Date	End Date
1	Foundation Work for 132kVAIS Switchyard	3.0 Acres	01-Apr-23	30-Aug-23
2	INSTALLATION of MMS(Module Mounting Structure)	4728 tables	01-Jun-23	30-Nov-23
3	PV MODULE INSTALLATION	274224 Nos.	01-Sep-23	15-Dec-23
4	DC Cable laying	1300km	01-Jun-23	30-Oct-23
5	Mesh Earthing & LPS Installation in PV Area	350km	01-Jun-23	30-Nov-23
6	INSTALLATION OF 33kV SUBSTATION & SWITCHGEAR PANEL	31 Nos.	01-Oct-23	30-Nov-23
7	INSTALLATION OF INVERTERS	744 Nos.	01-Oct-23	15-Dec-23
8	PILE CAP CASTING OF Transmission Line Towers	79Nos.	15-Apr-23	31-Jul-23
9	TOWERS & H-POLES ERECTION	79Nos.	01-Aug-23	30-Nov-23
10	STRINGING Work OF 132kV double Circuit Line	21km	01-Oct-23	30-Nov-23
11	132kV Underground Line inside PGCB Substation Area	0.5km	01-Jul-23	1-Oct-23
12	Construction & Erection Work for 132kV Feeder Bay Extension	Double Ckt	01-Sep-23	30-Nov-23
13	33kV Underground Line inside Main Plant Area	86km	01-Jul-23	30-Nov-23
14	Erection, Testing & Commissioning Work for 132kV AIS Switchgear, and POWER TRANSFORMER	Double Ckt	01-Sep-23	30-Nov-23
15	110Vdc Battery Banks and Charger Set	2 Set	01-Sep-23	30-Nov-23
16	Erection, Testing & Commissioning Work for 33kV GIS Switchgear Panel	43 Sets	01-Sep-23	30-Nov-23
17	Erection, Testing & Commissioning Work for 33kV RMU & 33/0.415kV Transformers	31 Sets	01-Sep-23	30-Nov-23
18	SCADA & PPC [Erection, Testing & Commissioning]	1 Lot	01-Sep-23	15-Dec-23

SL	Sub-Segment of Project	Total Qty./Work Volume	Work Plan	
			Start Date	End Date
19	Weather Station [Erection, Testing & Commissioning]	16 Nos.	01-Sep-23	15-Dec-23
20	Fire Protection System [Erection, Testing & Commissioning]	Full Package	01-Sep-23	15-Dec-23
21	Plant Illumination System [Erection, Testing & Commissioning]	Full Package	01-Jun-23	30-Nov-23
22	Construction of Plant Internal Road & Boundary road/dyke	Full Package	02-May-23	30-Nov-23
23	Testing & Pre-commissioning Work for All the System before Back Charging of the Sub-Station	Full Package	01-Dec-23	15-Dec-23
24	RRT	Job	23-Dec-23	31-Dec-23
25	CoD	Job	31-Dec-23	31-Dec-23

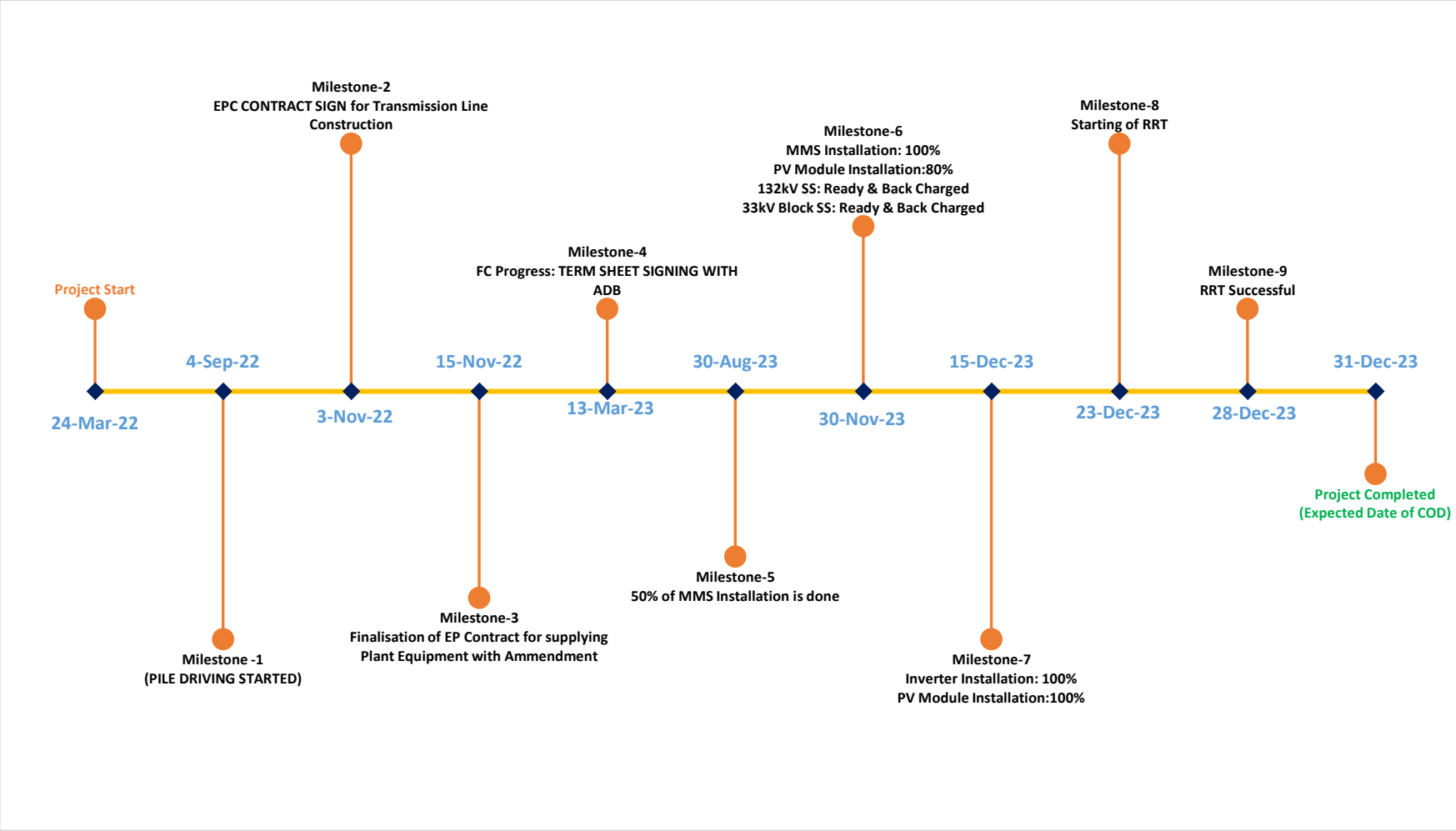


Figure 3.15: Work schedule for completion of the proposed project

Chapter 4

4 BASELINE STUDIES

4.1 General Consideration

Baseline condition of environment states the present status of different components of environment i.e. physical, biological, cultural, economic and social environmental characteristics in absence of the project. Environmental baseline study by examining the existing environment, serves as the basis of the project site against which potential impacts from development activities of the project both during implementation and in operation phases can be compared. Mainly there are two principal objectives in examining and defining the existing environment:

- To recognize potential environmental impacts of the project and enable mitigation measures to be identified;
- To provide a base line against which environmental conditions in the future project may be measured and to document conditions which were either existing or developing before the introduction of the project and not due to the project.

The baseline environmental quality is assessed through field studies within the impact zone for various components of the environment, viz. air, noise, water, soil, ecology, and socio-economic condition.

4.2 Objective and Methodology

The primary objective of the environmental and social baseline condition study is to provide an environmental and social baseline against which potential impacts from the construction and operational phases of the Project can be compared.

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

- Study area of 5 km radial zone from the center of the proposed main power plant location was selected for the baseline studies. In addition to that, 0.5 km on both sides of the transmission line has been considered as area of influence and baseline study has also been carried out along that strip.
- Primary data collection was conducted through environmental monitoring and field survey for water, air, soil, noise, and ecology;
- Social baseline of the study area was captured through primary and secondary data review;
- Secondary data was collected from government reports, academic institutes, websites, published literature etc.

4.3 Physical Environment Surrounding Project Site & Study Area

The land of the proposed project is in Hemayetpur, Pabna Sadar, Pabna. Pabna Sadar Upazila is on the north and west side of the project area and the Padma River is on the east and south side of the project area. Primary and Secondary data has been generated and collected for conducting the Baseline Study.

The immediate surrounding extended area of about 5 km radius around the main power plant area and 0.5 km on both sides of the transmission line has been considered as "Area of Influence (AoI)" for this study. AoI of the proposed project site is shown in **Figure 4.1**. Details of the Baseline study is presented in **Table 4.1**. Landmarks around the project site is given below in **Table 4.2** and shown in **Figure 4.2**.

Table 4.1: Details of Monitoring

SL. No.	Attribute	Parameters	Frequency of Monitoring
1	Ambient air quality	SPM, SO2, NOx, CO, and Particulate matter (PM2.5& PM10)	The monitoring was carried out at 6 locations for 24 hours
2	Noise levels	Noise levels in dB(A)	Once during study period continuously for 24 hours at 6 locations
3	Water quality	Physical, Chemical and Bacteriological Parameters	Once during the study period at 2 locations for surface water and 2 locations for ground water
4	Soil characteristics	Physical, Chemical Parameters	Once during the study period at 1 location
5	Meteorology	Wind Speed, Direction, Temperature, Relative Humidity, Rainfall & duration, and other non- instrumental observations	Data collected from secondary sources like Meteorological Station.
6	Ecology	Existing terrestrial and aquatic flora and fauna	Based on data collected during the site visit
7	Geology	Geological history	Based on data collected from secondary sources
8	Hydrology	History of water level of the river Meghna (maximum, danger level, peak water level) and the existing groundwater level	Based on Data collected from secondary sources
9	Socio-economic aspects	Socio-economic characteristics	Based on primary data collected through socio-economic survey and data published in latest census

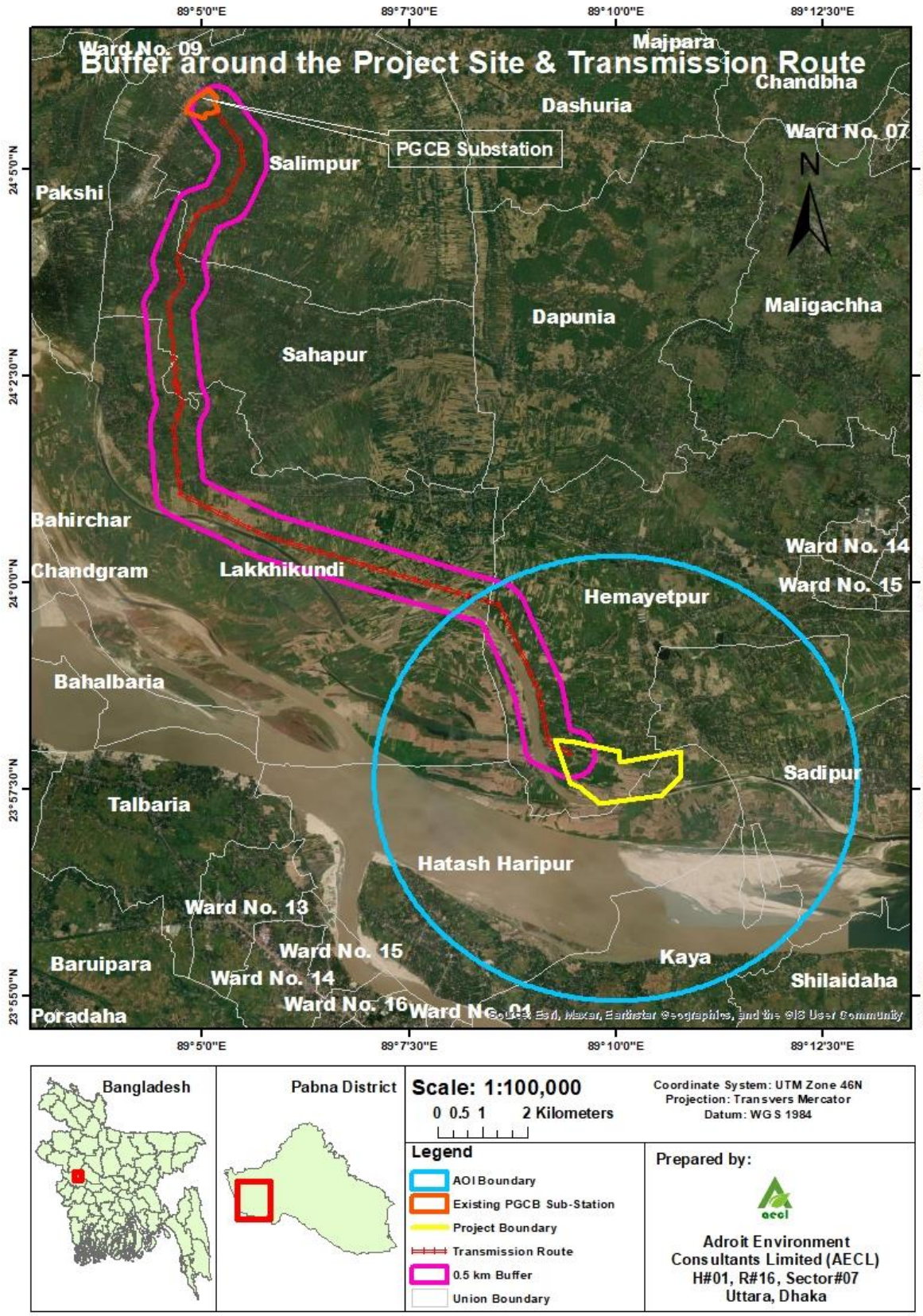


Figure 4.1: AoI of the Proposed Project Site and Transmission Line Area

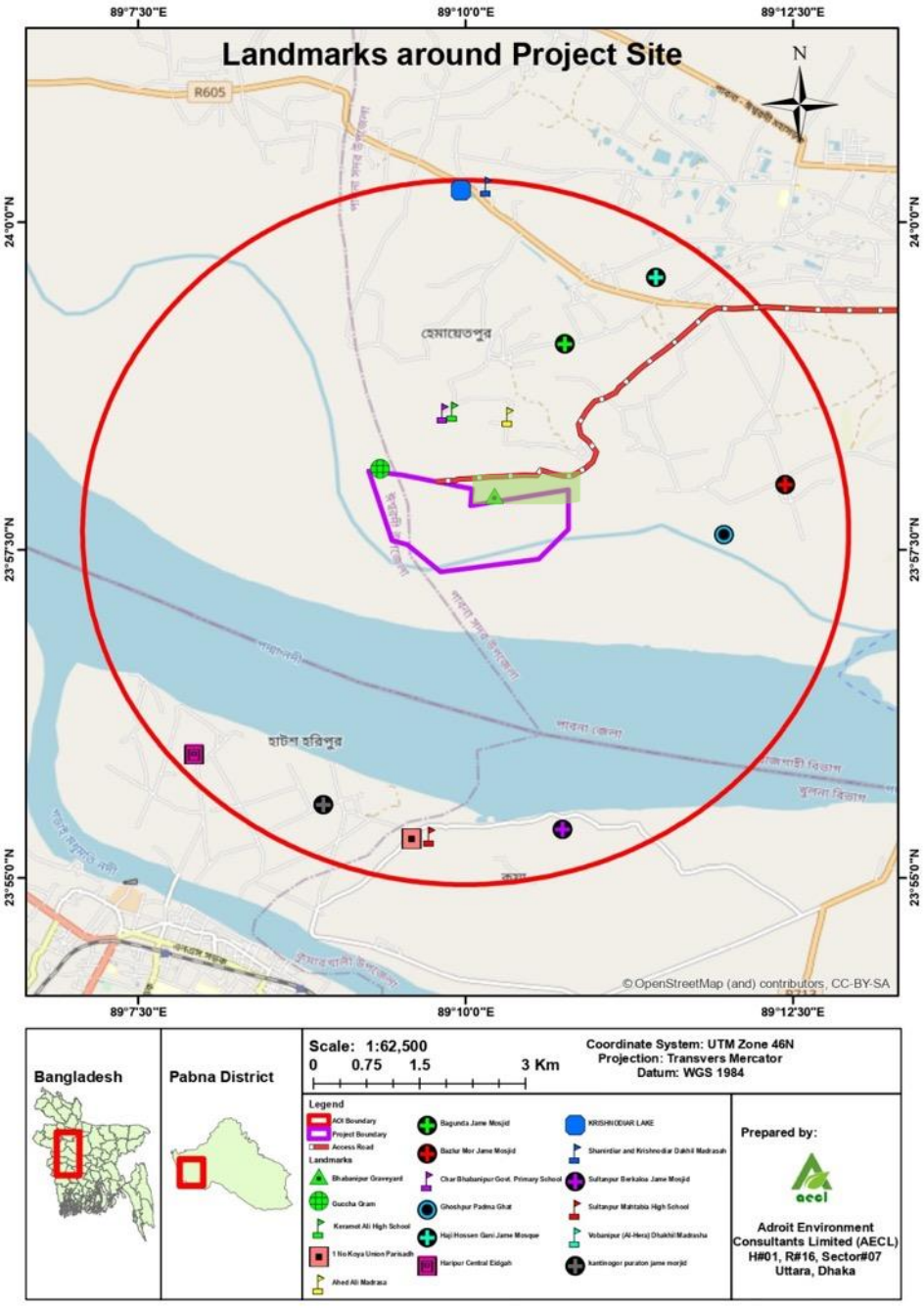


Figure 4.2: Landmark around the Project Area

Table 4.2: Landmarks around the Project Site

Landmarks Name	Latitude	Longitude	Distance (km)	Direction
Keramot Ali High School	23°58'33.31"N	89° 9'54.21"E	1.01	North
Char Bhabanipur Govt. Primary School	23°58'32.69"N	89° 9'49.56"E	0.98	North
Ahed Ali Madrasa (Religious School)	23°58'30.84"N	89°10'19.50"E	1.16	North-East
Bhabanipur (Al-Hera) Dhakhil Madrasha (Religious School)	23°58'54.23"N	89°10'25.13"E	1.8	North-East

Landmarks Name	Latitude	Longitude	Distance (km)	Direction
Bagunda Jame Mosque	23°59'4.67"N	89°10'45.50"E	2.05	North-East
Haji Hossen Gani Jame Mosque	23°59'34.86"N	89°11'26.98"E	3.94	North-East
Krishnodiar Lake	24° 0'14.83"N	89° 9'57.97"E	4.4	North
Shanirdiar and Krishnodiar Dakhil Madrasah (Religious School)	24° 0'16.30"N	89°10'9.61"E	4.5	North
Bazlur Mor Jame Mosque	23°58'0.12"N	89°12'26.32"E	2.8	East
Ghoshpur Padma Ghat (Landing station for boat)	23°57'37.14"N	89°11'58.16"E	1.98	East
1 No Koya Union Parisadh	23°55'17.78"N	89° 9'35.17"E	3.9	South
Sultanpur Mahtabia High School	23°55'18.88"N	89° 9'43.55"E	3.8	South
Kantinogor Puraton Jame Mosque	23°55'33.45"N	89° 8'54.91"E	3.72	South-West
Haripur Central Eidgah[4]	23°55'56.59"N	89° 7'55.72"E	4.02	South-West
Sultanpur Berkaloa Jame Mosque	23°55'22.25"N	89°10'44.42"E	3.9	South-East
Guccha Gram (Village)	23°58'7.15"N	89° 9'20.81"E	1.35	North-West
Bhabanipur Graveyard	23°57'54.82"N	89°10'13.47"E	0.5	North

4.4 Climate

Bangladesh is located in the tropical monsoon region, and its climate is characterized by high temperature, heavy rainfall, often excessive humidity, and fairly marked seasonal variations. From the climatic point of view, three distinct seasons can be recognized in Bangladesh and these are:

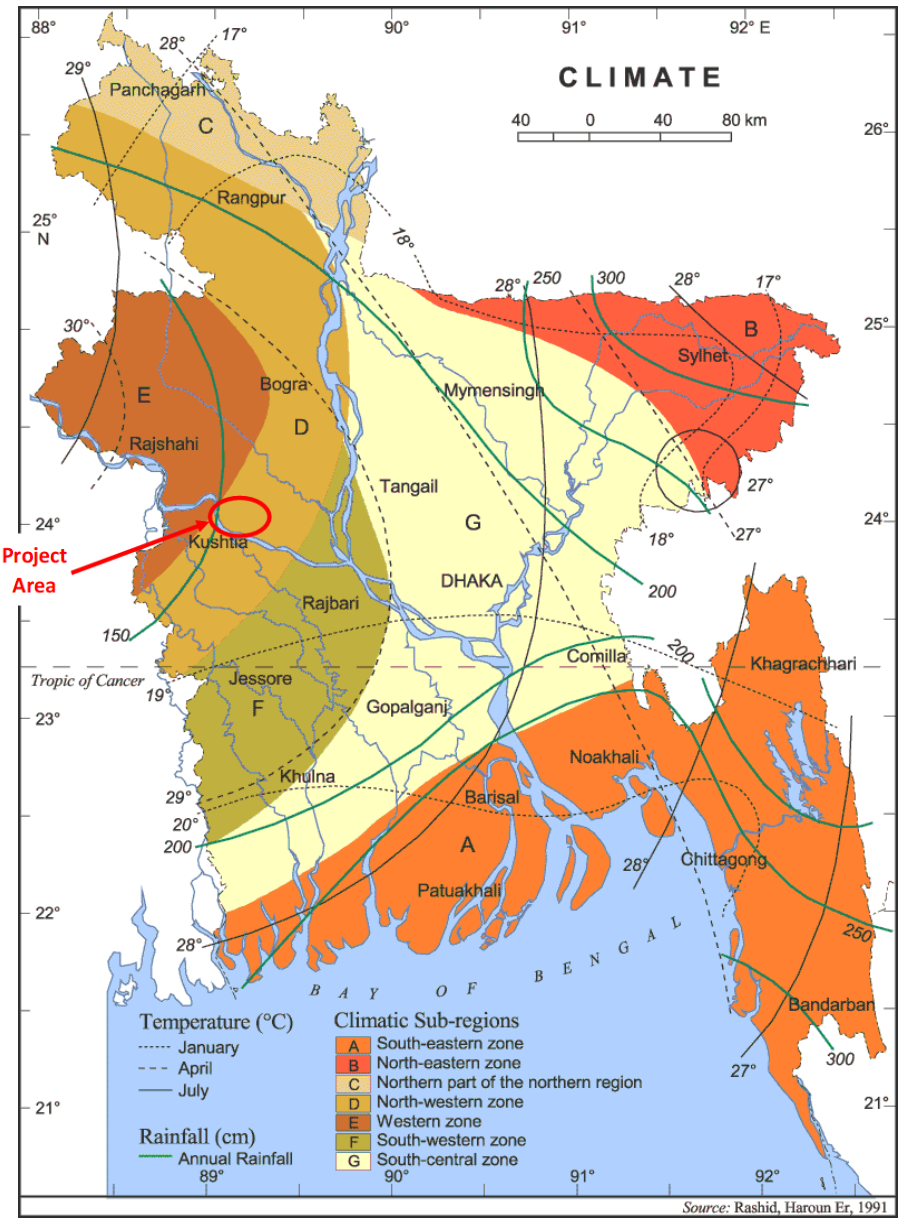
- Summer/pre-monsoon - March to May
- Rainy season/monsoon - June to October
- Winter - November to February

January is the coolest month, and April is the warmest. Most places receive more than 1,525 mm of rain a year, and areas near the hills receive 5,080 mm per year. Most rains occur during the monsoon (June-September) and a very little occurs in winter (November-February). Climate map of Bangladesh is presented in **Figure 4.3.** According to the Climate map, the project area falls in North-western zone (D).

North-western zone (D) comprises Dinajpur, Bogra, Pabna, Sirajganj, Kushtia and a strip of land extending from northwest Khulna Division to the west of Thakurgaon zila. This is an area of less extremes. In summer the mean maximum temperature is well above 32°C whereas in winter the mean

[4] Eidgah or Idgah, also Eid Gah or Id Gah is a term used in South Asian Islamic culture for the open-air enclosure usually outside the city or an area reserved for Eid prayers offered in the morning of Eid al-Fitr and Eid al-Adha. It is usually a public place that is not used for prayers at other times of the year.

minimum is below 10°C. The lower rainfall makes this area both atmospherically and pedologically drier. In winter dew fall is heavy.



(Rashid, 1991)

Figure 4.3: Climate Map of Bangladesh

4.5 Rainfall

The rainfall follows the general climate pattern with the highest rainfall in the summer month of June to September and minimum rainfall in the cooler and drier months of November to March. Total monthly rainfall values of Ishwardi are given in **Table 4.3.** Rainfall variability map of Bangladesh is presented in **Figure 4.5.** In the wet season, rainfall ranges from 200 to 400 mm and in dry season it ranges from 0 to 30 mm at Ishwardi region.

Table 4.3: Monthly Total Rainfall in Ishwardi (2010- 2022)

Year	Total Rainfall in mm											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	0	4	0	46	100	163	174	127	109	105	3	63
2011	4	1	30	96	155	253	289	645	261	2	0	0
2012	12	0	5	51	69	177	215	97	178	157	86	15
2013	1	14	0	69	182	264	130	218	121	130	0	0
2014	3	33	32	19	129	525	182	249	179	89	0	0
2015	0	8	38	111	147	332	394	254	213	82	3	2
2016	30	12	112	52	177	136	240	132	381	42	2	0
2017	1	0	21	118	111	159	456	274	278	323	19	39
2018	0	9	47	220	190	149	426	90	73	94	4	19
2019	0	53	8	82	126	286	300	148	179	220	36	6
2020	23	0	21	29	380	237	437	157	264	165	0	3
2021	0	0	1	41	179	396	315	324	182	114	18	16
2022	23	46	0	28	183	104	55	210	290	144	0	0

(Bangladesh Meteorological Department)

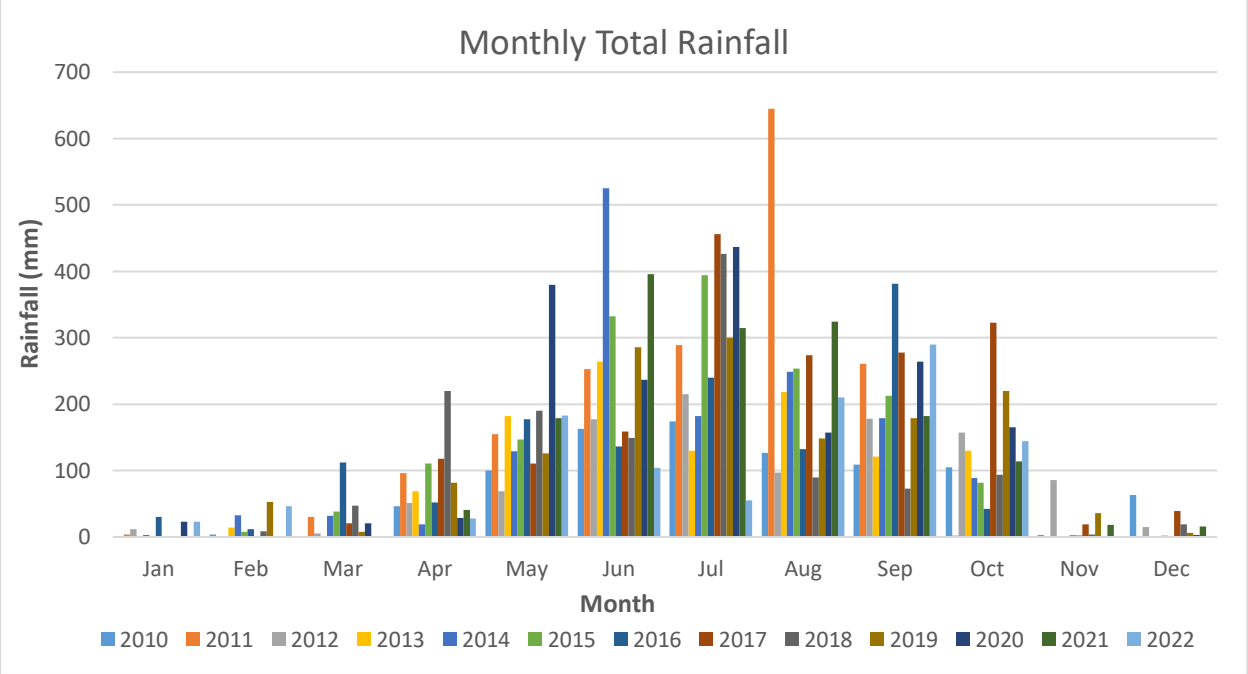
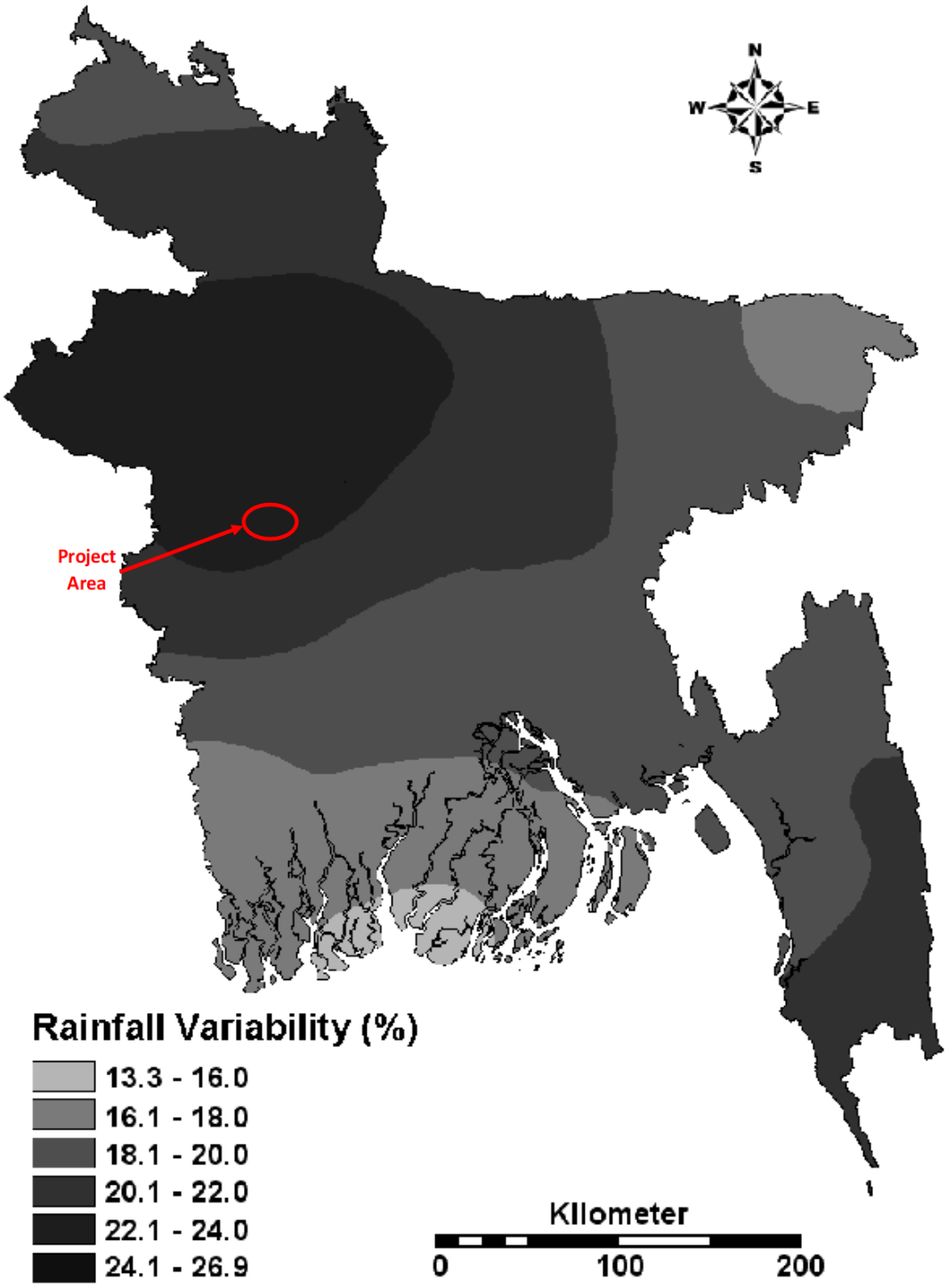


Figure 4.4: Monthly Total Rainfall data of Ishwardi (2010- 2022)



(Bangladesh Agricultural Research Council)

Figure 4.5: Rainfall variability map of Bangladesh

4.6 Relative Humidity

Humidity during the wet season is naturally the highest compared to those occurring at other times of the year. The monthly average relative humidity from year 2010 to year 2022 of project area (Ishwardi) are given in **Table 4.4.** In the dry season the average humidity ranges from 75 - 83% and in wet season it ranges from 80 - 86% at Ishwardi.

Table 4.4: Average Monthly Relative Humidity of Ishwardi (2010- 2022)

Humidity in %	Monthly Average Humidity											
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	80	70	61	68	76	83	83	83	86	83	78	78
2011	79	71	65	71	78	82	83	87	85	81	79	84
2012	79	66	60	68	71	81	87	86	86	83	80	86
2013	81	74	63	63	81	83	82	85	84	85	78	81
2014	83	76	64	61	69	83	85	84	83	82	77	83
2015	82	77	65	75	77	82	85	85	82	81	80	80
2016	82	77	69	70	77	82	88	84	86	82	79	83
2017	77	71	70	72	77	82	87	85	85	85	80	83
2018	82	73	67	77	81	80	85	82	81	80	77	75
2019	75	74	65	75	75	81	83	83	85	84	81	82
2020	83	75	70	70	79	83	85	83	86	83	77	81
2021	82	72	66	65	77	83	83	84	83	82	78	79
2022	82	77	67	74	79	81	79	81	85	82	77	79

(Bangladesh Meteorological Department)

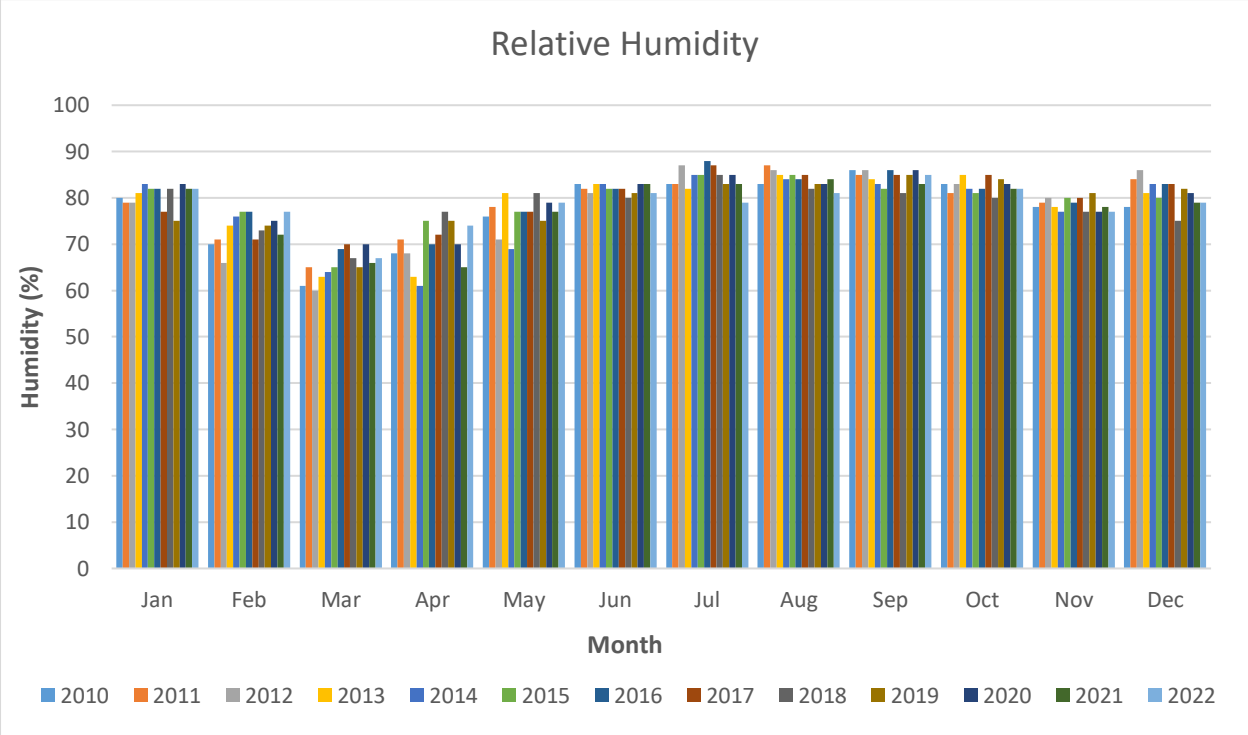


Figure 4.6: Average Monthly Relative Humidity of Ishwardi (2010-2022)

4.7 Wind Speed

According to Bangladesh Meteorological Department the average wind speed at Ishwardi Upazila since 2010 to 2022 are given in **Table 4.5.** Wind speed ranges from 1.2 – 2.5 knots in dry season and 1.5 – 2.9 knots in wet season at Ishwardi. A wind rose diagram of Pabna Sadar Upazila has been added in **Figure 4.8** to get the intensity and direction of wind around the project site.

Table 4.5: Monthly Prevailing Wind Speed and Direction in Ishwardi (2010-2022)

Year	Wind Speed in Knots with Direction											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	2.6N	2W	2.4SW	3.9S	3.1S	2.8S	2.8SE	2.7SE	2.5SE	2N	2.2N	2.1N
2011	2.6N	2.4NW	3.4S	2.3S	2.4SE	2.4SE	1.9S	2.4SE	2.3SE	1.9N	2.1NW	2N
2012	2.3NW	2.9NW	2.4W	2.4S	2.7S	2.7S	2.6SE	2.5SE	2.4SE	2N	2N	1.4NW
2013	2.2N	2.1NW	2.1W	2.4S	3SE	1.5S	2.6SE	2.5SE	1.6S	3.3SE	2.6N	2.3N
2014	2.7N	2.2NW	2.8NW	2.1S	3S	2.1S	3.1SE	2.2S	2.3S	1.8E	2.2N	1.8N
2015	1.6N	1.6N	1.8S	2.4S	2.3S	2.3S	1.8S	2.3S	1.6S	1.5SE	1.7N	2N
2016	2N	1.6N	2.2S	2.5S	2.2S	1.7S	2S	2.2S	1.8S	2N	1.6N	2N
2017	2.1N	1.9N	2S	2.4S	1.7S	2S	2.3SE	2S	1.5S	1.7S	2N	2N
2018	1.9N	1.9N	1.8S	2.1S	2.1S	2.1S	2.4SE	2.4SE	1.8S	1.6N	1.2N	2.4NW
2019	2.3NW	2.7NW	2.4W	2.3S	2.4S	2.1SE	2.4SE	2.6SE	2.3SE	1.8N	2.1N	2.2NW
2020	1.9N	2.3NW	3.1NW	2.5E	3.2S	2.4SE	2.1S	2.9SE	2.3S	2.3N	2.7N	2NW
2021	2.3NW	2.4NW	2.9NW	2.6S	2.9SE	2.3SE	2.4SE	2.1S	2.4SE	2.2NW	2.1NW	2.6NW
2022	2.4NW	2.8NW	3S	3.1S	3.1S	3.1S	2.7SE	3.7SE	2.5SE	2.6N	2.3NW	2.5N

(Bangladesh Meteorological Department)

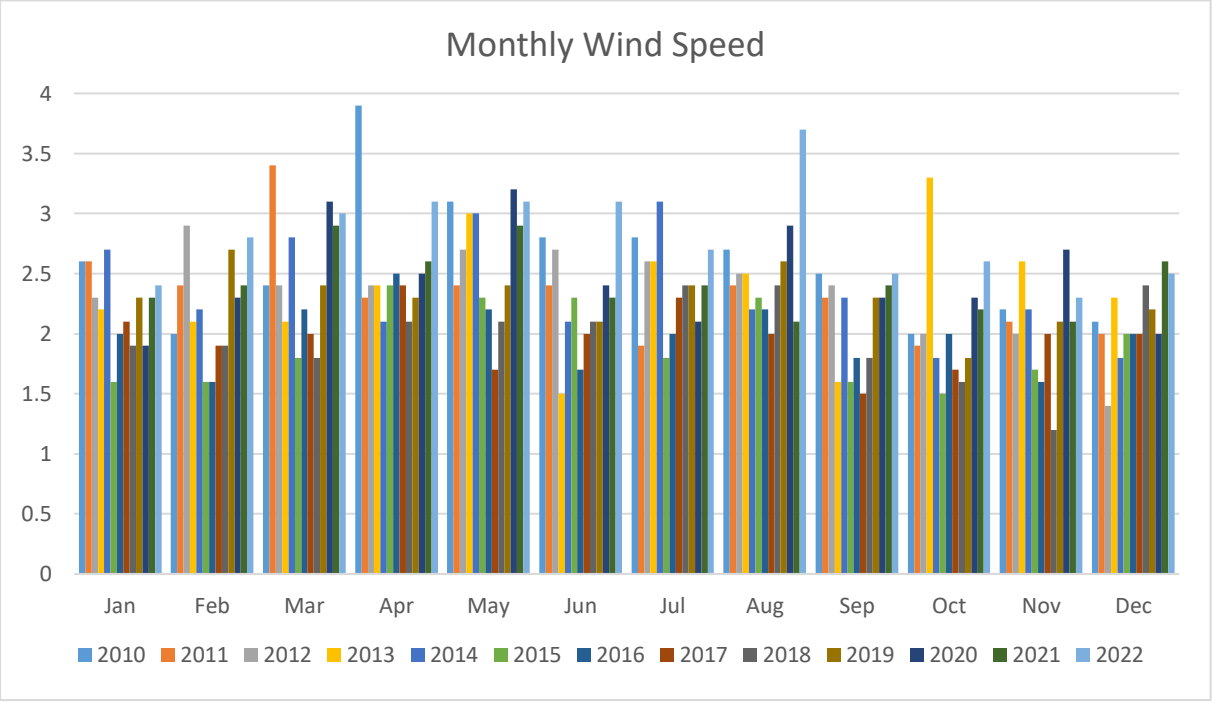


Figure 4.7: Monthly Prevailing Wind Speed of Ishwardi (2010- 2022)

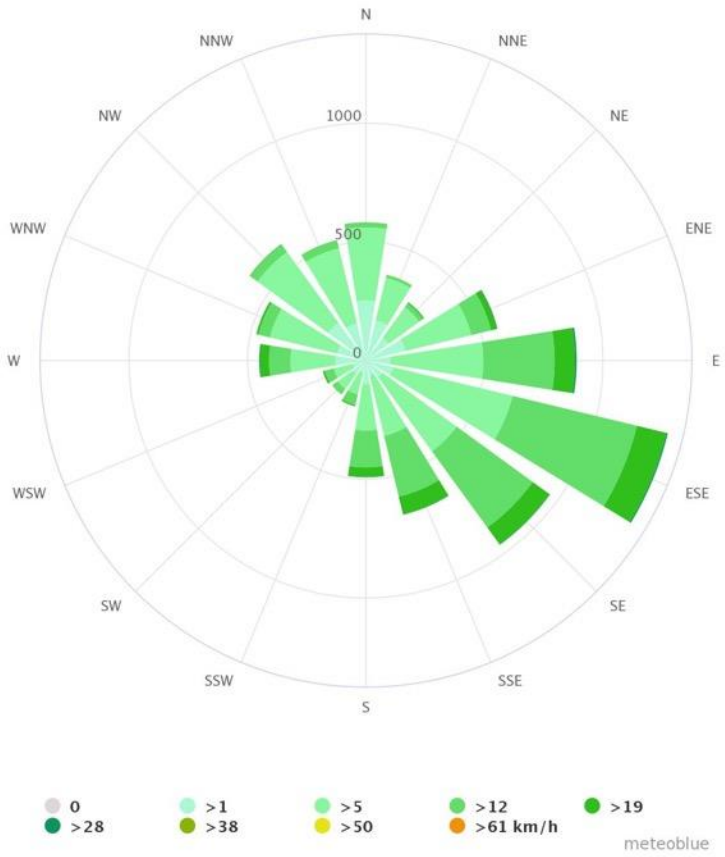


Figure 4.8: Wind Rose Diagram of Pabna Sadar Upazila.

4.8 Ambient Air Temperature

In general, cool seasons coincide with the period of lowest rainfall. **Table 4.6 - Table 4.8** shows the Monthly average, Maximum and minimum Temperature in degree Celsius for the period 2010 to 2022. The average bulb temperature ranges from 16.5-22.5 Degree Celsius in dry season and 29-30 Degree Celsius in wet season at Ishwardi.

Table 4.6: Monthly average Dry Bulb Temperature in Degree Celsius of Ishwardi (2010-2022)

Year	Monthly Average Temperature in degree Celsius											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	14.8	20.2	27.5	30.7	29.8	29.6	29.5	29.5	28.5	27	23.1	17.4
2011	14.5	19.5	25.2	27.3	28.5	29.3	29.2	28.4	28.5	27.1	21.9	16.9
2012	16.6	19.6	25.2	28.9	30.7	30.2	28.9	29.2	28.9	25.8	20.9	16.2
2013	14.7	19.5	25.3	28.6	28.2	29.7	29.4	28.6	28.8	26.3	21.2	17.5
2014	15.5	18.4	24.2	29.6	30.5	29.5	29.4	29	28.8	26.1	21.4	16.8
2015	16.2	20.4	24.6	27	29.7	29.4	28.7	29.1	29.1	26.8	22.9	18.2
2016	16.3	21.6	25.9	30.6	28.6	29.7	28.7	29.4	28.8	27.6	22.6	18.5
2017	16.8	20.4	24.3	28.1	29.4	29.6	28.6	29.4	29.1	27.3	22.4	19.2
2018	14.2	20.7	25.5	26.7	27.7	29.9	29.1	29.7	29.3	26	22.1	17.5

Year	Monthly Average Temperature in degree Celsius											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2019	16.7	19.5	24.4	27.7	30.3	30	29.4	29.7	28.5	26.2	22.9	17.1
2020	16.2	18.4	23.9	27.1	28.2	29.4	29.4	29.7	29.2	28.3	22.5	17.7
2021	16.4	19.8	26	29.2	28.6	29	29.4	29.3	29.2	27.9	22.1	18.9
2022	16.7	18.3	26.1	29.9	28.6	29.7	30.2	29.7	28.8	26.9	22.2	18.6

(Bangladesh Meteorological Department)

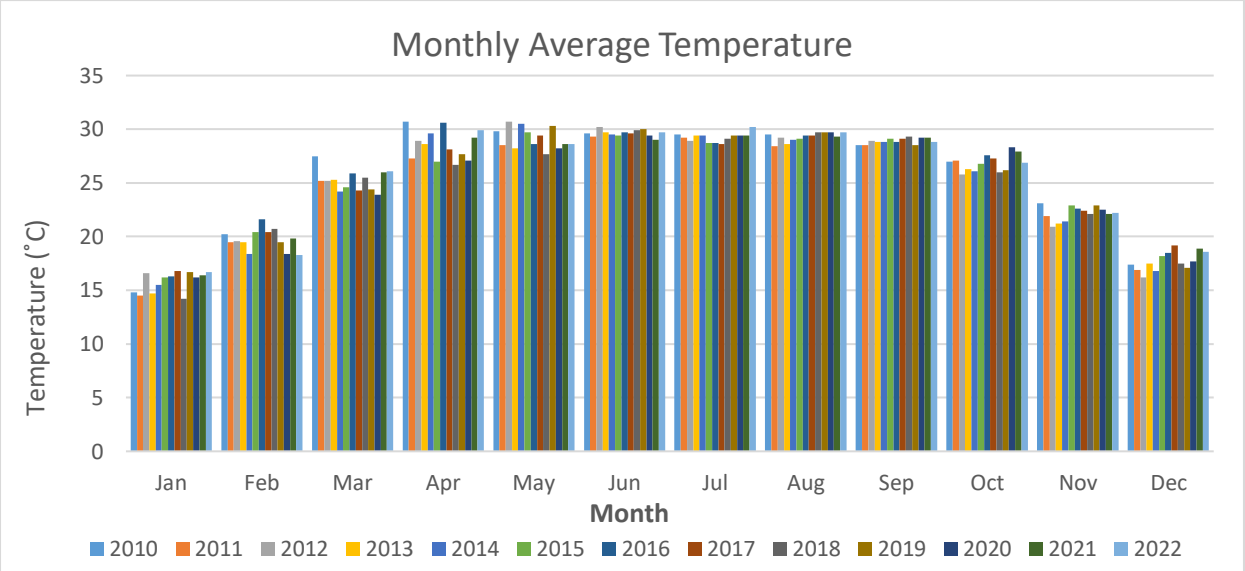


Figure 4.9: Monthly Ambient Average Temperature of Ishwardi (2010- 2022)

Table 4.7: Monthly Maximum Temperature in degree Celsius of Ishwardi (2010-2022)

Year	Monthly Maximum Temperature in degree Celsius											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	27.2	33	40.2	42.5	39.7	37.4	36	37.5	35.5	36.4	33.2	28.8
2011	26.8	32.5	38	37.5	36.3	37.5	35.8	35.5	36.4	35	31.2	30
2012	27.5	32.5	38.8	40.2	41.8	40.8	35.7	35.6	36.8	34.5	30.8	27.6
2013	27	31.6	37.2	40	38	36.8	35.5	36.2	35.6	34.2	32	29.4
2014	27.7	29.5	38.4	41	42	38	36	35.4	36.6	34.6	33	28.5
2015	29.5	33.7	36.5	36.5	39.2	37.5	36.2	35.2	36.5	35.7	32.4	30
2016	28	33.5	36	40.2	39	37.5	35	36.2	35	35.8	33.6	29.5
2017	29.3	33.1	36.8	38	37.2	37	36	35.5	36.2	35.8	32.5	28.8
2018	26.8	32.5	35.3	36.2	35.8	39	37.2	37	36.3	36	33	28.2
2019	28	32	36.5	39	39	38	36.3	36	36	34	31.7	30.2
2020	28.6	30.2	36	38.7	37.4	36.6	36	36.7	35.8	35.8	33.1	29.3
2021	29.2	35	37.5	40	38.5	37.7	36.4	35.8	36.2	36	31	29.7
2022	27.2	29.8	37	41	37	37	37	36.7	35.7	35.3	32.8	29.5

(Bangladesh Meteorological Department)

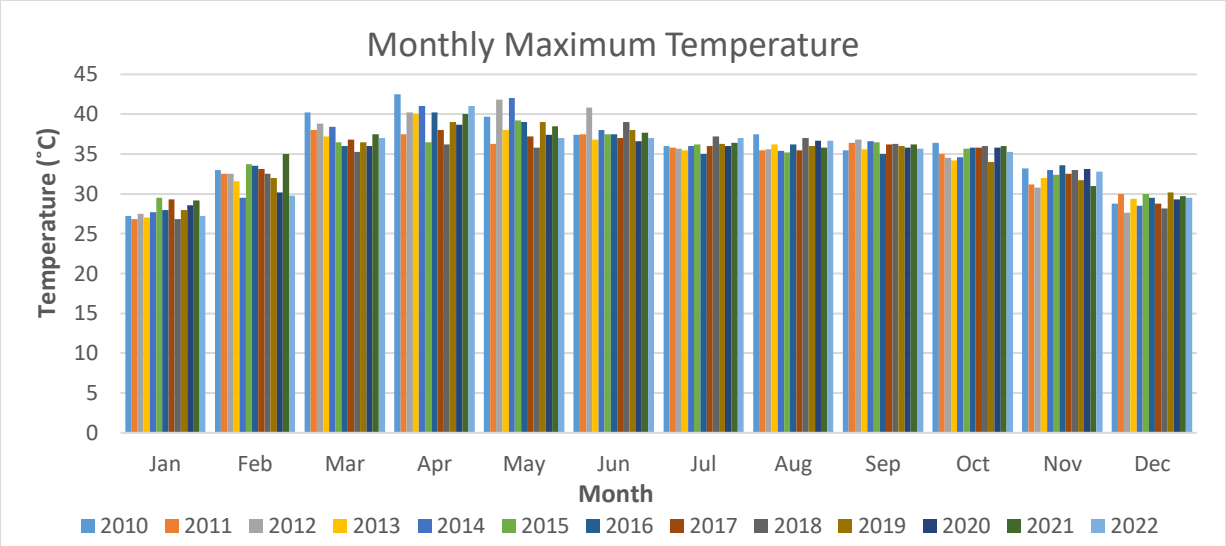


Figure 4.10: Monthly Maximum Temperature of Ishwardi (2010- 2022)

Table 4.8: Monthly Minimum Temperature in degree Celsius of Ishwardi (2010-2022)

Year	Monthly Minimum Temperature in degree Celsius											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	6.3	8.5	15	20	21.4	23.5	25.6	24.6	23	18.5	13.5	7.4
2011	4.6	9.5	10	19.5	21.2	23.6	24.5	24.2	25	17.5	13.8	7.5
2012	6.5	7.5	13.5	18	19.4	22.8	25.2	25.5	24.5	16.5	11	7.8
2013	3.9	9.2	11.5	19	21.5	23	24.6	25	24.5	18.4	12.4	8.5
2014	6	8.8	13	19	19.5	22.8	25	24.4	24.4	17.5	11.4	7.2
2015	7.2	7	12.4	18.6	20.5	23.3	24.4	24.5	24	18.5	15	8.8
2016	6.8	10.2	15.5	18	21.2	23.5	25.3	23.5	24.8	21.7	14	9.4
2017	5.5	10.8	12.8	18.7	20.6	23.5	24.8	25	23.5	18.5	12.5	11
2018	5.5	11	14.2	19	19.8	23.5	25	26	24.5	16.6	13.6	7
2019	7.5	9	10	17.5	21.7	21.5	24.4	25	24	19.6	14.5	8
2020	8.2	6.8	14.2	18	20	24.3	25.2	26	25	22	11.5	7.6
2021	6.2	6.4	14.8	16.7	21	24	23	24.5	25	18.7	14.4	9
2022	8	9.4	14.5	21	20.8	23	25.3	24	22.3	18.7	14	9.3

(Bangladesh Meteorological Department)

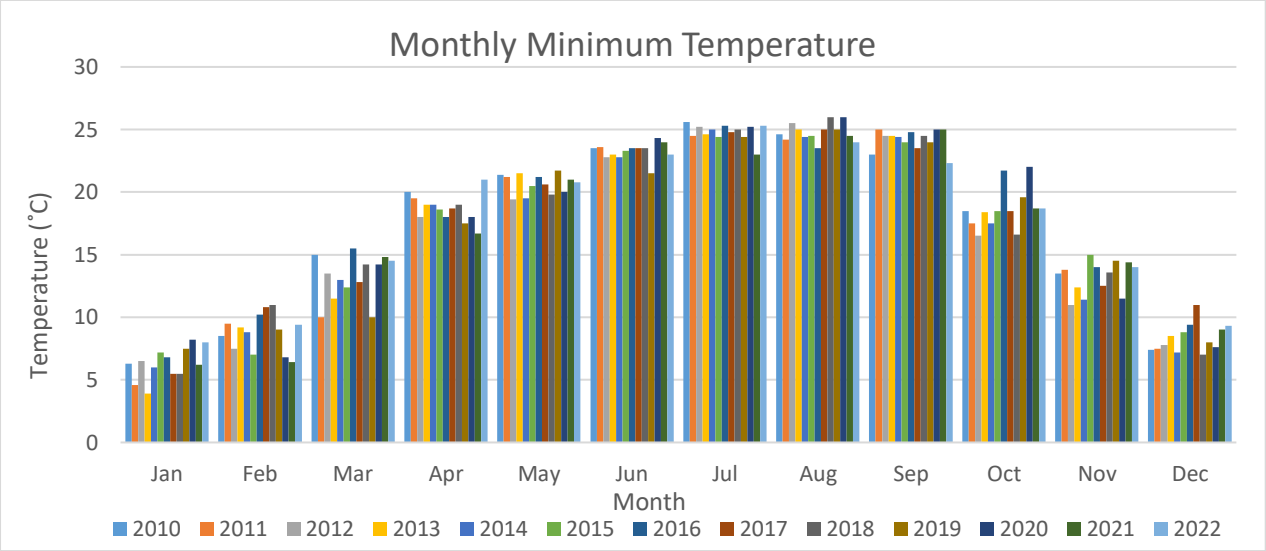


Figure 4.11: Monthly Minimum Temperature of Ishwardi (2010- 2022)

4.9 Land Use/ land Cover

Land use/ land cover inventories are an essential component in land resource evaluation and environmental studies due to the changing nature of land use patterns. By proper analysis of Land use, existing land use pattern can be known easily. The land use study for the proposed Project Site and its 5 km buffer is undertaken with the following objectives:

- To study the land use/cover in the 5 km area of the Proposed Project Site and provide inputs for environmental planning of the proposed plant by analyzing the existing land use/land cover scenario;
- To establish the existing base line scenario using a GIS database for incorporation of thematic information on the different physical features including Agricultural Land, Settlements, Water Body, Sandy Area, Mangrove Forest.

4.9.1 Process of Analysis

Land use analysis is carried out using Google Earth and ArcGIS 10.8 software. A multi-step task has been followed in analyzing the images. A series of tasks were followed for analyzing after receiving the images from image provider. On screen digitization techniques are used to extract required land use and land cover data from the satellite images. A land sat 8 images (Resolution 30m*30m) has been used to make the detail analysis of Existing land use Pattern.

4.9.2 Land Use Interpretation of the Study Area

The evaluation of the existing environmental status of the study area is conducted within 5 km buffer zone area. This revealed that the land use/land cover consists mainly of Char Land, Settlements, Water Body, Sandy Area and Brick Fields. **Figure 4.12** presents existing land use map.

4.9.2.1 Land Use Analysis

Among 19407 acres (5 km around Project site) about 25.57% (4962.25 Acres) area is Agricultural Land. From land use map, it is found that scattered settlements are there around the project area. About 12.19% (2367.51 Acres) land is Settlements within 19407 acres of land. About 31.43% land is water body, mainly the Padma river and its branches are surrounding the project site from west and south side. Some local canals and ponds are located within 5 km area of the project site. At the north of the project side, there are few of brick fields covering about 248.54 acres of land. The project site is mainly char land. Char land covers 29% (5729.38 Acres) of the 5km buffer zone.

Table 4.9: Area Calculation of Existing Land use for 5 km Buffer Area

Land Type	Area (Acres)	Percentage
Agricultural Land	4962.25	25.57
Char Land	5729.38	29.52
Water Body	6099.32	31.43
Urban & Settlement Area	2367.51	12.20
Brick Field	248.54	1.28
Total	**19407**	**100**

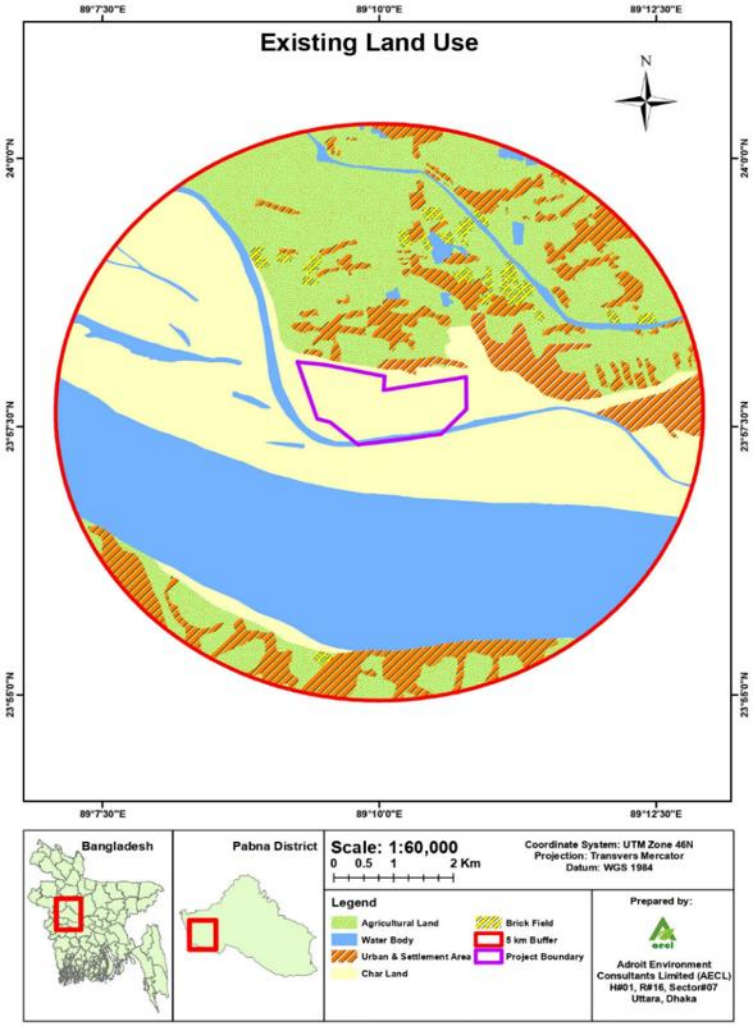


Figure 4.12: Existing Land Use Map for 5 km Buffer Area

4.9.3 Physical and Cultural Heritage

The project area as such, does not encompass any key cultural heritage or resource of national or regional value. Moreover, there is no key cultural heritage or resource of national or regional value within the 5 km radial zone. **Table 4.10** denotes the distance of other Physical and Cultural Heritage from the project site.

Table 4.10: Physical and Cultural Heritage from the project site

SL No.	Physical and Cultural Heritage	Distance from Project site (approx.)
1.	Sree Sree Thakur Anukul Chandra Ashram	5.69 km
2.	Hardinge Bridge	17.90 km
3.	Ishwardi Railway Junction	21.56 km
4.	Chatmohor Shahi Jame Masjid	32.06 km
5.	Khetupara Zamindar Bari	33.53 km

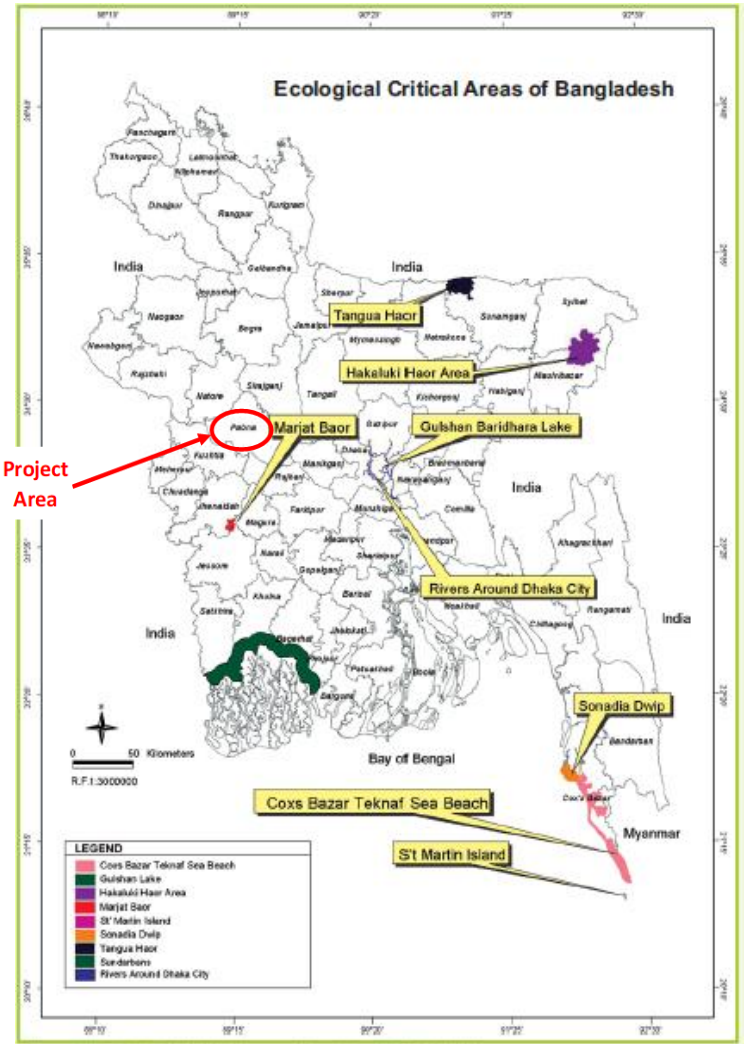
4.9.4 Ecologically Critical Area

Bangladesh Government declared 8 areas as Ecologically Critical area (ECAs) in Bangladesh (1999), i.e., Cox's Bazar, Teknaf Peninsula, St. Martin's Island, Sonadia Island, Hakaluki Haor, Tanguar Haor and Marjat Baor, Gulshan-Baridhara Lake and Sundarbans. **Table 4.11** shows the ECA and their distance from the project site. According to the list, there is no ecologically critical area within 5 km of the project site.

Figure 4.13 and Figure 4.14 shows the location of the project site in relation to the country's ecologically critical area and Protected Areas, Eco Parks & Safari Park of Bangladesh respectively. The maps illustrate that no ecologically critical area or Protected Areas, Eco Parks & Safari Park falls within 5 km area of the project site.

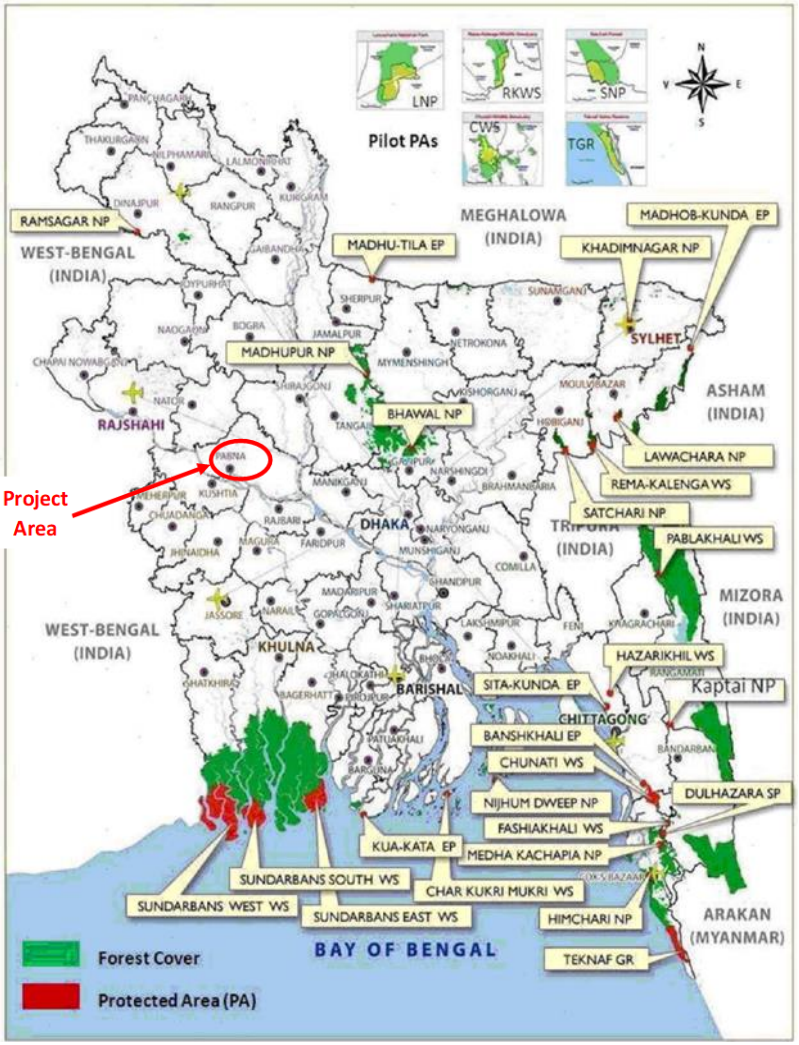
Table 4.11: Ecologically Critical areas (ECA) of Bangladesh and their distance from project site

No.	Name of the ECA	Type of Ecosystem	Location	Areas (ha)	Year of Declaration	Distance from Project site
1.	Cox's Bazar-Teknaf Peninsula	Coastal-Marine	Cox's Bazar	20,373	1999	471.22 km
2.	Sundarbans (10 km landward periphery)	Coastal-Marine	Bagerhat, Khulna, Barguna, Pirojpur and Satkhira	292,926	1999	224.38 km
3.	St. Martin's Island	Marine Island with coral reefs	Teknaf Upazila, Cox's Bazar	1,214	1999	493.3 km
4.	Hakaluki Haor	Inland Freshwater Wetland	Sylhet and Moulvibazar	40,466	1999	302.72 km
5.	Sonadia Island	Marine Island	Moheshkhali, Cox's Bazar	10,298	1999	390.63 km
6.	Tanguar Haor	Inland Freshwater Wetland	Tahirpur, Sunamganj	9,727	1999	234.35 km
7.	Marjat Baor	Oxbow Lake	Kaliganj Upazila of Jhenaidah and Chaugacha Upazila of Jessore	325	1999	75.15 km
8.	Gulshan-Baridhara Lake	Urban Wetland	Dhaka city	101	2001	130.56 km
9.	Buriganga	River	Around Dhaka	1336	2009	130.71 km
10.	Turag	River	Around Dhaka	1184	2009	120.6 km
11.	Sitalakhya	River	Around Dhaka	3771	2009	145.39 km
12.	Balu including Tongi canal	River	Around Dhaka	1315	2009	133.69 km
13.	Jaflong-Dawki	River	Jaflong, Sylhet	1493	2015	320.5 km



(Green & Islam, 2012)

Figure 4.13: Ecologically Critical Areas of Bangladesh

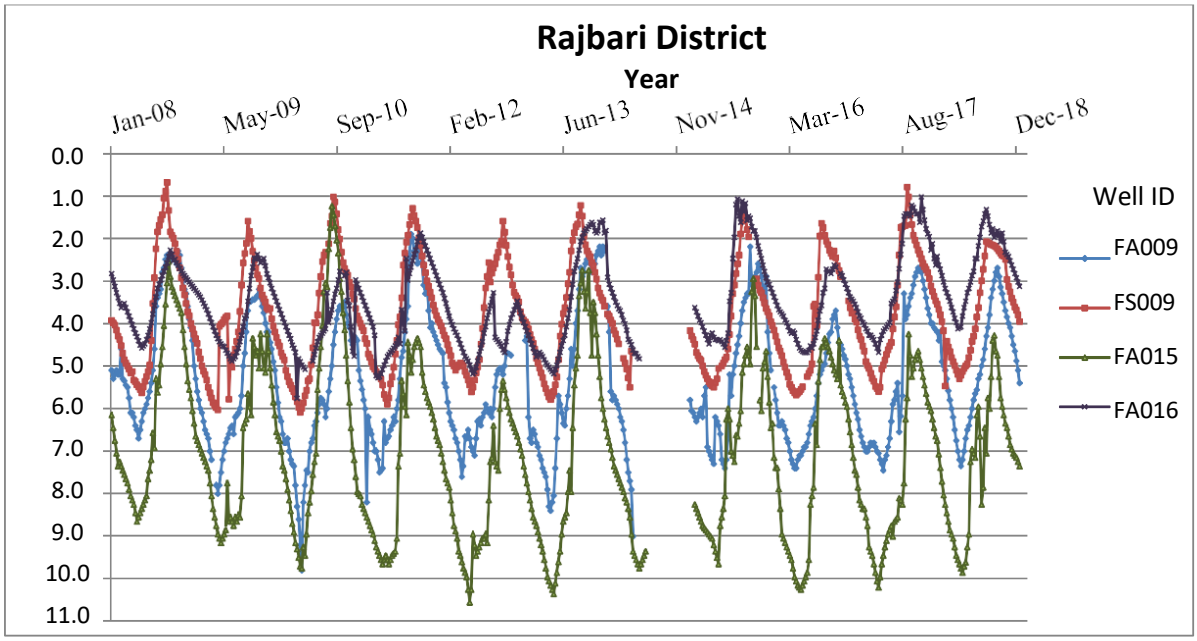


(Bangladesh Forest Department)

Figure 4.14: Protected Areas, Eco Parks and Safari Park of Bangladesh

4.10 Hydrology

Groundwater is an important segment of the hydrologic cycle and constitutes about one third of world's fresh water reserves. It has distinct advantages over surface water resources. It is the most dependable resource and is available almost everywhere on land phases. It is the only source of water supply for drinking and main source of irrigation. As other parts of the country this area also receives sufficient amount of rainfall and there is a good availability of ground water, which is being used by hand pumps for drinking and domestic purposes. The source of groundwater is either precipitation or seepage from large water bodies like reservoirs, lakes, River.



(BWDB 2020)

Figure 4.15: Hydrographs of GWT of Rajbari District

BWDB selected 32 districts of the country, among which Rajbari is the nearest one from the proposed project site. The general trends of hydrographs are normal and show almost similar seasonal fluctuations. In these district 4 wells were selected FA009, FS009, FA015 and FA016 from 4 different upazillas Baliakandi, Goalandaghat, Pangsha and Rajbari Sadar respectively. Seasonal fluctuation of GWT in this district varies from around 2m to 7.60m during this 11-year period. The nearest well from the project site is Rajbari Sadar Upazila (approx. 22 km). According to **Figure 4.15**, ground water level has shown a dramatic ups and downs in depth from 2008 to 2018. On January 2008, it was found around 2.5 – 4.5 m. The maximum depth was discovered at almost 6.0 m on September 2010 and the minimum depth was 1.0 m on November 2014 and December 2018.

4.10.1 Surface Water Quality

The primary data for surface water quality parameters near the project site was collected and the sample was analyzed in the laboratory. **Table 4.13** represents surface water quality report near the project site. Surface Water quality test report is attached as **Annexure 8 (a).** The result shows that all the parameters remain within the allowable limit of surface water value as per as Environmental Quality Standards for Bangladesh.

Sampling date: 15th April, 2023
Reporting date: 28th May, 2023

Table 4.12: Sampling locations ID and Name with Longitude-Latitude

Category	Identification of Location	GPS Co-ordinate		Specific Location
		X	Y	
Surface Water Quality	Location-01, SW1	23°56'46.51"N	89° 9'48.79"E	Padma River
	Location-02, SW2	23°57'32.71"N	89°10'54.21"E	Branch river of Padma

Table 4.13: Surface Water Quality

Name of the Parameter	Concentration present		Unit	DoE Standard according to ECR, 2023 (Schedule 2-Ka-1)	Method of analysis	Minimum Detection Limit (MDL)
	SW1	SW 2				
Temperature	26.5	27	°C	20-30	Mercury filled thermometer	-
pH	6.9	6.8	-	6.5-8.5	pH meter	-
TDS	137	113	mg/l	1000	TDS meter	-
TSS	20	<MDL	mg/l	NF	USEPA 160.1:1971, SM 2540D (23rd Edition)	5
Dissolved Oxygen (DO)	7.9	7.8	mg/l	NF	USEPA 360.1:1971, SM 4500-O (23rd Edition)	N/A
BOD5	<MDL	<MDL	mg/l	≤ 12	SM 5210B (23rd Edition), SM 5210D (23rd Edition) & USEPA 405.1:1974	8
COD	11	5	mg/l	100	SM 5220 D	0.2
Chromium	0.006	<MDL	mg/l	0.1	SM 3111 B	0.01
Cadmium	<MDL	<MDL	mg/l	-	SM 3111 B	0.001
Sulphate	<MDL	8	mg/l	-	SM 4500-SO4 E	7
Nitrate	0.4	0.6	mg/l	5.0	SM 4500-NO3-N E	0.1
Pb	0.017	0.013	mg/l	0.1	SM 3111 B	0.01
Zinc	0.18	0.06	mg/l	-	SM 3111 B	0.02
Copper	<MDL	<MDL	mg/l	-	SM 3111 B	0.014
EC	306	282	µS/cm	2250	USEPA 120.1:1982	20
Total Coliform	118	84	CFU/100 ml	NF	ISO 9308-1:2014, USEPA 9132:1986	1
Fecal Coliform	42	36	CFU/100 ml	NF	SM 9222 (23rd Edition), Membrane Filtration	1
Nickel (Ni)	<MDL	<MDL	mg/l	NF	USEPA 200.8:1994, ISO 17294-2:2016, ISO 1185:2007	0.1

Name of the Parameter	Concentration present		Unit	DoE Standard according to ECR, 2023 (Schedule 2-Ka-1)	Method of analysis	Minimum Detection Limit (MDL)
	SW1	SW 2				
Iron (Fe)	1.4	<MDL	mg/l	NF	USEPA 200.8:1994, ISO 17294-2:2016, ISO 1185:2007	0.1
Aluminum (Al)	0.7	<MDL	mg/l	NF	USEPA 200.8:1994, ISO 17294-2:2016, ISO 1185:2007	0.1
Phosphate	<MDL	<MDL	mg/l	2.0	USEPA 365.2:1978, USEPA 365.3:1978, SM 4500-P E (23rd Edition)	3

N.B.: *ECR – Environment Conservation Rules, 2023*
USEPA – U. S. Environmental Protection Agency
ISO – International Organization for Standardization
SM – Standard Methods set by National Environmental Method Index, United States
EC – Electrical Conductivity
CFU/ml – Colony Forming Unit per milliliter
MDL – Minimum Detection Limit
NF – Not Found
N/A – Not Applicable

SW-1

SW-2

Figure 4.16: Photograph of Surface Water Sampling

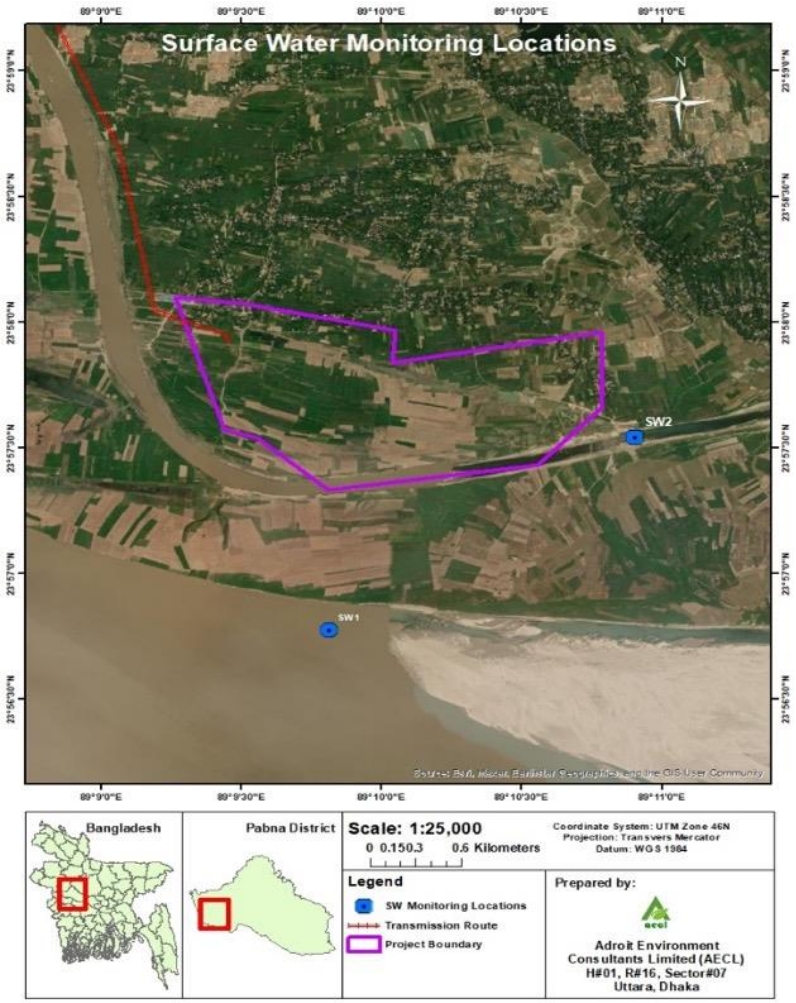


Figure 4.17: Surface Water Quality Monitoring locations

4.10.2 Ground Water Quality

To determine quality of ground water around the project site, water sample was collected from a nearby tube well and analyzed for different parameters. This water sample was not used for any kind of drinking purpose of the project associates. DSEPL had treatment facility at site for treating ground water for drinking purpose. The result shows that all the parameters, except Lead (Pb) and Cadmium (Cd) remain within the allowable limits of drinking water value as per as Environmental Quality Standards for Bangladesh. The parameters which have been analyzed in laboratory during this study are presented below in **Table 4.15.** Ground Water quality test report is attached as **Annexure 8 (b). Figure 4.19** shows the ground zoning map of Bangladesh. According to the map, the depth of ground water level is 7.6-9.8 m.

Sampling date: 15th April, 2023
Reporting date: 28th May, 2023

Table 4.14: Sampling locations ID and Name with Longitude-Latitude

Category	Identification of Location	GPS Co-ordinate		Specific Location
		X	Y	
Ground Water Quality	Location-01, GW1	23°58'2.51"N	89°10'9.16"E	North side (out of site)
	Location-02, GW2	23°57'52.98"N	89° 9'23.24"E	West side of the site

Table 4.15: Ground Water Quality

Name of the Parameter	Concentration Present		ECR, 2023 (Schedule 2-Kha)	WHO Drinking Water Quality Standards	Unit	Method of analysis	Minimum Detection Limit (MDL)
	GW -01	GW -02					
Temperature	22	23	20 - 30	-	°C	Mercury filled thermometer	N/A
pH	7.0	7.1	6.5 – 8.5	6.5 – 8.5	-	pH Meter	-
TDS	372	353	1000	1000	mg/l	TDS Meter	-
Total Hardness	440	460	500	500	mg/l	SM 2320 C	0.2
Total Alkalinity	393	485	-	500	mg/l	SM 2320 B	1
Nitrate	3.2	2.6	45	50	mg/l	SM 4500-NO3-N E	0.1
Sulphate	45	<MDL	250	250		SM 4500-SO4 E	7
Phosphate	<MDL	<MDL	6	6	mg/l	USEPA 365.2:1978, USEPA 365.3:1978, SM 4500-P E (23rd Edition)	3
As	<MDL	<MDL	0.05	0.01	mg/l	SM 3113 B	0.001
Nickel (Ni)	<MDL	<MDL	0.05	0.07	mg/l	USEPA 200.8:1994, ISO 17292-2:2016, ISO 1185:2007	0.1
Iron (Fe)	<MDL	<MDL	0.3 – 1.0	0.3	mg/l	USEPA 200.8:1994, ISO 17292-2:2016, ISO 1185:2007	0.1
Aluminum (Al)	<MDL	<MDL	0.20	0.20	mg/l	USEPA 200.8:1994, ISO 17292-2:2016, ISO 1185:2007	0.1
Chromium	<MDL	<MDL	0.05	0.05	mg/l	SM 3113 B	0.001
Pb	0.027	0.027	0.01	0.01	mg/l	SM 3113 B	0.001
Cd	0.01	0.01	0.003	0.003	mg/l	SM 3113 B	0.001
Zn	0.04	0.03	5		mg/l	SM 3113 B	0.02
Cu	<MDL	<MDL	1.5	2.0	mg/l	SM 3113 B	0.014
Total Coliform	0	0	0	0	CFU/100 ml	ISO 9308-1:2014, USEPA 9132:1986	1
Fecal Coliform	0	0	0	0	CFU/100 ml	SM 9222 (23rd Edition), Membrane Filtration	1

N.B.: No standard found for ground water. Water result has been compared with drinking water standard.

GW-1

GW-2

Figure 4.18: Photograph of Ground Water Sampling

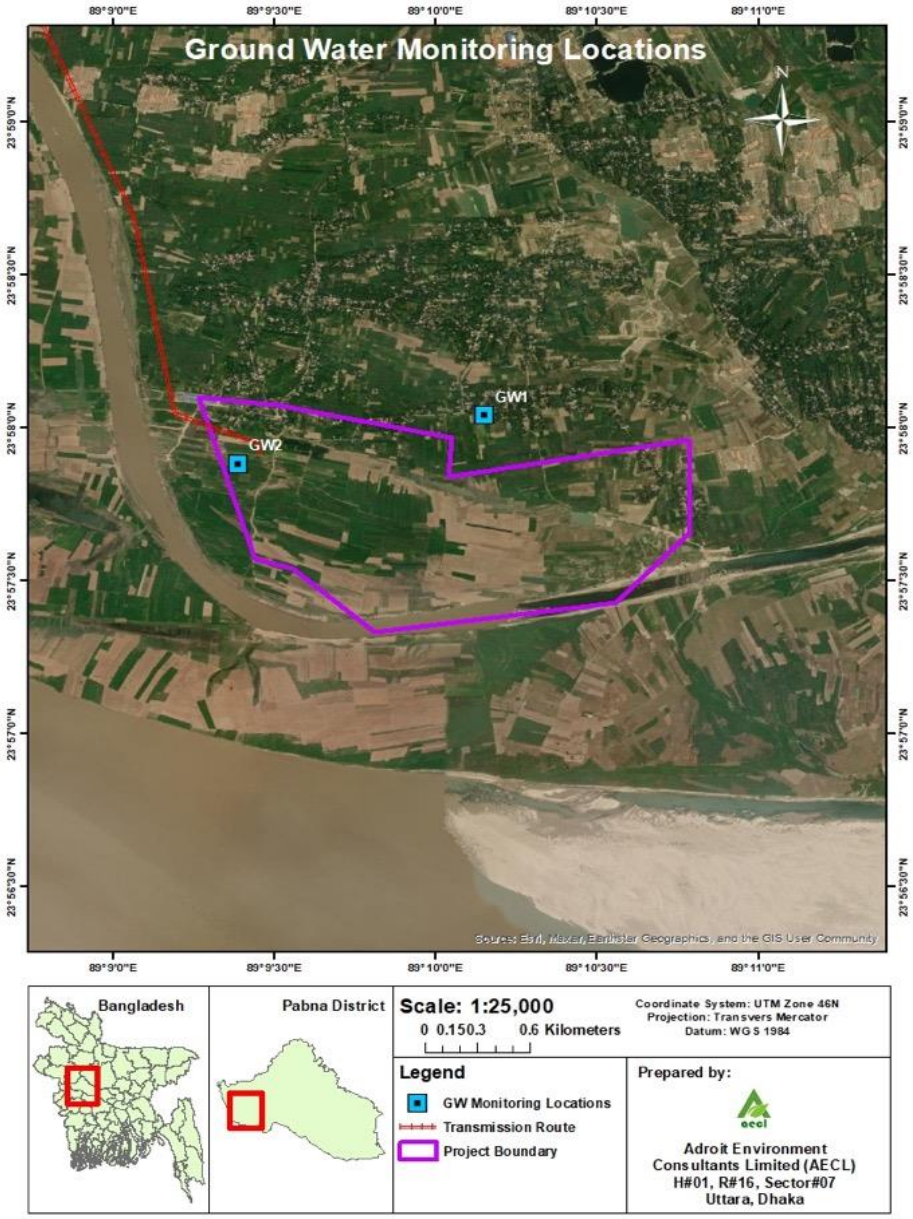
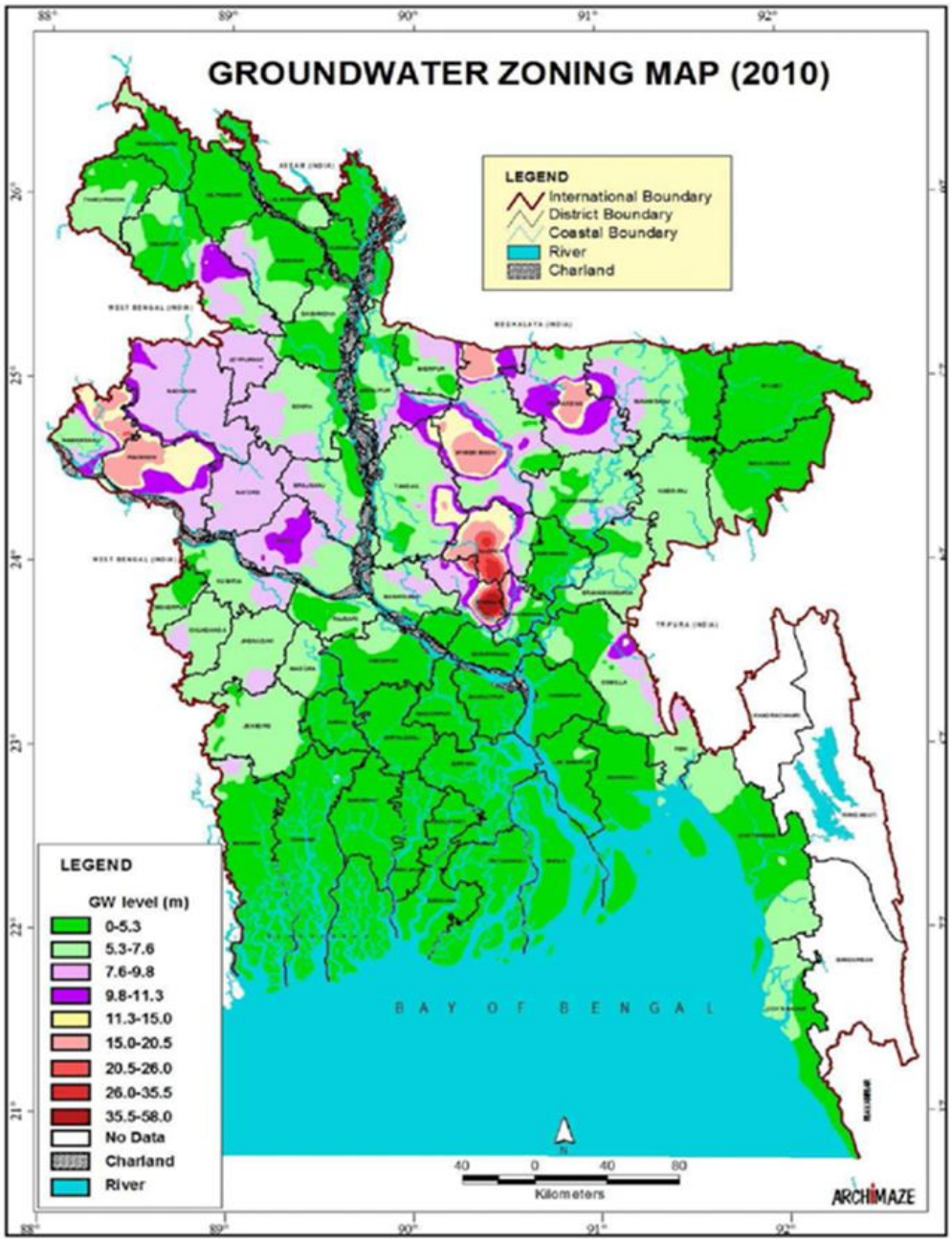


Figure 4.19: Ground Water Quality Monitoring Location



(Bangladesh Agricultural Development Corporation)

Figure 4.20: Ground Water Zoning Map of Bangladesh

4.10.3 Drinking Water Quality

DSEPL had treatment facility at site for treating ground water for drinking purpose. Right now, they have drinking water treatment facility at site for the supply of drinking water for the labors and its officials. DSEPL has set up new submersible pump at 220 ft depth along with water treatment plant (WTP) which can treat 1000 liters of drinking water per hour (24m^3/day) for the supply of drinking water for the rest of the construction period and operation phase ahead. A drinking water quality test was conducted, which showed all the parameters under the standards set by DoE (ECR, 2023) and WHO (Drinking Water Quality Guideline). Test result of Pb and Cd is added in Table 4.16 (b). Both drinking water quality test reports are attached in Annexure 10.

Table 4.16 (a): Drinking water quality of Sub-mersible pump

Name of the Parameter	Concentration Present	DoE Standard according to ECR, 2023 (Schedule 2-Kha)	WHO Drinking Water Quality Standards 2004	Unit	Method of analysis	Minimum Detection Limit (MDL)
pH	6.5	6.5 – 8.5	6.5 – 8.5	-	SM 4500 H-B	0
Color	2	15	15	Pt-Co	SM 2120 C	0.01
Turbidity	0.14	5	5	NTU	SM 2130 B	0.01
Total Hardness as $CaCO_3$	14	500	200	mg/l	SM 2340 C	0.2
Chloride	5	250	250	mg/l	SM 4500-Cl-B	1
TDS	25	1000	1000	mg/l	SM 2540 C	5
Manganese (Mn)	<MDL	0.4	0.4a, 0.1b	mg/l	PAN Method	0.005
Arsenic (As)	<MDL	0.05	0.01	mg/l	SM 3113 B	0.001
Iron (Fe)	<MDL	0.3-1.0	0.3	mg/l	SM 3113 B	0.02
TC	0	0	0	CFU/100 ml	SM 9221 E	0
FC	0	0	0	CFU/100 ml	SM 9222 D	0

Table 4.16 (b): Drinking water quality of Sub-mersible pump

Name of the Parameter	Concentration Present	DoE Standard according to ECR, 2023 (Schedule 2-Kha)	WHO Drinking Water Quality Standards 2004	Unit	Method of analysis	Minimum Detection Limit (MDL)
pH	6.71	6.5 – 8.5	6.5 – 8.5	-	SM 4500 H-B	0
Color	3	15	15	Pt-Co	SM 2120 C	0.01
Turbidity	0.23	5	5	NTU	SM 2130 B	0.01
Total Hardness as $CaCO_3$	1	500	200	mg/l	SM 2340 C	0.2
Chloride	10	250	250	mg/l	SM 4500-Cl-B	1
TDS	10	1000	1000	mg/l	SM 2540 C	5
Manganese (Mn)	<MDL	0.4	0.4a, 0.1b	mg/l	PAN Method	0.005
Arsenic (As)	0.002	0.05	0.01	mg/l	SM 3113 B	0.001
Iron (Fe)	<MDL	0.3-1.0	0.3	mg/l	SM 3113 B	0.02
TC	0	0	0	CFU/100 ml	SM 9221 E	0

Name of the Parameter	Concentration Present	DoE Standard according to ECR, 2023 (Schedule 2-Kha)	WHO Drinking Water Quality Standards 2004	Unit	Method of analysis	Minimum Detection Limit (MDL)
FC	0	0	0	CFU/100 ml	SM 9222 G	0
Total Alkalinity (as $CaCO_3$)	13	-	-	mg/l	SM 2320B	1
Sulphate (SO_4)	<MDL	250	250	mg/l	SM 4500-SO4	7
Nitrate-Nitrogen (NO_3-N)	0.3	45	50	mg/l	SM 4500-NO3-N-F	0.1
Chromium (Cr)	<MDL	0.05	0.05	mg/l	SM 3113 B	0.001
Lead (Pb)	<MDL	0.01	0.01	mg/l	SM 3113 B	0.01
Cadmium (Cd)	<MDL	0.003	0.003	mg/l	SM 3113 B	0.001
Zinc (Zn)	0.11	5	3-5	mg/l	SM 3113 B	0.02
Copper (Cu)	<MDL	1.5	2	mg/l	SM 3113 B	0.014

4.11 Air Quality

Major atmospheric pollution is caused by construction works and transportation activity. Air monitoring has been conducted at six different locations (24 Hour Basis). The air quality data of the proposed site is given in **Table 4.18**. The result for ambient air quality monitoring shows the PM2.5, PM10, SPM, SO2, NOx & CO concentrations of the ambient air. Air quality test report is attached as **Annexure 8 (c).** The result shows that all the parameters remain within the allowable limit of Ambient Air as per as Environmental Quality Standards for Bangladesh.

Sampling date: 15th – 16th April, 2023
Reporting date: 25th April, 2023

Table 4.17: Sampling locations ID and Name with Longitude-Latitude

Category	Identification of Location	GPS Co-ordinate X	GPS Co-ordinate Y	Specific Location
Ambient Air Quality	Location-01, AQ1	23°57'48.2"N	89°10'39.9"E	East side of the site
	Location-02, AQ2	23°58'2.89"N	89°10'4.99"E	North side of the site
	Location-03, AQ3	23°57'34.86"N	89° 9'38.89"E	North-western side of site (near branch river of Padma)
	Location-04, AQ4	23°57'55.56"N	89° 9'22.54"E	North-western side of site
	Location-05, AQ5	24° 1'14.62"N	89° 4'43.28"E	Near Dadapur Purba Para
	Location-06, AQ6	24° 5'21.83"N	89° 5'25.96"E	Residential area near Rajshahi-Kushtia Highway

Table 4.18: Ambient Air Quality Analysis

SN	*Parameters*	Method	Test Duration (hours)	Unit	AQ1	AQ2	AQ3	AQ4	AQ5	AQ6	(DoE) Standard	IFC Standard
1	$PM_{2.5}$	Gravimetric	24	µg/m^3	31.11	33.52	32.72	28.41	27.61	25.73	65	75
2	PM_{10}	Gravimetric	24	µg/m^3	65.73	61.66	64.68	52.39	50.33	51.48	150	150
3	SPM	Gravimetric	8	µg/m^3	105.84	105.18	103.4	87.8	82.94	80.21	200	NF
4	SO_2	West-Geake	24	µg/m^3	12.44	13.83	10.20	8.73	7.12	6.36	80	125
5	NO_x	Jacob and Hochheiser	24	µg/m^3	10.83	11.49	9.15	6.53	5.35	5.09	80	200
6	CO	CO/O_3 Meter	1	ppm	1	1	2	1	1	1	20	NF

N.B.: NF – not found;
DoE – Department of Environment

AQ-1

AQ-2

AQ-3

AQ-4

AQ-5

AQ-6

Figure 4.21: Ambient Air quality monitoring locations

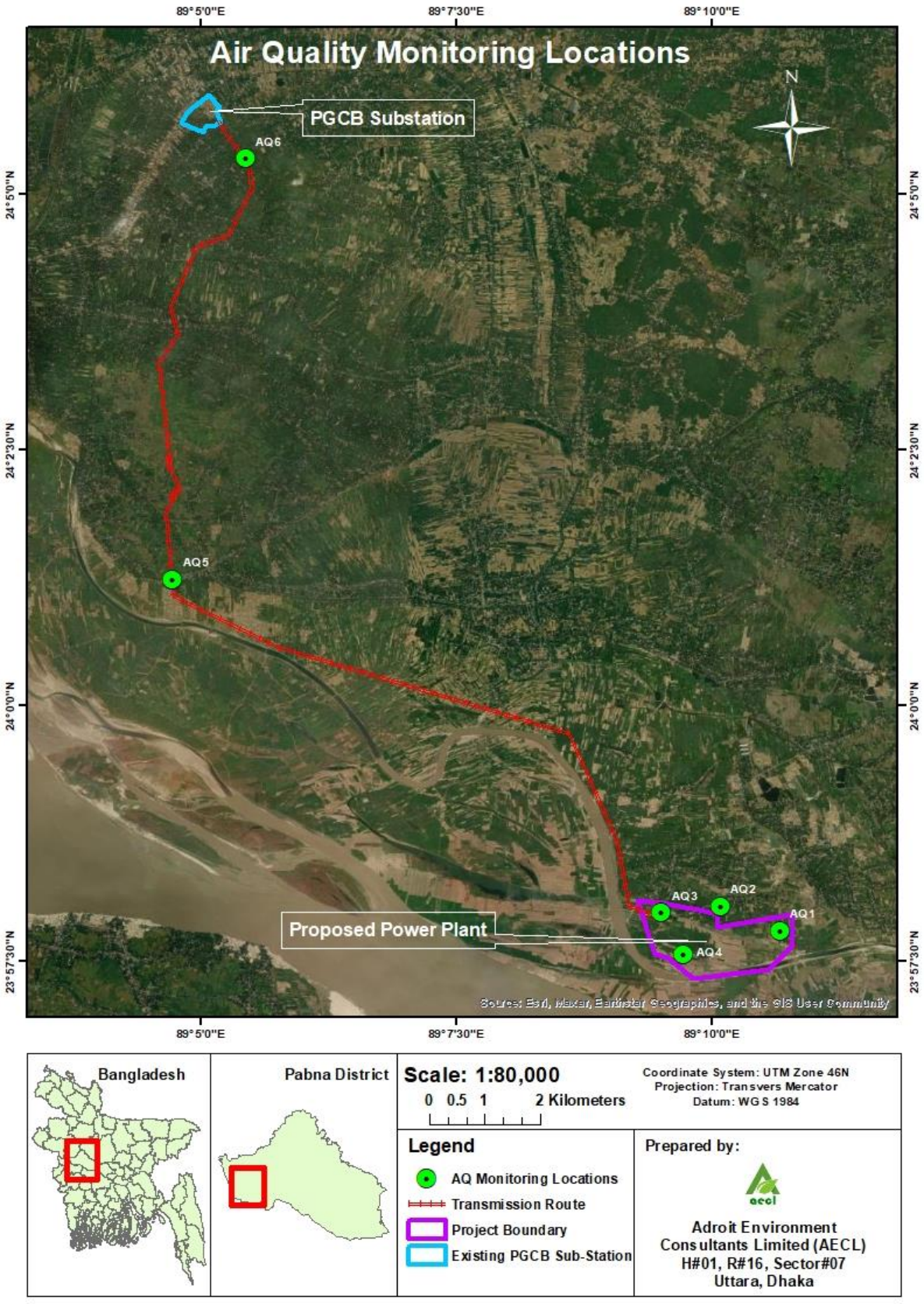


Figure 4.22: Air Quality Monitoring Location

4.12 Noise Level

The ambient noise level data were collected from different sides (six locations) of the project within 5 km radius area by noise level meter and has been given below in **Table 4.20.** All the noise level data are under the standard value set by DoE and IFC/International Standard. Noise quality test report is attached as **Annexure 8 (d).**

Sampling date: 15th – 16th April, 2023
Reporting date: 29th April, 2023

Table 4.19: Sampling locations ID and Name with Longitude-Latitude

Category	Identification of Location	GPS Co-ordinate		Specific Location
		X	Y	
Ambient Noise Level	Location-01, NQ1	23°57'44.76"N	89°10'41.40"E	East side of the site
	Location-02, NQ2	23°58'2.89"N	89°10'5.24"E	North side of the site
	Location-03, NQ3	23°57'23.06"N	89° 9'57.29"E	South side of the site
	Location-04, NQ4	23°57'55.02"N	89° 9'23.66"E	West side of the site
	Location-05, NQ5	24° 1'14.57"N	89° 4'44.41"E	Near Dadapur Purba para
	Location-06, NQ6	24° 5'21.41"N	89° 5'25.46"E	Residential area near Rajshahi-Kushtia Highway

Table 4.20: Ambient Noise Quality Analysis

SN.	Site Location with GPS Coordinates	Concentration present (LA_{eq}) dBA.			
		Day Time		Night Time	
		Minimum	Maximum	Minimum	Maximum
01	NQ-1	36.6	40.7	27.5	31.6
02	NQ-2	32.4	38.6	25.3	28.5
03	NQ-3	30.9	33.4	25.4	26.9
04	NQ-4	35.9	41.8	27.6	30.2
05	NQ-5	38.6	44.1	30.2	35.8
06	NQ-6	30.2	36.3	25.3	28.7
DoE (Bangladesh) Standard for Mixed area (mainly residential area, and also simultaneously used for commercial and industrial purposes)		60		50	
IFC/International Standard for Residential; institutional; educational		55		45	

NQ-1 (Day)

NQ-1 (Night)

NQ-2 (Day)

NQ-2 (Night)

NQ-3 (Day)

NQ-3 (Night)

NQ-4 (Day)

NQ-4 (Night)

NQ-5 (Day)

NQ-5 (Night)

NQ-6 (Day)

NQ-6 (Night)

Figure 4.23: Ambient Noise quality monitoring locations

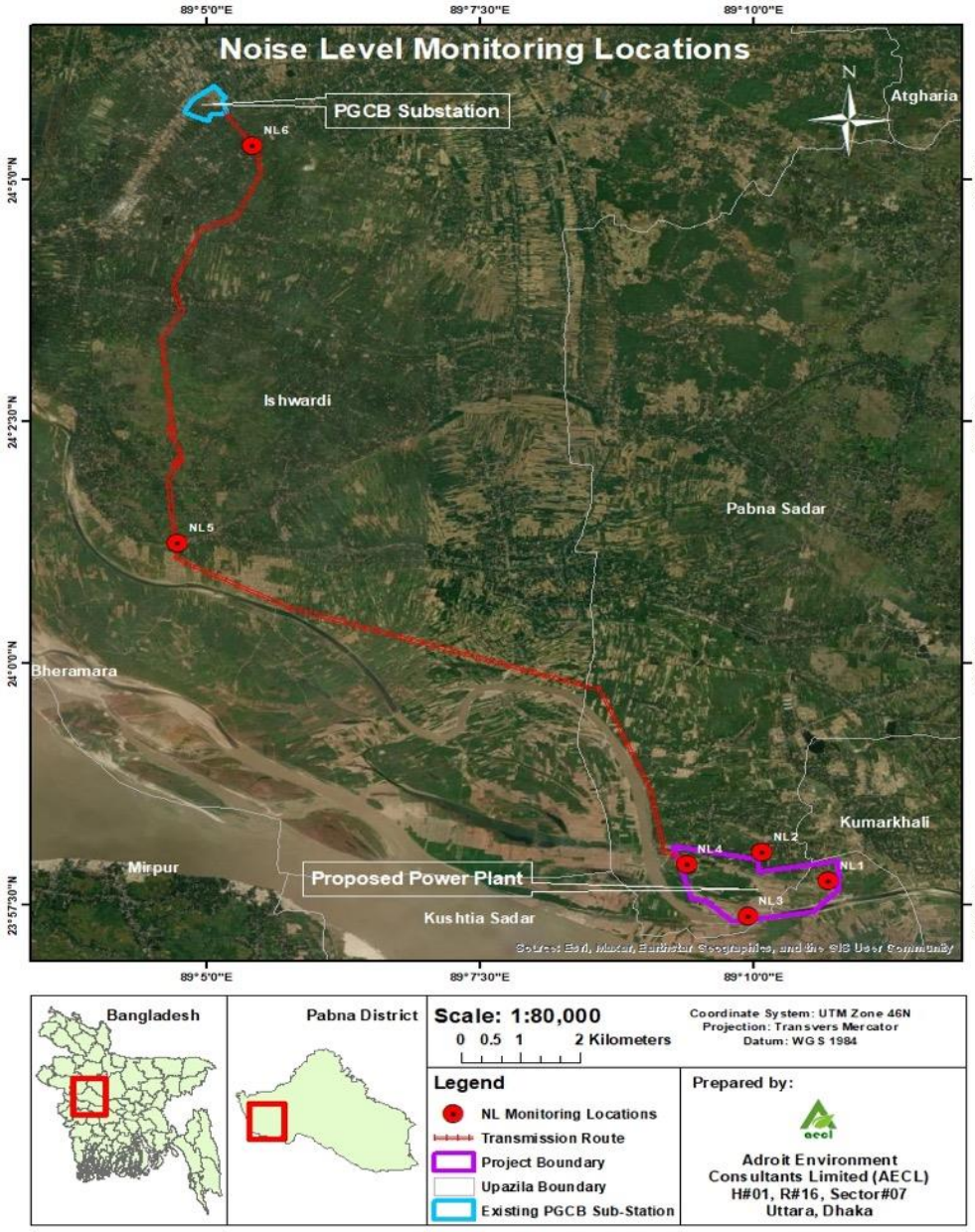


Figure 4.24: Noise Quality Monitoring Location

4.13 Traffic Volume Study

The project location is beside the existing LGED Road. For Project Access, in DSEPL's own land, only a 200m herringbone road has been constructed and developed for accessing the Project from the nearby LGED Road. No land was acquired for this purpose. Access road from Heliboard Bazar to Project Site is kacha and damaged. Though after implementing the project, DSEPL has improved the quality of road than before. The width of this roads is almost 10-12 ft. Normally, motorcycles, bi-cycles, easy-bikes, auto-rickshaws, and local vans use this road for communication. During construction phase, heavy-weight vehicle will move in these roads with materials and wastes, which may increase the load on the roads. But it will not cause any traffic jam. This is the only road from Pabna Sadar Upazila to reach the project site. So, no other option is left to carry out to reach the site.

Traffic volume around the project site has been studied on 16th May, 2023 and 16th August, 2023. The traffic volume counts have been recorded continuously for 24 hours to assess the peak hour traffic and traffic composition. Traffic Survey was done at Heliboard Bazar to Project site road and near to Project access road. Traffic study locations are shown in **Figure 4.25**. The full data of the traffic survey is listed in the **Table 4.21** & **Table 4.22** below:

Table 4.21: Traffic Volume Data (Road Traffic) at Heliboard Bazar

Hour	Direction	Truck	Car/ Jeep	Micro Bus	CNG	Rickshaw	Easy Bike	Motor cycle	Bicycle	Van	Tractor
Day											
07:00-09:00AM	North to South	4	0	0	8	4	5	7	11	3	**2**
	South to North	0	0	0	3	6	3	5	4	2	**0**
09:00-11:00AM	North to South	1	3	0	5	8	9	8	5	4	**1**
	South to North	0	0	0	6	9	6	9	3	3	**0**
11:00AM -01:00PM	North to South	0	0	1	8	5	8	10	8	5	**2**
	South to North	3	0	0	7	6	3	7	5	7	**2**
01:00-03:00PM	North to South	0	0	0	2	4	2	7	3	8	**3**
	South to North	2	0	0	5	7	1	9	2	2	**1**
03:00-05:00PM	North to South	0	0	0	7	2	3	11	5	1	**0**
	South to North	1	3	0	8	5	5	8	1	1	**1**
05:00-07:00PM	North to South	2	0	0	7	6	1	9	9	6	**3**

Hour	Direction	Truck	Car/ Jeep	Micro Bus	CNG	Rickshaw	Easy Bike	Motor cycle	Bicycle	Van	Tractor
	South to North	1	0	0	6	7	3	6	13	1	**1**
Night											
07:00-09:00PM	North to South	3	0	0	5	6	2	7	6	0	**0**
	South to North	0	0	0	6	3	2	7	8	5	**3**
09:00-11:00PM	North to South	0	1	0	5	5	0	8	3	1	**2**
	South to North	2	0	1	3	2	1	6	5	3	**0**
11:00PM-01:00AM	North to South	0	0	0	1	1	0	3	2	2	**0**
	South to North	0	0	0	0	0	0	2	2	0	**2**
01:00-03:00AM	North to South	0	0	0	0	0	0	0	0	0	**0**
	South to North	0	0	0	0	0	0	0	0	0	**0**
03:00-05:00AM	North to South	0	0	0	2	0	0	0	1	0	**1**
	South to North	0	0	0	0	0	0	1	1	0	**0**
05:00-07:00AM	North to South	2	0	0	5	2	2	4	5	3	**6**
	South to North	1	1	0	3	2	1	2	4	3	**2**
Total		**21**	**8**	**2**	**102**	**90**	**56**	**136**	**106**	**61**	**32**

Table 4.22: Traffic Volume Data (Road Traffic) near to Project Access Road

Hour	Direction	Truck	Car/ Jeep	Micro Bus	CNG	Rickshaw	Easy Bike	Motor cycle	Bicycle	Van	Tractor
Day											
07:00-09:00AM	North to South	3	3	0	2	4	4	5	10	1	**0**
	South to North	1	0	0	2	4	2	0	0	2	**0**
09:00-11:00AM	North to South	2	0	0	0	3	5	7	12	7	**3**
	South to North	0	0	0	0	3	5	4	0	5	**0**
11:00AM-	North to	3	1	1	3	0	1	6	3	4	**4**

Hour	Direction	Truck	Car/ Jeep	Micro Bus	CNG	Rickshaw	Easy Bike	Motor cycle	Bicycle	Van	Tractor
01:00PM	South										
	South to North	0	0	0	0	0	1	7	2	2	**2**
01:00-03:00PM	North to South	1	0	0	0	1	0	3	1	0	**0**
	South to North	2	1	0	3	1	0	3	1	0	**0**
03:00-05:00PM	North to South	0	0	0	2	0	2	4	3	3	**0**
	South to North	0	0	0	0	0	3	7	0	4	**2**
05:00-07:00PM	North to South	0	3	0	0	2	5	3	0	2	**3**
	South to North	1	0	1	2	2	2	5	14	3	**1**
Night											
07:00-09:00PM	North to South	1	0	0	1	3	0	7	0	4	**4**
	South to North	0	0	0	1	3	3	7	8	4	**3**
09:00-11:00PM	North to South	0	1	0	0	0	0	2	0	1	**0**
	South to North	1	1	0	0	0	0	3	3	0	**2**
11:00PM-01:00AM	North to South	0	1	0	0	0	0	0	0	0	**0**
	South to North	0	0	0	0	0	0	0	0	0	**0**
01:00-03:00AM	North to South	0	0	0	0	0	0	0	0	0	**0**
	South to North	0	0	0	0	0	0	0	0	0	**0**
03:00-05:00AM	North to South	0	0	0	0	0	0	0	0	0	**0**
	South to North	0	0	0	0	0	0	0	0	0	**0**
05:00-07:00AM	North to South	2	0	0	0	0	0	0	0	3	**2**
	South to North	0	0	0	0	0	0	0	2	1	**1**
Total		**17**	**11**	**2**	**81**	**26**	**33**	**73**	**59**	**46**	**27**

The traffic volume study shows that, the access road to the project site has very low traffic flow and the road is calm and quiet. Table 4.21 & 4.22 show that, not much heavy vehicles use this road, only local transports i.e., rickshaw, easy bike, motorcycle, bicycle, and local van uses this road. Due to the project activity of DSEPL few trucks, lorry etc. runs through this road. Traffic survey data shows that even during full-fledged construction phase the traffic flow is way less than saturation condition. After the completion of construction phase, the traffic movement will decrease even more. So, the traffic study shows that, the project has no negative impact on traffic movement.

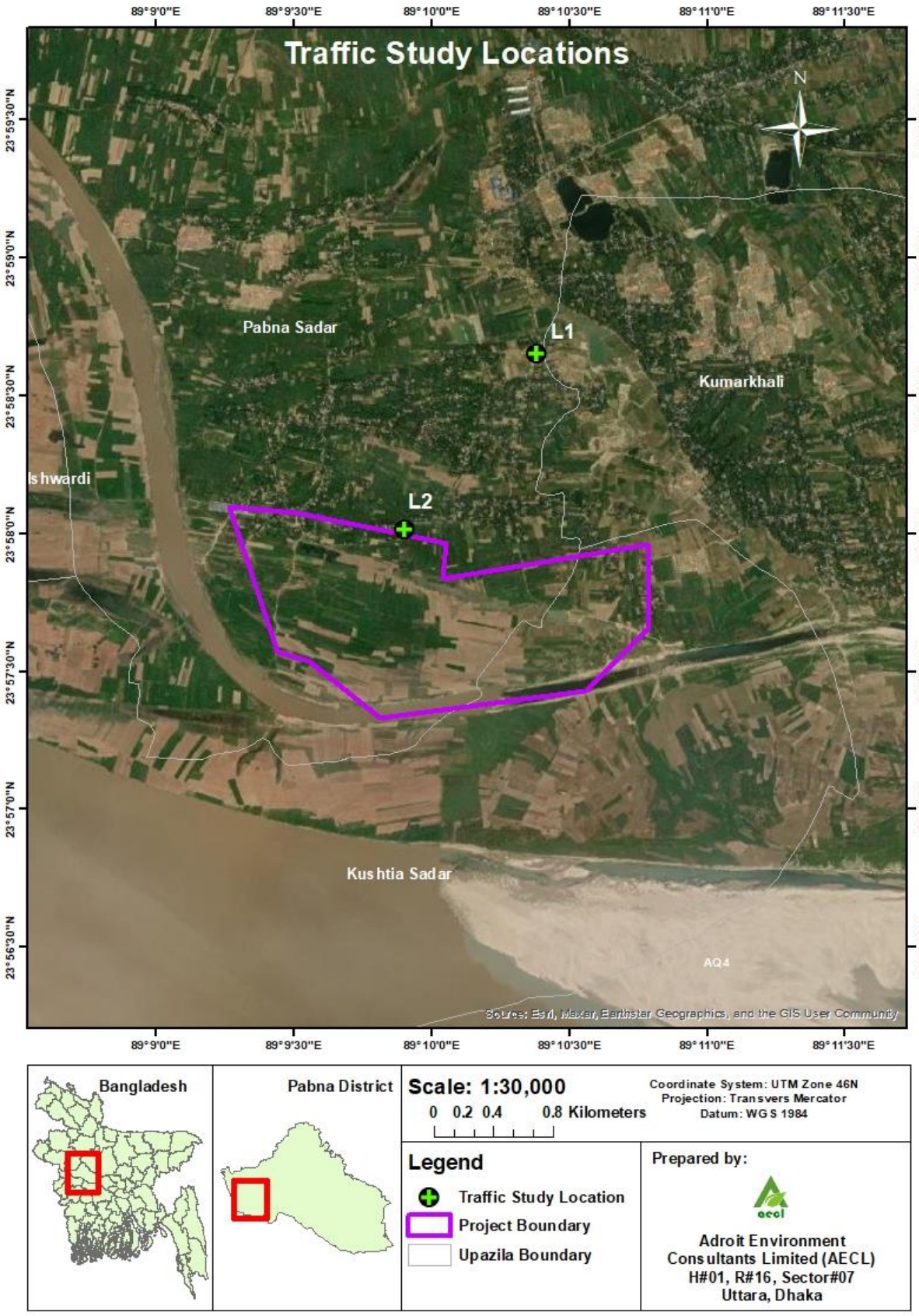


Figure 4.25: Traffic volume study locations

4.14 Geology

The geological evolution of Bangladesh is related to the uplift of the Himalayan mountains and outbuilding of deltaic landmass by major river systems having their origin in the uplifted Himalayas. This geology is mostly characterized by the rapid subsidence and filling of a basin in which a huge thickness of deltaic sediments was deposited as a mega delta built out and progressed towards the south. The delta building is continuing into the present Bay of Bengal and a broad fluvial front of the Ganges-Brahmaputra-Meghna River system gradually follows it from behind.

4.14.1 Soil

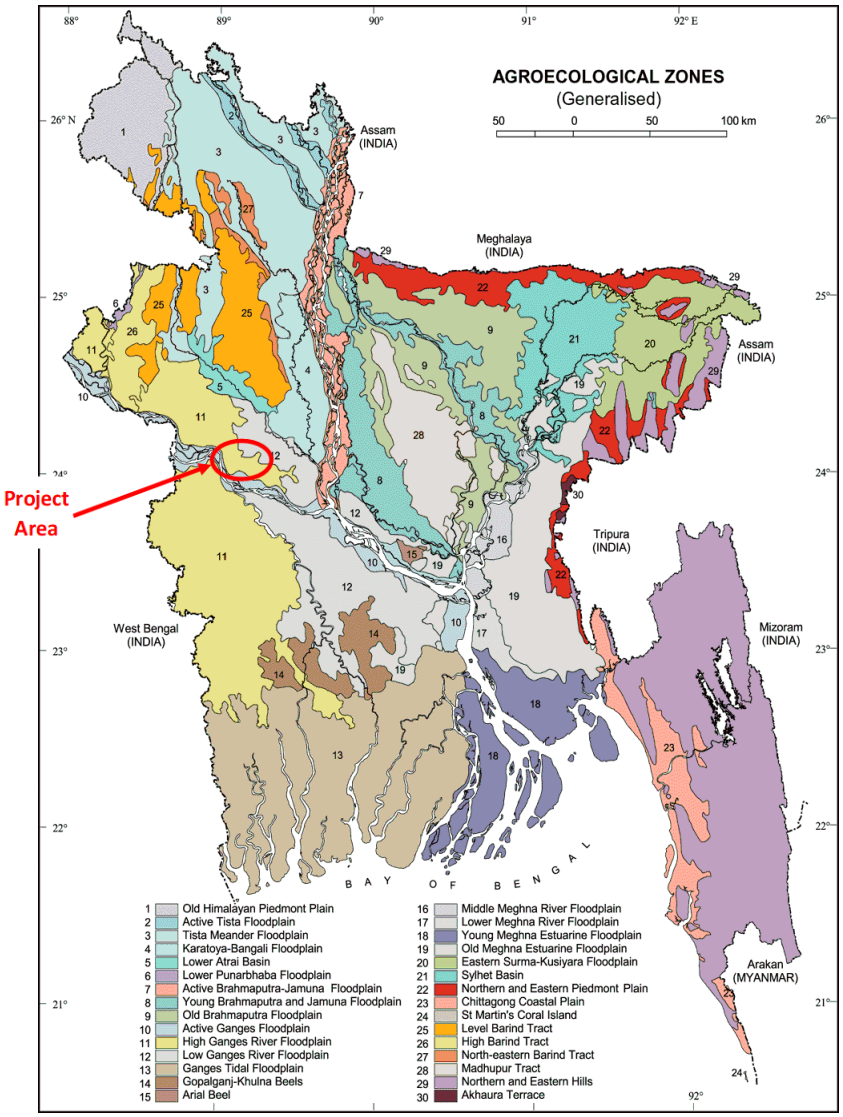
Most of the area of Bangladesh is a vast, low-lying alluvial plain, sloping gently to the south and southeast. According to Bangladesh Agricultural research council's Agro-Ecological Zoning map [**Figure 4.26 (a)]** the project area falls in High Ganges River Floodplain.

The proposed project area falls in the High Ganges River Floodplain. This region includes the western part of the Ganges River floodplain which is predominantly highland and medium highland. Most areas have a complex relief of broad and narrow ridges and inter-ridge depressions. The upper parts of high ridges stand above normal flood level. Lower parts of ridges and basin margins are seasonally shallowly flooded. General soil types predominantly include calcareous dark grey floodplain soils and calcareous brown floodplain soils. Organic matter content in the brown ridge soils is low but higher in the dark grey soils. Soils are slightly alkaline in reaction. General fertility level is low.

The project area falls under Mixed highland, shallowly flooded and deeply flooded phases according to **Figure 4.26 (b).** This type of zone is segregated into different elevations which makes them both shallowly and deeply flooded at wet seasons. Flood visits these phases regularly. The southwestern corner along the Padma River is characterized by calcareous alluvium that is called Calcaric Fluviosols. The rest of the southern and southwestern parts are characterized by calcareous dark grey floodplain soils which are called mainly Calcaric Gleysols with some vertisols and calcareous brown flood plain soils also called as Calcaric Cambisols with some Calcaric Gleysols which are mixed highland, shallowly flooded and deeply flooded phases.

4.14.2 Topology

Project proponent has distributed the project area into 15 Blocks. Each of the block has different elevations according to the **Figure 4.27.** According to the site elevation map the highest elevation of the power plant site is 13.162m and lowest elevation is 7.487m.



(Islam et al, 2020)

Figure 4.26 (a): Agro-ecological zones Map of Bangladesh

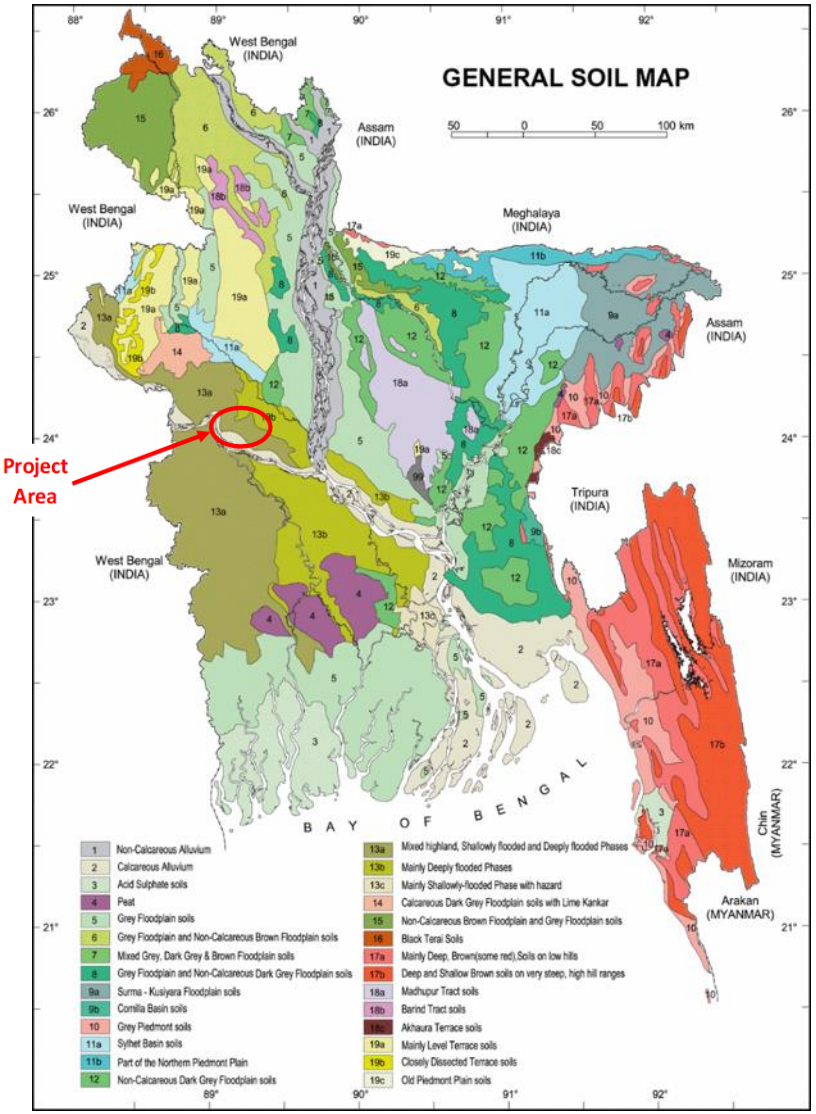


Figure 4.26 (b): Soil Map of Bangladesh

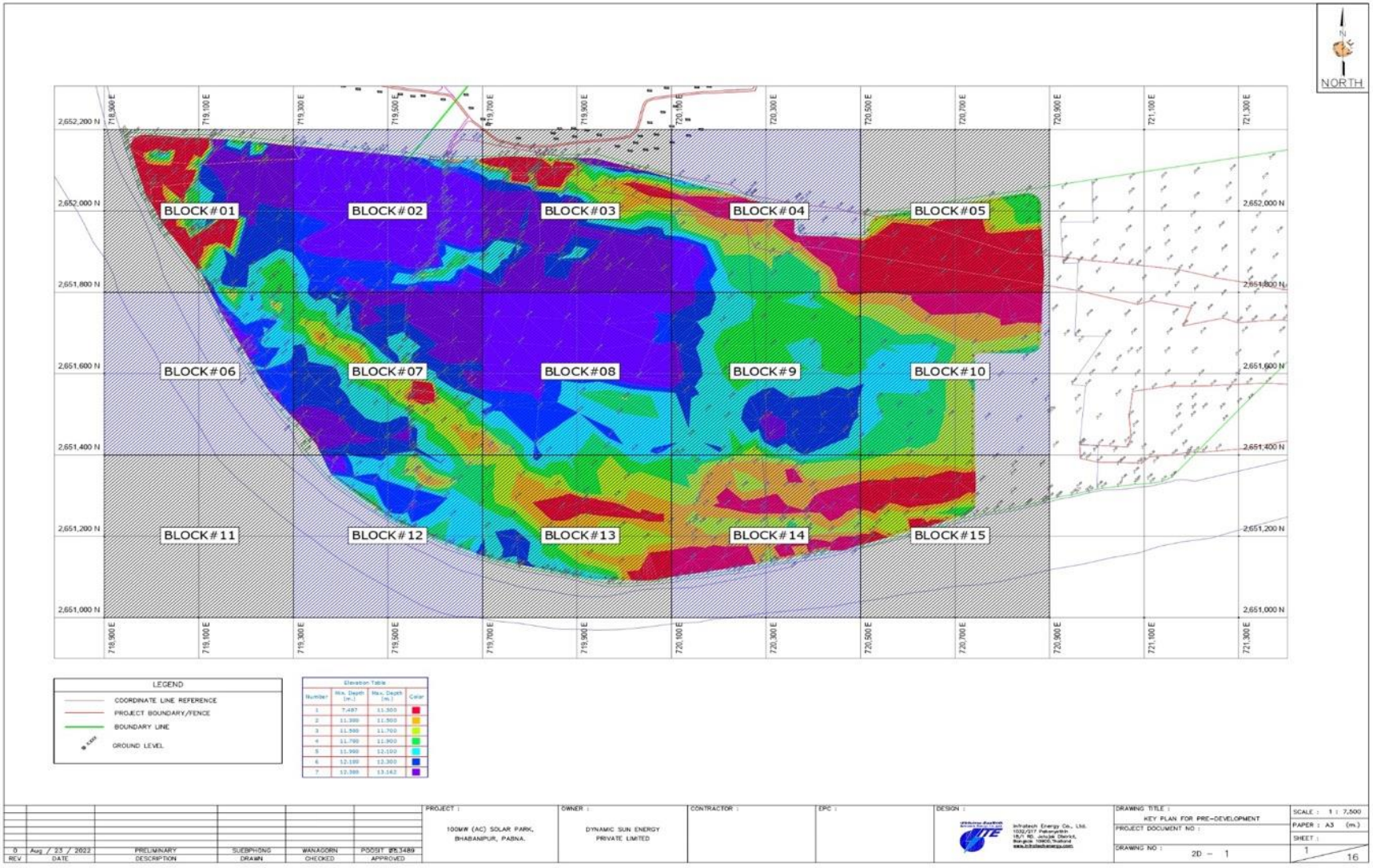


Figure 4.27: 2D site elevation map of the project site.

4.14.3 Soil Quality

Soil sample has been collected during field survey. Test result on soil sample has been presented in **Table 4.23.** Soil quality test report is attached as **Annexure 8 (e).**

Sampling date: 15th April, 2023
Reporting date: 14th June, 2023

Table 4.23: Soil quality test result

Name of the Parameter	Concentration present	Unit	WHO permissible limit for heavy metal in soil (1996)
Location: SQ -01 (23°57'43.63"N, 89° 9'24.55"E)			
pH	7.5	-	-
Zinc (Zn)	0.40	ppm	50
Copper (Cu)	2.04	ppm	36
Lead (Pb)	17.14	ppm	85
Chromium (Cr)	4.26	ppm	100
Cadmium (Cd)	0.12	ppm	0.8
Nickel (Ni)	1.59	ppm	35

Figure 4.28: Soil Sample Collection

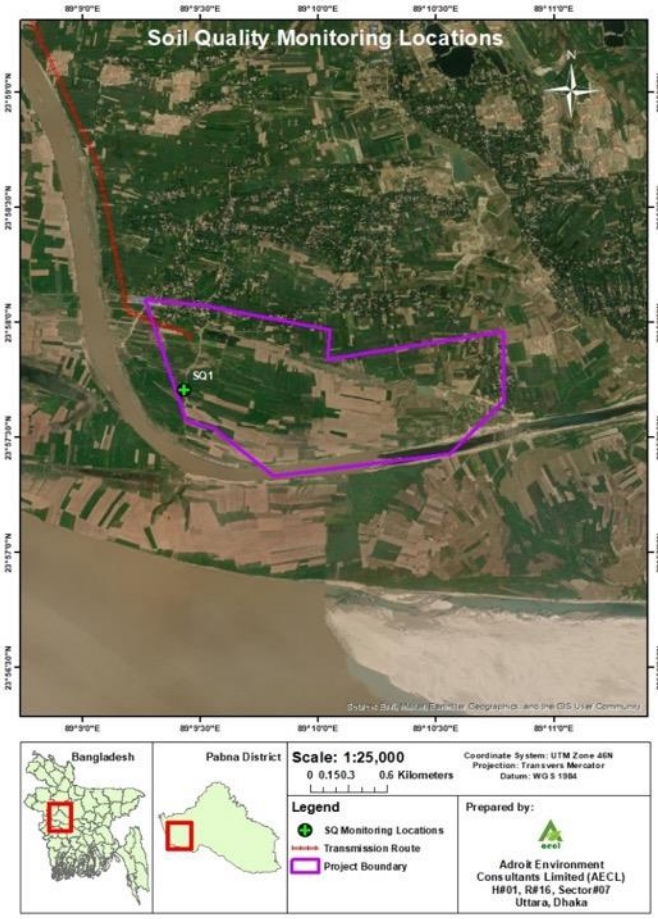


Figure 4.29: Soil Quality Monitoring Location

4.15 Climate Change and Natural Disaster

Bangladesh is one of the most vulnerable countries, who is facing problems on climate change due to global warming. Low-lying coastal regions like Bangladesh are vulnerable to sea level rise and increased occurrence of intense, extreme weather conditions such as the cyclones from 2007 and 2009. It is necessary to identify all present vulnerabilities and future opportunities, adjusting priorities, at times even changing commodity and trade policies in the agricultural sector while promoting training and education throughout the masses in all possible spheres.

4.15.1 Seismicity

Earthquakes are closely related to plate tectonics. Bangladesh is in a tectonically active region close to the plate boundaries of the Indian plate and the Eurasian plate. The plate boundaries lie to the north and east of Bangladesh. The collision of the north-east moving (around 4 cm or more annually) Indian Plate with the Eurasian plate **(Figure 4.30)** is the cause of frequent earthquakes in the region comprising North East India, Nepal, Bhutan, Bangladesh, and Myanmar.

Tectonically Bangladesh is divided broadly into three divisions: (i) Stable Shelf (in the northwest) (ii) Bengal Foredeep (in the Central) and (iii) Chittagong-Tripura Folded Belt (in the east). In addition, there is a SW-NE trending 25 km wide hinge zone separating the Bengal Foredeep from the Stable Shelf.

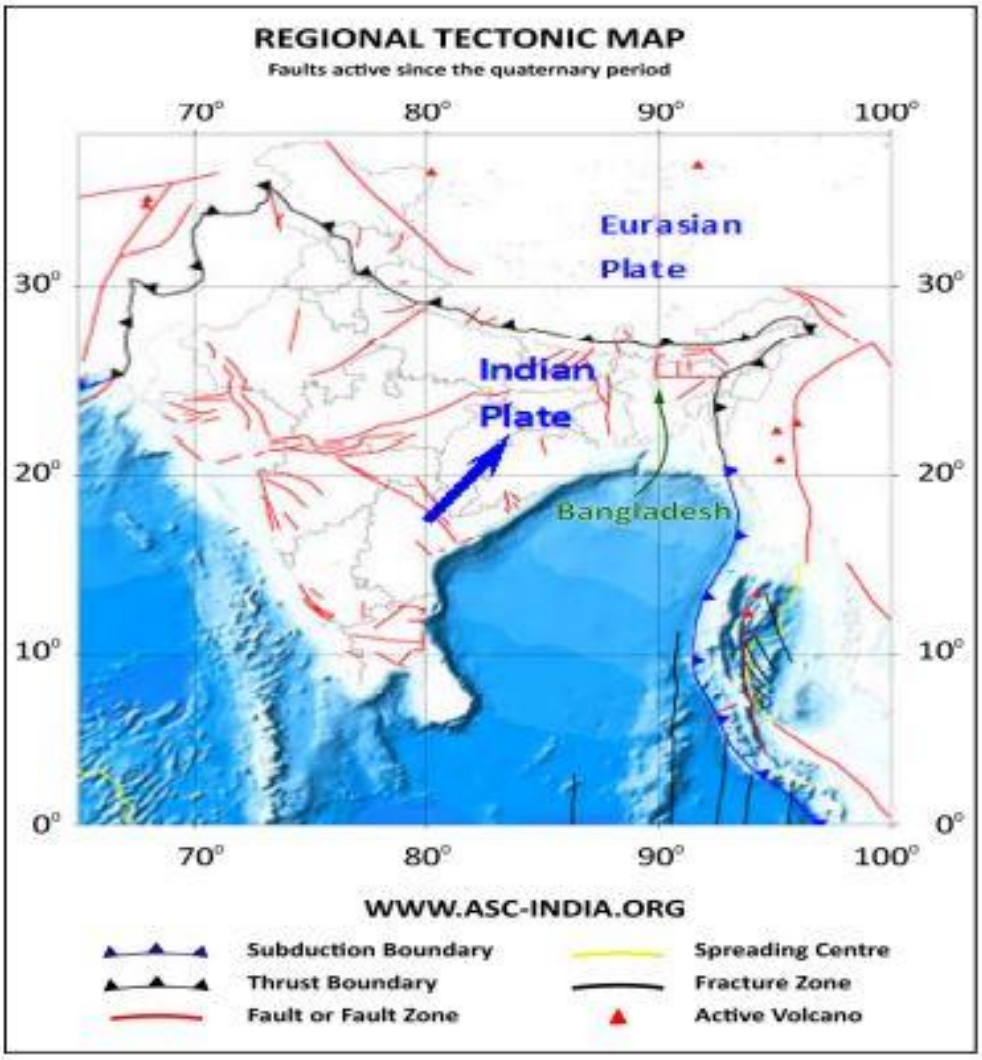
- The Stable Pre-Cambrian Shelf in the northwest consists of relatively thin sedimentary strata over bedrock. In Madhyapara area of Dinajpur the basement is only 130 m deep from the ground surface. The basement plunges gently from Madhyapara towards the southeast up to the Hinge Zone. Seismic contours on top of limestone in Bogra show regional dip of 2-3^{o} besides revealing several NE-SW trending faults.

- In the hinge zone, the depth of the limestone increases from 4000m to 9000m within a narrow zone of 25-km. Hinge Zone relates to Bengal Foredeep by deep basement faults that probably started with the breakup of Gondwanaland. The SW-NE trending Hinge Zone turns to the east near Indian border in Jamalpur and seems to relate to the Dauki Fault, probably by a series of east-west trending faults. Bengal Foredeep occupies the vast area between Hinge Line and Arakan Yoma Folded System in the east. The Bengal Foredeep consists of some Troughs and some relatively high lands.

- Eastern part of the country is represented by the Chittagong-Tripura Folded Belt. The folded belt in the east consists of narrow, elongated N-S trending folds in Sylhet and Chittagong Divisions of Bangladesh, Tripura, southern Assam, and Mizoram states in India and also Myanmar territory. The elevation of these elongated anticlinal folds in Bangladesh ranges from 100-1,000m. Some of the structures are faulted and thrusted and the intensity of folding increases gradually from west to east.

The project area falls in seismic zone II according to the [**Figure 4.31**] Revised Seismic Zonation of Bangladesh (2017) and BNBC 2020. According to Revised Seismic Zonation of Bangladesh (2017) and BNBC 2020, the country is divided into four seismic zones with different expected levels of intensity of ground motion. Each zone has a seismic zone coefficient (Z) which represents the maximum

considered peak ground acceleration (PGA) on very stiff soil/rock (site class SA) in units of g (acceleration due to gravity). The zone II consists of Lower Central and Northwestern part including Noakhali, Dhaka, Pabna, Dinajpur, as well as Southwestern corner including Sundarbans in where seismic intensity is ***Moderate*** and seismic zone coefficient (Z) is 0.2 [**Table 4.24**].



(BNBC, 2020)

Figure 4.30: Movement of Indian plate relative to Eurasian plate

Table 4.24: Seismic Zonation of Bangladesh, 2017

Seismic Zone	Location	Seismic Intensity	Seismic Zone Coefficient, Z
1	Southwestern part including Barisal, Khulna, Jessore, Rajshahi	Low	0.12
2	Lower Central and Northwestern part including Noakhali, Dhaka, Pabna, Dinajpur, as well as Southwestern corner including Sundarbans	Moderate	0.20
3	Upper Central and Northwestern part including Brahmanbaria, Sirajganj, Rangpur	Severe	0.28

Seismic Zone	Location	Seismic Intensity	Seismic Zone Coefficient, Z
4	Northeastern part including Sylhet, Mymensingh, Kurigram	Very Severe	0.36

(BNBC, 2020)

(BNBC, 2020)

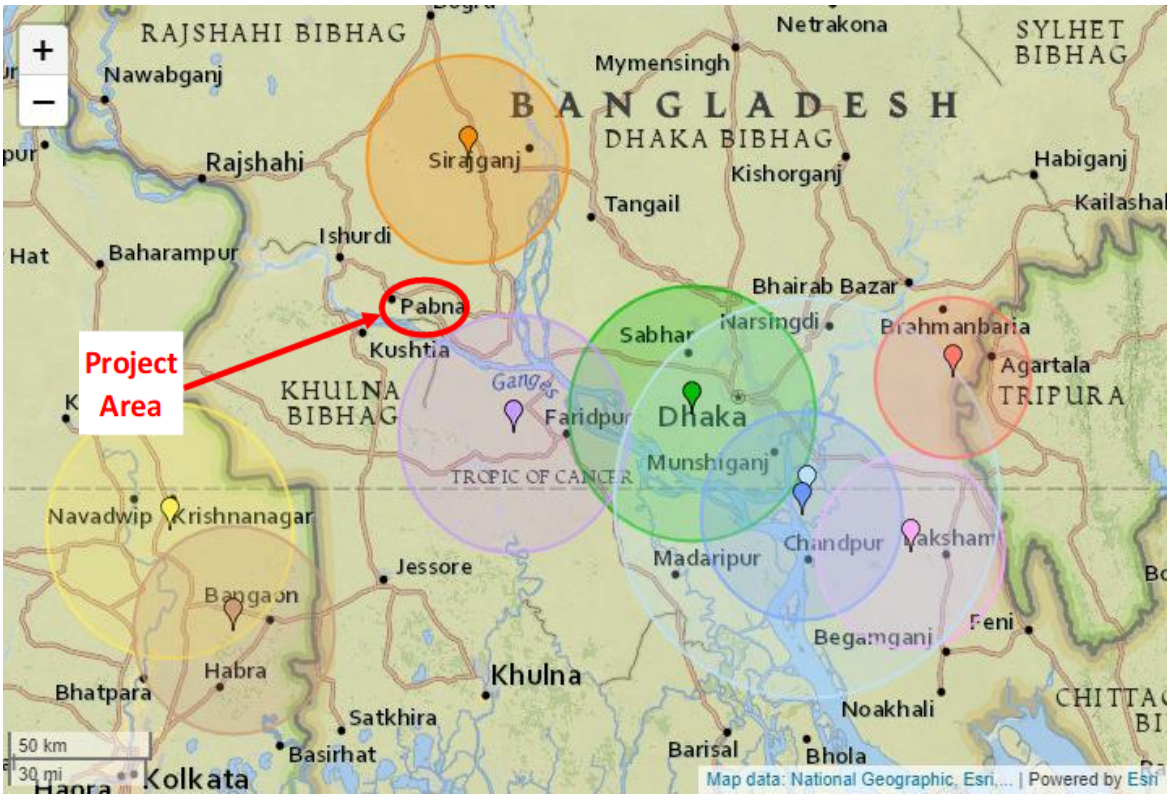
Figure 4.31: Earthquake Zoning Map of Bangladesh

Since 1900, Pabna district felt 56 quakes in total till last year. Among them, only one earthquake was 7.8 on richter scale, which was started from Kathmandu, Nepal on April 2015. Maximum of them are ranging from magnitude level 4-5. Details are given on **Table 4.25**.

Table 4.25: Earthquakes in or near Pabna since 1900

Magnitude Range	7+	6 - 7	5 - 6	4 - 5	3 - 4	2 - 3
No. of Quakes occurred	1	1	3	31	17	3

Recent earthquakes which were near to Pabna Sadar Upazila and the project site are shown on the map given **Figure 4.32**. Details of the quakes are provided on **Table 4.26**.



(National Geographic and Environmental Systems Research Institute)

Figure 4.32: Recent nearest earthquakes of Pabna

Table 4.26: Recent nearest earthquakes of Pabna

Year	Magnitude	Location	Depth (km)
2008	3.8	Agartala, Tripura, India	35
2009	4.2	Bangaon, West Bengal, India	35
2010	5.1	Narayanganj, Dhaka, Bangladesh	10
2010	4.1	Laksham, Chattogram, Bangladesh	10
2011	4.4	Faridpur, Dhaka, Bangladesh	35
2011	4.2	Hajiganj, Chittagong, Bangladesh	10
2012	4.5	Dohar, Dhaka, Bangladesh	44

Year	Magnitude	Location	Depth (km)
2013	4.1	Joypurhat, Rajshahi, Bangladesh	11
2013	4.5	Shantipur, West Bengal, India	35
2014	4.2	Sirajganj, Rajshahi, Bangladesh	14
2014	4.1	Mankachar, Meghalaya, India	15

4.15.2 Floods

Bangladesh is a land of rivers. It is prone to flooding due to being situated on the Padma River Delta (also known as the Ganges Delta) and the many distributaries flowing into the Bay of Bengal. The project area falls in moderate to low river flooding area shown in **Figure 4.33**. Recent floods occurred in Pabna are listed here below:

Table 4.27: Recent floods occurred in Pabna

Year	Description
2022	The catastrophic floods occurred throughout July and August in the country. Bhabanipur, Hemayetpur, Pabna Sadar Upazila was under the water for several days.
2021	Heavy rainfall and continuous rise of water level of Padma caused flood on August. Sadar Upazila and Ishwardi was under water for a few days that time.
2020	Over 20 thousand families have been marooned as swelling Padma, Jamuna and Boral rivers have flooded around a hundred villages of five upazilas in Pabna. That time it was, the Jamuna river which caused massive flood.

4.15.2.1 Danger Level of Padma River at Talbaria Point (SW 91)

Padma River is on the south side of the project site which is around 1.5km from the project site. According to the local people, the project area does not get flooded as the project area is 1.5km away from the Padma River. Observing the maximum and minimum water level data from the year 1950 to 2019, it is found that the maximum highest level was 14.53m, minimum highest level was 13.09 and the danger level is considered as 14.53m. The proponent has already undertaken a flood study and has designed the project accordingly so that during flood the project does not get hampered due to water level rise. Details of flood study report and consideration of flooding in project design has been discussed in Section 3.8.1. The details of water level of Ganges-Padma River at Talbari point (1950-2019) are given on **Table 4.28**.

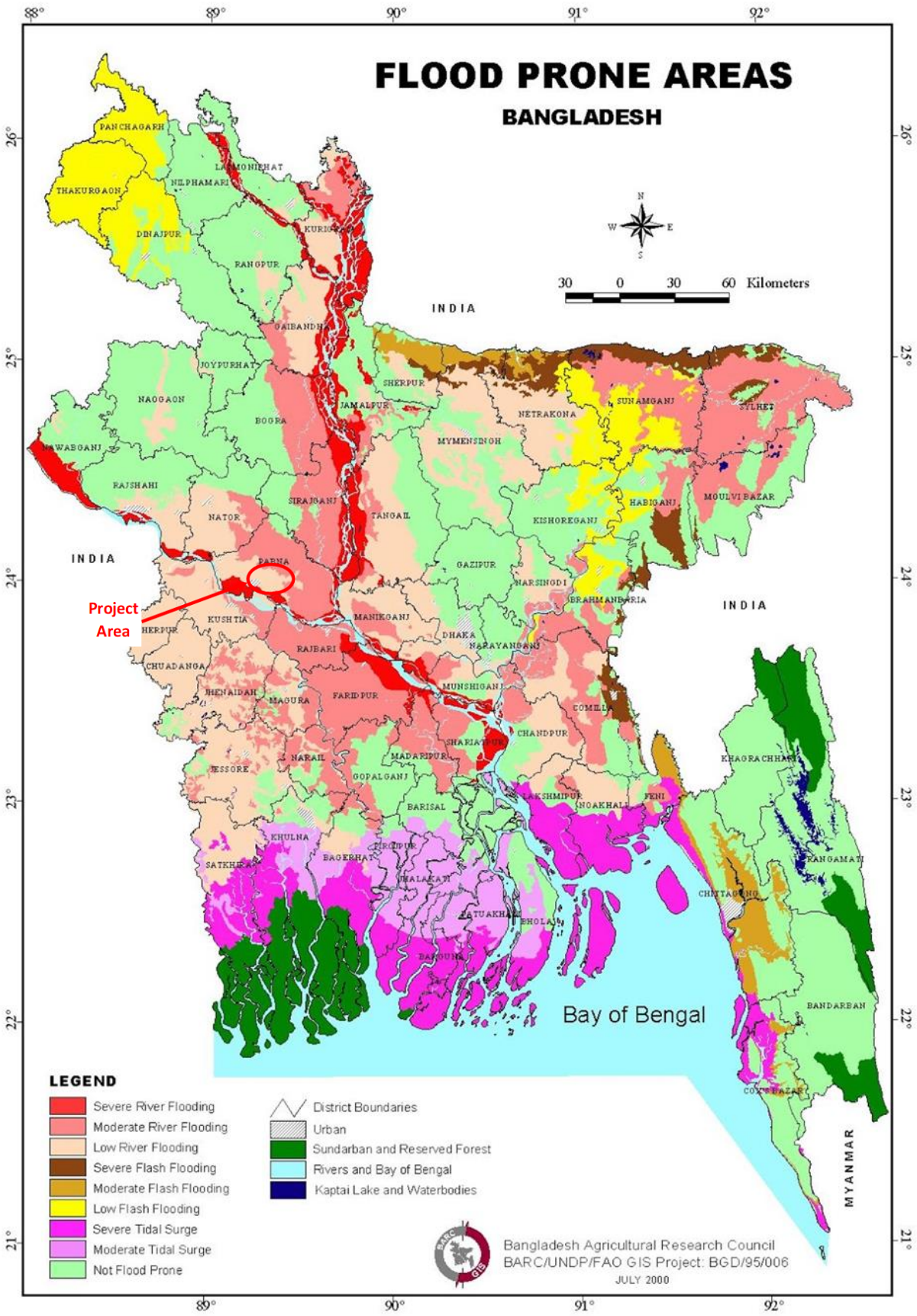
Table 4.28: Maximum and Minimum water level of Ganges-Padma River at Talbari point (1950-2019)

River	Station ID	Station Name	Year	Maximum WL(m)	Minimum WL(m)
Ganges-Padma	SW91	Talbaria	1950	13.84	5.51
Ganges-Padma	SW91	Talbaria	1951	13.14	6.61
Ganges-Padma	SW91	Talbaria	1952	13.32	6.56
Ganges-Padma	SW91	Talbaria	1953	13.56	6.12
Ganges-Padma	SW91	Talbaria	1954	13.41	5.95

River	Station ID	Station Name	Year	Maximum WL(m)	Minimum WL(m)
Ganges-Padma	SW91	Talbaria	1955	13.48	5.18
Ganges-Padma	SW91	Talbaria	1956	13.69	6.29
Ganges-Padma	SW91	Talbaria	1957	12.88	7.20
Ganges-Padma	SW91	Talbaria	1958	13.44	6.59
Ganges-Padma	SW91	Talbaria	1959	12.99	7.12
Ganges-Padma	SW91	Talbaria	1960	13.58	6.58
Ganges-Padma	SW91	Talbaria	1961	13.70	7.20
Ganges-Padma	SW91	Talbaria	1962	13.53	6.99
Ganges-Padma	SW91	Talbaria	1963	13.53	6.11
Ganges-Padma	SW91	Talbaria	1964	13.50	6.43
Ganges-Padma	SW91	Talbaria	1965	12.74	6.40
Ganges-Padma	SW91	Talbaria	1966	13.11	5.39
Ganges-Padma	SW91	Talbaria	1967	13.38	5.51
Ganges-Padma	SW91	Talbaria	1968	12.34	5.12
Ganges-Padma	SW91	Talbaria	1969	13.58	5.51
Ganges-Padma	SW91	Talbaria	1970	12.41	4.76
Ganges-Padma	SW91	Talbaria	1971	12.34	5.12
Ganges-Padma	SW91	Talbaria	1972	12.41	5.76
Ganges-Padma	SW91	Talbaria	1973	13.29	5.64
Ganges-Padma	SW91	Talbaria	1974	13.57	5.53
Ganges-Padma	SW91	Talbaria	1975	13.10	5.15
Ganges-Padma	SW91	Talbaria	1976	13.58	4.11
Ganges-Padma	SW91	Talbaria	1977	13.08	4.80
Ganges-Padma	SW91	Talbaria	1978	13.55	5.12
Ganges-Padma	SW91	Talbaria	1979	12.33	5.23
Ganges-Padma	SW91	Talbaria	1980	13.73	4.54
Ganges-Padma	SW91	Talbaria	1981	12.44	4.25
Ganges-Padma	SW91	Talbaria	1982	5.17	4.24
Ganges-Padma	SW91	Talbaria	1983	13.88	4.16
Ganges-Padma	SW91	Talbaria	1984	13.64	5.16
Ganges-Padma	SW91	Talbaria	1985	13.16	5.18
Ganges-Padma	SW91	Talbaria	1986	13.15	5.36
Ganges-Padma	SW91	Talbaria	1987	13.69	5.07
Ganges-Padma	SW91	Talbaria	1988	14.09	5.43
Ganges-Padma	SW91	Talbaria	1989	12.36	5.00
Ganges-Padma	SW91	Talbaria	1990	12.89	4.51
Ganges-Padma	SW91	Talbaria	1991	12.33	4.16
Ganges-Padma	SW91	Talbaria	1992	12.45	4.15
Ganges-Padma	SW91	Talbaria	1993	12.50	3.56
Ganges-Padma	SW91	Talbaria	1994	13.39	0.00
Ganges-Padma	SW91	Talbaria	1995	12.58	3.97
Ganges-Padma	SW91	Talbaria	1996	13.77	4.39
Ganges-Padma	SW91	Talbaria	1997	12.42	3.83

River	Station ID	Station Name	Year	Maximum WL(m)	Minimum WL(m)
Ganges-Padma	SW91	Talbaria	1998	14.53	3.98
Ganges-Padma	SW91	Talbaria	1999	13.37	4.45
Ganges-Padma	SW91	Talbaria	2000	13.53	4.02
Ganges-Padma	SW91	Talbaria	2001	12.66	4.02
Ganges-Padma	SW91	Talbaria	2002	12.61	4.87
Ganges-Padma	SW91	Talbaria	2003	13.46	4.89
Ganges-Padma	SW91	Talbaria	2004	12.56	5.17
Ganges-Padma	SW91	Talbaria	2005	12.41	4.40
Ganges-Padma	SW91	Talbaria	2006	12.54	4.53
Ganges-Padma	SW91	Talbaria	2007	12.35	4.85
Ganges-Padma	SW91	Talbaria	2008	12.67	4.65
Ganges-Padma	SW91	Talbaria	2009	11.96	4.85
Ganges-Padma	SW91	Talbaria	2010	11.94	4.44
Ganges-Padma	SW91	Talbaria	2011	12.74	4.65
Ganges-Padma	SW91	Talbaria	2012	12.45	4.65
Ganges-Padma	SW91	Talbaria	2013	12.66	4.38
Ganges-Padma	SW91	Talbaria	2014	12.94	4.50
Ganges-Padma	SW91	Talbaria	2015	12.84	4.33
Ganges-Padma	SW91	Talbaria	2016	13.35	3.77
Ganges-Padma	SW91	Talbaria	2017	12.90	4.33
Ganges-Padma	SW91	Talbaria	2018	12.66	4.14
Ganges-Padma	SW91	Talbaria	2019	6.26	4.08

(BWDB 2020)

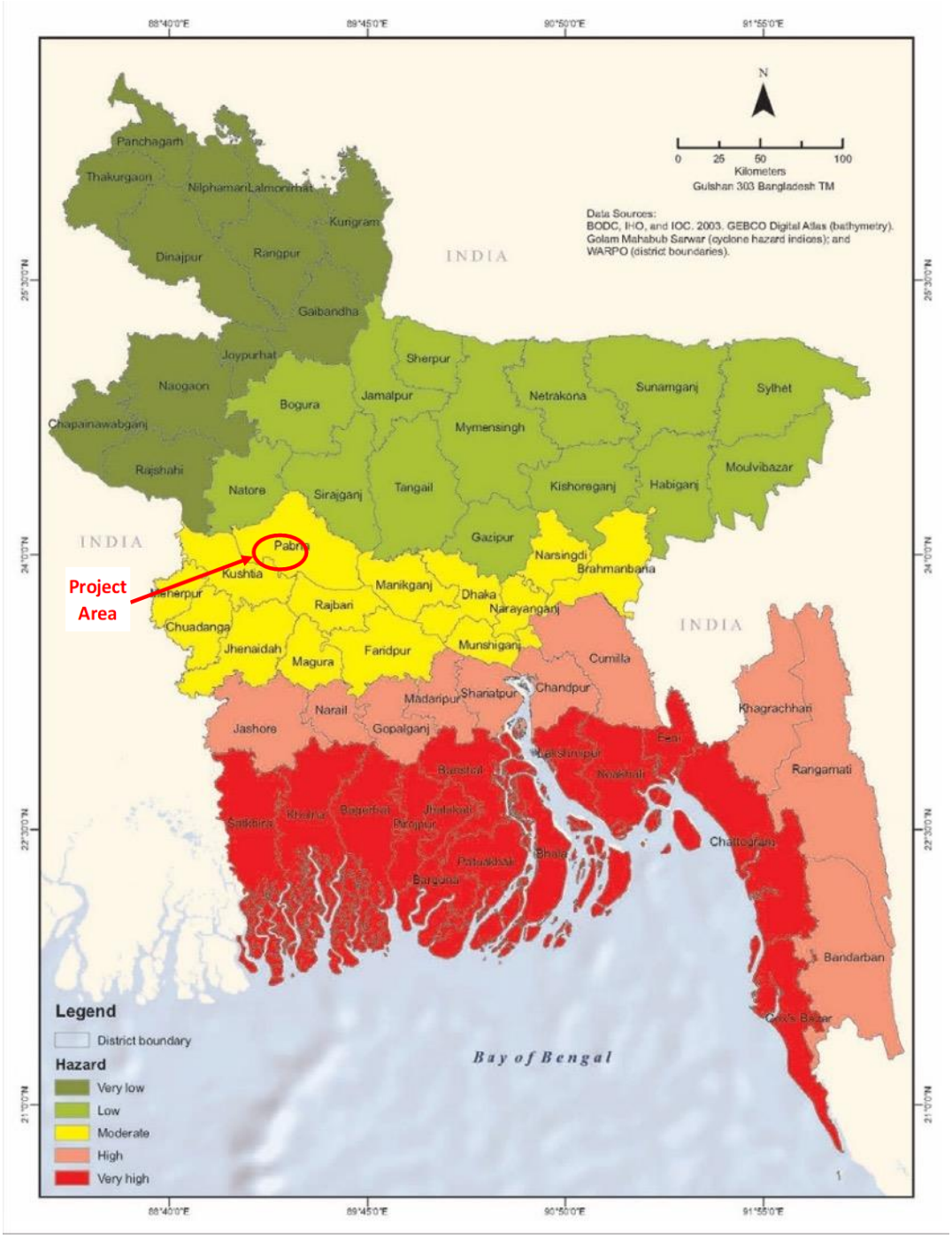


Bangladesh Agricultural Research Council (BARC)

Figure 4.33: Flood Prone Areas of Bangladesh

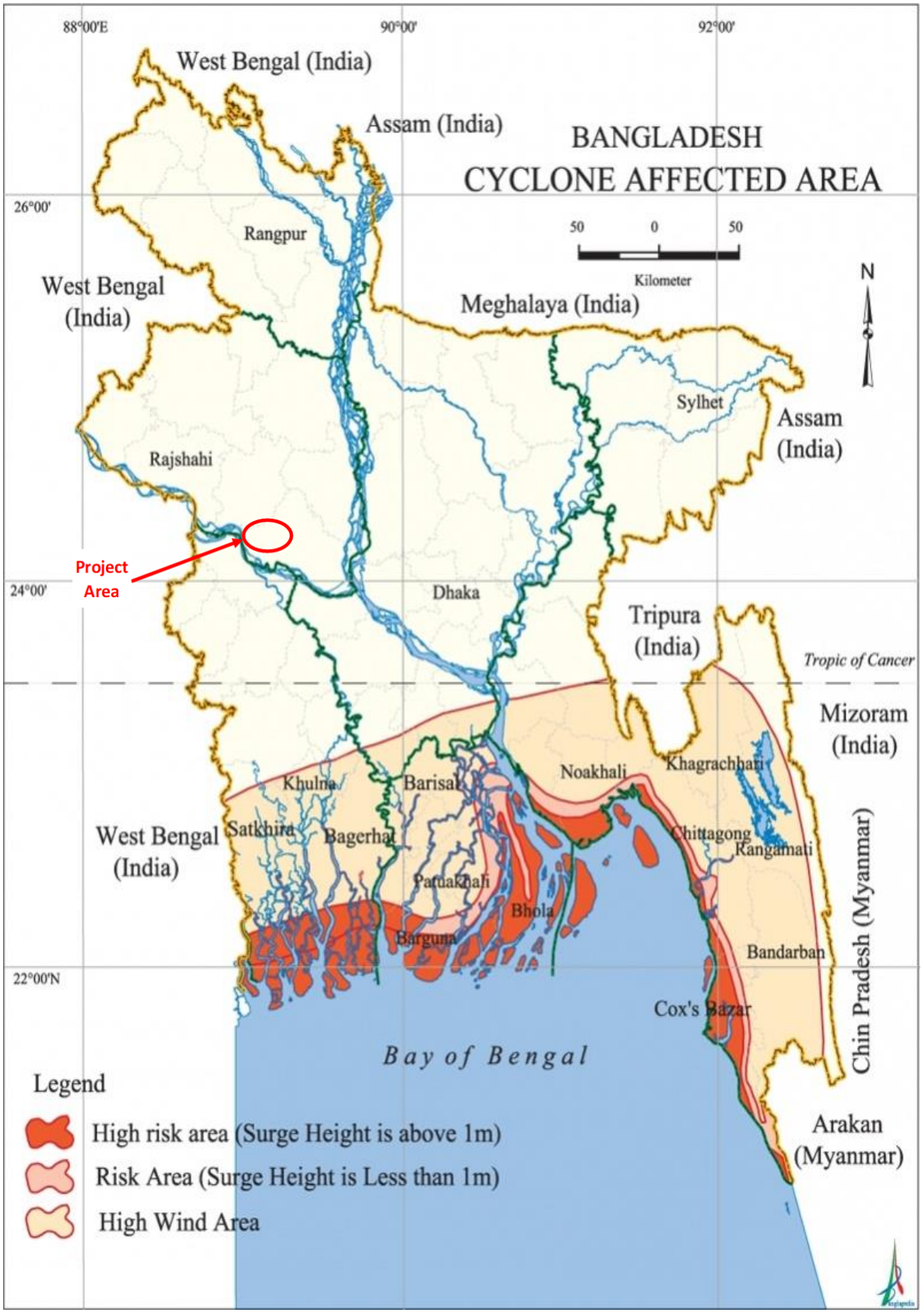
4.15.3 Cyclones

Bangladesh is one of the most cyclone prone areas on the earth. Devastating cyclones hit the coastal zones almost every year and are usually accompanied by high-speed winds, sometimes reaching 250 km/hr. or more and with 3 m to 10m high waves, causing extensive damage to life, property, and livestock. These cyclones usually occur in two seasons, April-May and October November – i.e., before and after the monsoon season. As per Cyclone Affected Area Map of Bangladesh shown in **Figure 4.34**, the project site is risk-free cyclone prone area.



(Bangladesh Climate and Disaster Risk Atlas, Volume 1, December 2021)

Figure 4.34: Cyclonic Storm Tracks in Bangladesh



(SPARRSO)

Figure 4.35: Cyclone Affected Area Map of Bangladesh

4.16 Socio-Economic Conditions

A social baseline study was carried out in areas surrounding the project site. This has been done based on several surveys around the locality as well as Pabna Sadar Upazila Profile. Bangladesh Bureau of Statistics (BBS), Bangladesh National Portal, concerned books and periodicals were also consulted.

4.16.1 Administrative Information

Proposed Power Plant- is in Hemayetpur union, Pabna Sadar upazila, Pabna district which further comes under Rajshahi Division. Pabna is a district in North-western Bangladesh. It is situated at the fringe of mighty Padma River.

Pabna Sadar upazila is in Pabna district. Pabna District (Rajshahi Division) area 2,371.5 sq. km. Pabna is bounded on the north by Natore and Sirajganj zilas, on the east by Manikganj zila and the river Jamuna, on the south by Rajbari and Kushtia zilas and the river Padma and on the west by Natore zila. The district lies between 23˚48' and 24˚21' north latitudes and between 89˚00' and 89˚44' East longitudes. Demographic Characteristics of Pabna District is presented on **Table 4.29**.

Table 4.29: Demographic Characteristics of Pabna District

District	Pabna
Upazila	9
Union	74
Mouza	1321
Village	1549
Paurashovas	9
Ward	87
Mahalla	234

(District Statistics 2011, Pabna)

The project area is in Pabna Sadar Upazila. Pabna Sadar is the largest upazila of Pabna; occupies an area of 439.30 sq. km. It is located between 23˚53’ and 24˚05’ north latitudes and between 89˚09' and 89˚25’ east longitudes. The upazila is bounded on the north by Atgharia upazila, on the east by Santhia upazila and Sujanagar upazila, on the south by Pangsha upazila of Rajbari zila and Khoksha upazila and Kumarkhali upazila of Kushtia zila and on the west by Ishwardi upazila.

4.16.2 Population and Social Structure

The project location is at Pabna Sadar Upazila, Pabna. The Demographic characteristic of the Pabna Sadar Upazila is presented in **Table 4.30.**

Table 4.30: Demographic Characteristics of the Pabna Sadar Upazila

Upazila	Pabna Sadar
Total Area (Sq. km)	439.30
Total Household	1,38,839

Upazila	Pabna Sadar
Total population	5,90,914
Male	2,96,870
Female	2,94,044
Average Household	4.21
Literacy rate (%)	51.4
Sex ratio (M/F)	101
Population Density (Per Sq. km)	1345
Municipality	1
Union	10
Mouza	243
Village	291
Ward	15
Mahalla	46

(District Statistics 2011, Pabna)

4.16.3 Religion

Table 4.31: Religion of the households Pabna Sadar Upazila

Upazila	Total population	Muslim	Hindu	Buddhists	Christian	Others
Pabna Sadar	590914	578365	12294	221	27	7
%	100	97.87	2.08	0.037	0.004	0.001

(District Statistics 2011, Pabna)

From the above table it could be understood that Pabna Sadar is predominantly a Muslim populated area with 97.87 percent of Muslim population, while Hindus are the second most populated religion, with a presence of 2.08 percent. Buddhists and Christians are the two other religions having a slight presence of 0.037 and 0.004 percent while others are 7 in number representing a trivial population of 0.001 percent.

4.16.5 Health and Medical facilities

There are 4 Govt. Hospitals and 10 Health Center/Clinic at the upazila. The one and only Mental Hospital of the country is also situated near the project site.

4.16.4 Source of Drinking Water

In Pabna Sadar upazila 93.9% of general households have got the facility of drinking tube well water, 3.7% tap water and the remaining 2.3% household gets water from other sources.
(Population and Housing Census 2011; Community Report: Pabna)

4.16.5 Sanitation

In the upazila, 71.4% of general households use sanitary latrine, 25.9% non-sanitary latrine and 2.7% have no toilet facility. (Population and Housing Census 2011; Community Report: Pabna).

4.16.6 Literacy

In Pabna Sadar upazila it is found that 51.4% population aged 7 years and over is literate. (Population and Housing Census 2011; Community Report: Pabna).

4.16.7 Access to Electricity

The entire Pabna Sadar upazila have brought under the Rural Electrification Program. However, a total of 73.4% of the general households reported to have electricity connection. (Population and Housing Census 2011; Community Report: Pabna).

4.16.8 Agriculture

The economy of Pabna is predominately agriculture. The main crops of this district are boro and aman paddy, jute, chili, sugarcane, potato etc. Fruits like Mango, jackfruit, papaya, banana, litchi, betel nut and palm are also produced. Most of the people depend on agriculture in this char.

4.16.9 Archeological, Cultural Heritage and Religious Site

The famous archaeological heritage and relics are Sree Sree Thakur Anukul Chandra Ashram, Hardinge Bridge, Ishwardi Railway Junction, Chatmohor Shahi Jame Masjid and Khetupara Zamindar Bari etc.

4.16.10 Indigenous people and others

There is no presence of indigenous people in and around the project area.

4.17 Primary Social/Household Survey

For this project, land of the main power plant area has been purchased following willing buyer and willing seller process and there were no informal land users who would have been involuntarily displaced, nor any structures been displaced. In addition to that, there was no informal land user, land sellers / users who will be worse off as a result of the land sale / loss. Involuntary resettlement is triggered for land acquisition along TL for transmission tower footing area. There is no informal land user or any structure along the TL route. Transmission Line runs mostly through agricultural land. So, there is no village along that route. A detailed survey of all the affected HH due to this Power Plant and TL has been conducted to establish the socio-economic conditions of the households within the power plant and TL, to identify project impacts and their mitigating/management measures. Findings of the primary socio-economic survey of the affected HH is provided the sections 4.17.1 & 4.17.2.

4.17.1 Socio-economic Conditions of Power Plant Area

Socio-economic details of the power plant area households were collected during the social baseline survey. The socio-economic profile of the surveyed HHs is consequently presented following

demographic profile of the HHs. A total of 1054 HHs comprises of 3693 people has been surveyed with average HH size 3.50.

Table 4.32: General Profile of Surveyed Population

Category	Total
Number of total surveyed Households /Units	1054
Number of total Population	3693
Average HHs Size	3.50

Source: *Field survey of AECL Team*

4.17.1.1 Demographic Profile of Project Area Households

Demographic profile of the affected community has been analyzed as a part of socio- economic profile of the project area. This comprises of gender profile and age-sex distribution of the project affected communities. Precisely, it can be stated that the area lacks gender parity as 97.55% male headed and 2.45 female headed HHs are found during census period. The general scenario in Bangladesh is same as most of the HHs head are male. Age-sex ratio indicates that majority of the population are within the age limit of 15-59.

4.17.1.2 Distribution of Household Population

Distribution of HH population is presented in the table below. It indicates that majority of the HHs have 3-4 members. It is interesting that 214 HHs have only 1-2 members. HH size of within 7 to 8 members was minimal in the area. Distribution of HH population is presented by area-wise in the illustration:

Table 4.33: Distribution of HH population

SL No.	Number of household members	Total	
		HH	%
1	1 to 2	214	20.30
2	3 to 4	786	74.57
3	5 to 6	37	3.52
4	7 to 8	17	1.61
5	9 to 10	0	0
6	10+	0	0
	Total	**1054**	**100**

Source: *Field Survey of AECL Team*

4.17.1.3 Age and Sex Distribution of project area Population

Age-sex distribution of the surveyed 1054 HHs was measured during the census and IOL survey. It was found that population density increases respectively from the age group of 1-60. According to the age band, the most prominent group is 30-60. The number of surveyed persons steadily decreases with increasing age limit above 60. It is the almost similar to the national scenario. Details see in **Table 4.34**.

Table 4.34: Age Sex Distribution of Surveyed Population

SL	Age Group (Years)	Male		Female		Total	Overall
			%		%		%
1	01 to 05	109	5.09	115	7.30	224	6.07
2	06 to 15	252	11.89	226	14.35	478	12.94
3	16-30	573	27.10	394	25.01	967	26.18
4	31-60	1094	51.66	751	47.68	1845	49.96
5	61-65	46	2.15	36	2.29	82	2.22
6	Above 65	44	2.11	53	3.37	97	2.63
Total		**2118**	**100**	**1575**	**100**	**3693**	**100**

Source: *Field Survey of AECL Team*

4.17.1.4 Sex Profile of Project Area Households

The percentage of male populations are greater than female in the project area. At project area total of 3693 populations will be surveyed where 2118 are male and 1575 are female, which represents that percentage of female population in the project area is less compared to the male population.

4.17.1.5 Marital Status

Among the 3693 surveyed population around the project area, 2806 people are above 18 years. Any person below 18 years are not allowed to marry in Bangladesh. No people below the age of 18 are found married. It is found that 65.12% people are married against 34.88% unmarried or widow.

Table 4.35: Marital Status of Male & Female population (18 years above)

SL	Marital Status	Male	%	Female	%	Total	%
1	Married	1329	62.75	1076	68.31	2405	65.12
2	Unmarried	774	36.54	470	29.85	1288	33.69
3	Abandoned	0	0	0	0	0	0
4	Widow	15	0.71	29	1.84	44	1.19
Total		**2118**	**100**	**1575**	**100**	**3693**	**100**

Source: *Field Survey of AECL Team*

4.17.1.6 Household by Religion

It is found that Islam is the predominant religion in the study area (96.77%). Rest of the people are the followers of Hinduism (3.23%). No other religions were found in the surveyed area.

4.17.1.7 Education Level of Surveyed Population (6 Years and above)

Education level of the surveyed population is presented in the table below. Among the surveyed 3693 populations, 3469 populations are at the age of above 6 years and 6 people are below the age of 6 years who has not started the school yet. The table demonstrates that primary and secondary level education entrance is high in the area and considered the people above the age of 6 (3469 population). But dropout rate is very high as the number of people sharply decreases from secondary certificate achievers. It also indicates that education rate is higher among male population than female. Also, illiteracy is higher among female population than male population.

Table 4.36: Level of Education of Surveyed Population (6 Years and above)

SL	Education Level	Male	%	Female	%	Total	%
1	Up to class five/ Ebtedaye Madrasa	513	24.23	477	30.28	990	26.81
2	Class six to ten	206	9.71	186	11.81	392	10.61
3	SSC or equivalent	427	20.17	394	25.02	821	22.23
4	HSC or equivalent	180	8.50	76	4.82	256	6.93
5	BA or equivalent	57	2.69	9	0.57	66	1.79
6	MA or equivalent	3	0.14	0	0	3	0.08
7	Illiterate	328	15.49	398	25.27	726	19.66
8	Can sign only	404	19.07	35	2.22	439	11.89
Total		**2118**	**100**	**1575**	**100**	**3693**	**100**

Source: *Field Survey of AECL Team*

4.17.1.8 Occupation of the Population

There are varieties number of occupations have been identified during survey of the project. The population distribution according to gender engaged in various Primary Occupations is presented in tabular form below. A variety of occupational choices have been found in the project location, and majority are farmer. Female population are mostly unemployed. In addition to agriculture, the other significant occupations are involvement with business, service, day labor, service, doctor and mason etc. Apart from these, a minimal number of populations have been identified as unemployed in the form of retired person and aged persons.

Table 4.37: Distribution of Surveyed People by occupation (15 years and above)

SL No.	Occupation	Male	Female	Total	%
1	Agriculture/Husbandry	778	527	1305	42.23
2	Service holder	143	15	158	5.11
3	Housewife/Househusband	2	354	356	11.52
4	Business	256	13	269	8.71
5	Day Laborer	305	156	461	14.92
6	Driver	9	0	9	0.29
7	Mason	0	0	0	0
8	Carpenter	2	0	2	0.06

SL No.	Occupation	Male	Female	Total	%
9	Unemployed	0	0	0	0
10	Doctor	0	0	0	0
11	Ayurveda physician	0	0	0	0
12	Student	309	197	506	16.38
13	Aged Person	3	21	24	0.78
14	Retired Person	0	0	0	0
Total		**1807**	**1283**	**3090**	**100**

Source: *Field Survey of AECL Team*

4.17.1.9 Per capita income of surveyed HHs

The total surveyed based on per capita income. Table demonstrates per capita income distribution of the project area. It is clear that out of the 1054 HHs surveyed, 273 incomes fall below the poverty line.

Table 4.38: Per capita income of surveyed HHS

SL	Yearly Level of Income (BDT)	Total	
		No.	%
1	Up to 100000	273	25.90
2	100000 to 120000	148	14.04
3	120001 to 180000	309	29.32
4	180001 to 240000	222	21.06
5	240001 to 360000	63	5.98
6	360001 to 480000	16	1.52
7	480001 to 600000	14	1.33
8	Above 600000	9	0.85
Total		**1054**	**100**

Source: *Field Survey of AECL Team*

4.17.1.10 Drinking Water Facility

In transmission line area, 74.19% of general households have got the facility of drinking tube well water, 1.43% tap water and the remaining 24.38% household gets water from other sources.

Table 4.39: Drinking Water Facility of surveyed HHS

SL	Drinking Water source	Total	
		No.	%
1	Tube well	782	74.19
2	Tap water	15	1.43
3	Other sources	257	24.38

SL	Drinking Water source	Total	
		No.	%
Total		**1054**	**100**

Source: *Field survey of AECL team*

4.17.1.11 Sanitation

In the transmission line area, 67.27% of general household use sanitary facility, 31.50% non-sanitary latrine and 1.23% have no toilet facility.

Table 4.40: Sanitation Facility of surveyed HHS

SL	Sanitation Facility	Total	
		No.	%
1	Proper sanitary latrine	709	67.27
2	Non- sanitary latrine	332	31.50
3	No toilet facility	13	1.23
Total		**1054**	**100**

Source: *Field survey of AECL team*

4.17.1.12 Access to Electricity

The entire Pabna Sadar upazila have brought under the Rural Electrification Program. However, a total of 73.5% of the survey households in transmission line area reported to have electricity connection. (***Source:*** *Field survey of AECL team*)

4.17.2 Socio-economic Conditions of Transmission Line Area

Socio-economic details of the Transmission line area households were collected during the social baseline survey. The socio-economic profile of the surveyed HHs is consequently presented following demographic profile of the HHs. A total of 79 HHs comprises of 257 people has been surveyed with average HH size 3.25.

Table 4.41: General Profile of Surveyed Population

Category	Total
Number of total surveyed Households /Units	79
Number of total Population	257
Average HHs Size	3.25

Source: *Field survey of AECL Team*

4.17.2.1 Demographic Profile of Project Area Households

Demographic profile of the affected community has been analyzed as a part of socio- economic profile of the project area. This comprises of gender profile and age-sex distribution of the project affected communities. Precisely, it can be stated that the area lacks gender parity as 97.47% male headed and 2.53 female headed HHs are found during census period. The general scenario in Bangladesh is same as most of the HHs head are male. Age-sex ratio indicates that majority of the population are within the age limit of 15-59.

4.17.2.2 Distribution of Household Population

Distribution of HH population is presented in the table below. It indicates that majority of the HHs have 3-4 members. It is interesting that 14 HHs have only 1-2 members. HH size of within 7 to 8 members was minimal in the area. Distribution of HH population is presented by area-wise in the illustration:

Table 4.42: Distribution of HH population

SL No.	Number of household members	Total	
		HH	%
1	1 to 2	14	17.72
2	3 to 4	61	77.22
3	5 to 6	3	3.80
4	7 to 8	1	1.27
5	9 to 10	0	0
6	10+	0	0
	Total	**79**	**100**

Source: *Field Survey of AECL Team*

4.17.2.3 Age and Sex Distribution of project area Population

Age-sex distribution of the surveyed 79 HHs was measured during the census and IOL survey. It was found that population density increases respectively from the age group of 1-60. According to the age band, the most prominent group is 30-60. The number of surveyed persons steadily decreases with increasing age limit above 60. It is the almost similar to the national scenario. Details see in **Table 4.43**.

Table 4.43: Age Sex Distribution of Surveyed Population

SL	Age Group (Years)	Male		Female		Total	Overall
			%		%		%
1	01 to 05	0	0	2	1.74	2	0.78
2	06 to 15	26	18.31	14	12.17	40	15.56
3	16-30	35	24.65	38	33.04	73	28.40
4	31-60	76	53.52	57	49.57	133	51.75
5	61-65	2	1.41	2	1.74	4	1.56
6	Above 65	3	2.11	2	1.74	5	1.95
Total		**142**	**100**	**115**	**100**	**257**	**100**

Source: *Field Survey of AECL Team*

4.17.2.4 Sex Profile of Project Area Households

The percentage of male populations are greater than female in the project area. At project area total of 256 populations will be surveyed where 142 are male and 114 are female, which represents that percentage of female population in the project area is less compared to the male population.

4.17.2.5 Marital Status

Among the 257 surveyed population around the project area, 170 people are above 18 years. Any person below 18 years are not allowed to marry in Bangladesh. No people below the age of 18 are found married. It is found that 66.15% people are married against 33.85% unmarried. This means that child marriage is not that common in the project area and widows/widowers are not found in project survey areas.

Table 4.44: Marital Status of Male & Female population (18 years above)

SL	Marital Status	Male	%	Female	%	Total	%
1	Married	89	62.68	81	70.43	170	66.15
2	Unmarried	53	37.32	34	29.57	87	33.85
3	Abandoned	0	0	0	0	0	0
4	Widow	0	0	0	0	0	0
Total		**142**	**100**	**115**	**100**	**257**	**100**

Source: *Field Survey of AECL Team*

4.17.2.6 Household by Religion

It is found that Islam is the predominant religion in the study area (100%). Among the surveyed people there is no other religion.

4.17.2.7 Education Level of Surveyed Population (6 Years and above)

Education level of the surveyed population is presented in the table below. Among the surveyed 257 populations, 251 populations are at the age of above 6 years and 6 people are below the age of 6 years who has not started the school yet. The table demonstrates that primary and secondary level education entrance is high in the area and considered the people above the age of 6 (251 population). But dropout rate is very high as the number of people sharply decreases from secondary certificate achievers. It also indicates that education rate is higher among male population than female. Also, illiteracy is higher among female population than male population.

Table 4.45: Level of Education of Surveyed Population (6 Years and above)

SL	Education Level	Male	%	Female	%	Total	%
1	Up to class five/ Ebtedaye Madrasa	31	21.83	22	19.13	53	20.62
2	Class six to ten	23	16.19	30	26.09	53	20.62
3	SSC or equivalent	27	19.01	12	10.43	39	15.18
4	HSC or equivalent	18	12.68	18	15.65	36	14.01
5	BA or equivalent	6	4.23	4	3.48	10	3.89
6	MA or equivalent	0	0	0	0	0	0
7	Illiterate	18	12.68	10	8.70	28	10.89
8	Can sign only	19	13.38	19	16.52	38	14.79
Total		**142**	**100**	**115**	**100**	**257**	**100**

Source: *Field Survey of AECL Team*

4.17.2.8 Occupation of the Population

There are varieties number of occupations have been identified during survey of the project. The population distribution according to gender engaged in various Primary Occupations is presented in tabular form below. A variety of occupational choices have been found in the project location, and majority are farmer. Female population are mostly unemployed. In addition to agriculture, the other significant occupations are involvement with business, service, day labour, service, doctor, and mason etc. Apart from these, a minimal number of populations have been identified as unemployed in the form of retired person and aged persons.

Table 4.46: Distribution of Surveyed People by occupation (15 years and above)

SL No.	Occupation	Male	Female	Total	%
1	Agriculture	31	1	32	13.62
2	Service holder	6	2	8	3.40

SL No.	Occupation	Male	Female	Total	%
3	Housewife/Househusband	2	78	80	34.04
4	Business	1	0	1	0.43
5	Day Laborer	31	1	32	13.62
6	Driver	3	0	3	1.28
7	Mason	0	0	0	0
8	Carpenter	0	0	0	0
9	Unemployed	0	0	0	0
10	Doctor	0	0	0	0
11	Ayurveda physician	1	0	1	0.43
12	Student	46	29	75	31.91
13	Aged Person	1	1	2	0.85
14	Retired Person	1	0	1	0.43
Total		**123**	**112**	**235**	**100**

Source: *Field Survey of AECL Team*

4.17.2.9 Per capita income of surveyed HHs

The total surveyed based on per capita income. Table demonstrates per capita income distribution of the project area. Out of the 79 HHs surveyed, 15 incomes fall below the poverty line.

Table 4.47: Per capita income of surveyed HHS

SL	Yearly Level of Income (BDT)	Total	
		No.	%
1	Up to 100000	16	20.25
2	100000 to 120000	2	2.53
3	120001 to 180000	22	27.85
4	180001 to 240000	11	13.92
5	240001 to 360000	21	26.58
6	360001 to 480000	3	3.80
7	480001 to 600000	3	3.80
8	Above 600000	1	1.27
Total		**79**	**100**

Source: *Field Survey of AECL Team*

4.17.2.10 Drinking Water Facility

In transmission line area, 92.04% of general households have got the facility of drinking tube well water, 4.1% tap water and the remaining 3.86% household gets water from other sources.

Table 4.48: Drinking Water Facility of surveyed HHS

SL	Drinking Water source	Total	
		No.	%
1	Tube well	72	92.04
2	Tap water	3	4.1
3	Other sources	4	3.86
Total		**79**	**100**

Source: *Field survey of AECL team*

4.17.2.11 Sanitation

In the transmission line area, 67% of general household use sanitary facility, 27.6% non-sanitary latrine and 4.3% have no toilet facility.

Table 4.49: Sanitation Facility of surveyed HHS

SL	Sanitation Facility	Total	
		No.	%
1	Proper sanitary latrine	53	67
2	Non- sanitary latrine	21	26.4
3	No toilet facility	5	6.6
	Total	79	100

Source: *Field survey of AECL team*

4.17.2.12 Access to Electricity

The entire Pabna Sadar upazila have brought under the Rural Electrification Program. However, a total of 68.7% of the survey households in transmission line area reported to have electricity connection. (***Source:*** *Field survey of AECL team*)

4.18 Ecology (Flora and Fauna)

Bangladesh has realm number of biological diversities for its geographical location and favorable climatic condition for life. Biodiversity is facing unprecedented levels of threat due to unwise industrialization. For the reasons, it has become imperative to assay diversity prior to any big set up. Understanding biological diversity in terms of the processes by which ecosystems and their component function, be it at community, species, population, or genetic levels, is critical to informing its sustainable use and safeguarding it for the benefit of future generations.

4.18.1 Primary Study Methodology

A comprehensive survey was conducted at the vicinity of the proposed project area. The baseline ecological survey has been conducted on and from 7th – 9th February 2023 and 14th – 17th August, 2023 to get an idea about the status of the diversity of Flora and Fauna in that area. The basic methodological approaches which were followed for the present baseline work are:

- Field survey,
- Visual observations,
- Review of literature,
- Secondary available data,
- By interviewing local people,
- Data analysis and interpretation.

4.18.2 Ecological Field Survey

According to the AECL field survey, habitat type around the project area including the Transmission Line area is described below

- **Agricultural land around the T/L**: This land is usually used for one or two types of paddy cultivation such as (rice, wheat, banana etc.). Transmission lines are passing through agricultural land. Least diversity of floral community is present there. Some modified habitat of fauna such as Bengal mongoose, common toads, local birds, yellow speckled wolf snake and small mammals etc. are present there.
- **Near Settlements**: Habitats around the settlements area are mostly comprises of tall fruit plants (mango, litchi, coconut, banana) with underground natural shrub and climber species diversity. Some modified habitat of fauna such as pigeon, domestic chicken, duck, cat, dog, domestic cow, goat and crow etc. are present there.
- **Roadside Habitats:** Roadside vegetation near the main power plant site is generally planted and the vegetation developed an ecosystem which is dominated by hard wood and economic tree species. Major species are found along the roadside of study area are Mango (*Mangifera indica)*, litchi (*Litchi chinensis Sonn.*), banana (*Musa acuminata*), Akashmoni (*Acacia auriculiformis*), Bot (*Ficus benghalensis L.*), Eucalyptus (*Eucalyptus camaldulensis*) etc. In most cases, this plantation program is considered under public-private partnership afforestation. Some terrestrial fauna such as local birds (Common Myna, King Crows, Magpie Robin etc.), domestic cows, Bengal mongoose etc.

Transmission Line Area Ecosystem

Roadside Ecosystem

Settlements Ecosystem

Around Project Area Ecosystem

Figure 4.36: Ecological diversity of the project area surroundings

4.18.3 Flora

4.18.3.1 Terrestrial Flora

Detail lists of Terrestrial Flora found during our field visit in main power plant and transmission line area are presented in **Table 4.50 and Table 4.51.**

Table 4.50: Terrestrial Flora around the Main Power Plant Area

Sl. No.	Local name	Scientific name	Family name	Habit	Plant group
1.	Papaya	*Carica papaya*	Caricaceae	Herb	Dicot
2.	Aam	*Mangifera indica*	Anacardiaceae	Tree	Dicot
3.	Kachu	*Colocasia esculenta*	Araceae	Herb	Mocot
4.	Bel	*Aegle marmelos (L.) Corr.*	Rutaceae	Tree	Dicot
5.	Jam	*Syzygium cumini (L.) Skeels*	Myrtaceae	Tree	Dicot
6.	Kathal	*Artocarpus heterophyllus Lamk.*	Moraceae	Tree	Dicot
7.	Kamranga	*Averrhoa carambola L.*	Oxalidaceae	Tree	Dicot
8.	Neem	*Azadirachta indica A. Juss.*	Meliaceae	Tree	Dicot
9.	Narical	*Cocos nucifera L.*	Arecaceae	Tree	Mocot
10.	Ata, Nona Ata	*Annona reticulate L.*	Annonaceae	Tree	Dicot
11.	Shorifa	*Annona squamosa L.*	Annonaceae	Shrub	Dicot
12.	Akond	*Calotropis gigantea (L.) R. Br.*	Asclepiadaceae	Shrub	Dicot
13.	Ghash	*Chloris barbata Sw.*	Poaceae	Herb	Monocot
14.	Lotagach	*Cissampelos pareira*	Menispermaceae	Climber	Dicot
15.	Jambura	*Citrus grandis (L.) Osbeck.*	Rutaceae	Tree	Dicot
16.	Misti alu	*Ipomoea batatas (L.) Poir.*	Convolvulaceae	Creeper	Dicot
17.	Jui	*Jasminum sambac (L.) Ait.*	Oleaceae	Shrub	Dicot
18.	Muthaghas	*Kyllinga microcephala Steud.*	Cyperaceae	Herb	Monocot
19.	Shim	*Lablab purpureus (L.) Sweet*	Fabaceae	Climber	Dicot
20.	Mistikumra	*Cucurbita maxima Duch. ex Lamk.*	Cucurbitaceae	Climber	Dicot
21.	Durba	*Cynodon dactylon (L.) Pers.*	Poaceae	Herb	Mocot
22.	Chalta	*Dillenia indica L.*	Dilleniaceae	Tree	Dicot
23.	Deshigab	*Diospyros peregrina Guerke*	Ebenaceae	Tree	Dicot
24.	Eucalyptus	*Eucalyptus camaldulensis*	Myrtaceae	Tree	Dicot

Sl. No.	Local name	Scientific name	Family name	Habit	Plant group
25.	Bot	*Ficus benghalensis L.*	Moraceae	Tree	Dicot
26.	Jhinga	*Luffa cylindrica (L.) M. Roem.*	Cucurbitaceae	Climber	Dicot
27.	Gora Neem	*Melia azedarach L.*	Meliaceae	Tree	Dicot
28.	Shayndhamaloti	*Mirabilis jalapa L.*	Nyctaginaceae	Herb	Dicot
29.	Shojna	*Moringa oleifera Lamk.*	Moringaceae	Tree	Dicot
30.	Tetul	*Tamarindus indica L.*	Caesalpiniaceae	Tree	Dicot
31.	Lau	*Lagenaria siceraria (Molina) Standl.*	Cucrbitaceae	Climber	Dicot
32.	Mehedi	*Lawsonia inermis L.*	Lythraceae	Tree	Dicot
33.	Litchu	*Litchi chinensis Sonn.*	Sapindaceae	Tree	Dicot
34.	Tomato	*Solanum lycopersicum Dunal*	Solanaceae	Herb	Dicot
35.	Begun	*Solanum melongena L.*	Solanaceae	Herb	Dicot
36.	Kata begun	*Solanum sisymbriifolium Lam.*	Solanaceae	Shrub	Dicot
37.	Korolla	*Momordica charantia L.*	Cucurbitaceae	Climber	Dicot
38.	Kul, Boroi	*Ziziphus mauritiana Lamk.*	Rhamnaceae	Tree	Dicot
39.	Peyara	*Psidium guajava L.*	Myrtaceae	Tree	Dicot
40.	Bon Tulshi	Croton banplandianum	Euphorbiaceae	shrub	Dicot
41.	Hatisur	*Heliotropium indicum*	Asteraceae	Herb	Dicot
42.	Mundi	*Sphaeranthus indicus*	Asteraceae	Herb	Dicot

Source: *Field survey of AECL team*

Table 4.51: Terrestrial Flora around the Transmission Line Area

Sl. No.	Local name	Scientific name	Family name	Habit	Plant group
1.	Aam	*Mangifera indica*	Anacardiaceae	Tree	Dicot
2.	Bon Tulshi	Croton banplandianum	Euphorbiaceae	shrub	Dicot
3.	Hatisur	*Heliotropium indicum*	Asteraceae	Herb	Dicot
4.	Kathal	*Artocarpus heterophyllus Lamk.*	Moraceae	Tree	Dicot
5.	Papaya	*Carica papaya*	Caricaceae	Herb	Dicot
6.	Mundi	*Sphaeranthus indicus*	Asteraceae	Herb	Dicot
7.	Neem	*Azadirachta indica A. Juss.*	Meliaceae	Tree	Dicot
8.	Narical	*Cocos nucifera L.*	Arecaceae	Tree	Mocot
9.	Banana	*Musa acuminata*	Musaceae	Herbaceous	Monocot
10.	Litchu	*Litchi chinensis Sonn.*	Sapindaceae	Tree	Dicot
11.	Akond	*Calotropis gigantea (L.) R. Br.*	Asclepiadaceae	Shrub	Dicot
12.	Ghash	*Chloris barbata Sw.*	Poaceae	Herb	Monocot
13.	Lotagach	*Cissampelos pareira*	Menispermaceae	Climber	Dicot
14.	Jambura	*Citrus grandis (L.) Osbeck.*	Rutaceae	Tree	Dicot
15.	Misti alu	*Ipomoea batatas (L.) Poir.*	Convolvulaceae	Creeper	Dicot
16.	Jui	*Jasminum sambac (L.) Ait.*	Oleaceae	Shrub	Dicot
17.	Muthaghas	*Kyllinga microcephala Steud.*	Cyperaceae	Herb	Monocot
18.	Eucalyptus	*Eucalyptus camaldulensis*	Myrtaceae	Tree	Dicot
19.	Bot	*Ficus benghalensis L.*	Moraceae	Tree	Dicot
20.	Tetul	*Tamarindus indica L.*	Caesalpiniaceae	Tree	Dicot
21.	Rice	*Oryza sativa*	Poaceae	Herb	Monocot
22.	Tomato	*Solanum lycopersicum Dunal*	Solanaceae	Herb	Dicot

Sl. No.	Local name	Scientific name	Family name	Habit	Plant group
23.	Begun	*Solanum melongena L.*	Solanaceae	Herb	Dicot
24.	Korolla	*Momordica charantia L.*	Cucurbitaceae	Climber	Dicot
25.	Wheat	*Triticum aestivum L.*	Poaceae	Herb	Monocot
26.	Kata begun	*Solanum sisymbriifolium Lam.*	Solanaceae	Shrub	Dicot
27.	Kathali kola	*Musa paradisiaca*	Musaceae	Herbaceous	Monocot
28.	Thankuni	*Centella asiatica* (L.) Urban	Apiaceae	Creeper	Dicot
29.	Botua shak	*Chenopodium album* L.	Chenopodiaceae	Herb	Dicot
30.	Jhonjhoni	Crotalaria pallida Ait.	Fabaceae	Herb	Dicot
31.	Banmarich	Croton bonplandianus Baill.	Euphorbiaceae	Herb	Dicot
32.	Gimashak	Glinus oppositifolius (L.) A. DC.	Molluginaceae	Herb	Dicot

Source: *Field survey of AECL team*

Carica papaya

Cocos nucifera

Musa Sepientum

Mangifera indica

Phoenix sylvestris

Colocasia esculenta

Swietenia macrophylla

Psidium guajava

Areca catechu

Ficus racemosa

Zizyphus mauritiana

Borassus flabellifer

Bambusa bambus

Casuarina equisetifolia

Oryza sativa

Albizia chinensis

Sonneratia apetala

Excoecaria agallocha

Figure 4.37: Terrestrial Flora around the project area

4.18.3.1 Aquatic Flora

Aquatic flora is divided into three major types - tree, shrub, and herb. Aquatic floral species grow in rivers, canals, ditches, seasonal wetland, and low-lying agricultural lands in submerged, free floating, or rooted floating states. Common aquatic floral species in the study areas include Kalmi Shak (*Ipomoea aquatica*), Shapla (*Nymphaea nouchali*), Helencha (*Enhydra fluctuans*), Kuchuripana (*Eichhornia crassipes*) are also seen. No water bodies are crossed by the transmission line.

Ipomoea aquatica

Eichhornia crassipes

Nymphaea nouchali

Enhydra fluctuans

Figure 4.38: Aquatic Flora around the project area

4.18.4 Fauna

4.18.4.1 Terrestrial Fauna

The study was based on field survey methods where an appropriate questionnaire was prepared and used for collecting data from different sampling locations. During collection of data, both primary and secondary sources were considered to interpret the results. Primary data were collected from fishermen through questionnaire interviews and from the local fish markets. The secondary information was collected from books, journals, and thesis and also discussion with the local people. After collecting the data through questionnaire interviews, it was cross-checked through interviews of school teachers, local leaders in the study area. Finally, data were analyzed. List of Fauna Identified in

and around the main power plant and transmission line area are mentioned below **Table 4.52 and Table 4.53** respectively**.**

Table 4.52: List of Terrestrial Fauna Identified in and around the Main Power Plant Area

Sl. no	English name	Scientific name	Local Name	Conservational status	
				IUCN Bangladesh status	IUCN Global status
Amphibians					
1.	Skipper Frog	*Rana cyanophlyctis*	Kotkoti Bang	LC	LC
2.	Bull Frog	*Rana tigrina*	Sona Bang, Kola Bang	LC	LC
3.	Common Toad	*Bufo melanostictus*	Kuno Bang	LC	LC
Reptiles					
1.	House Lizard	*Hemidactylus brookii*	Goda Tiktiki	LC	NE
2.	Common House Gecko	*Hemidactylus frenatus*	Mosrin Tiktiki	LC	LC
Birds					
1.	Marsh harrier	*Circus aeruginosus*	Poshchima Pankapashi	LC	LC
2.	Black Kite	*Milvus migrans*	Bhubon Chil	LC	LC
3.	Cattle Egret	*Bubulcus ibis*	Go-Boga	LC	LC
4.	Black Hooded Oriole	*Oriolus xanthornus*	Halde pakhi	LC	LC
5.	Common Myna	*Acridotheres tristis*	Shalik	LC	LC
6.	Red-vented bulbul	*Pycnonotus cafer*	Bangla Bulbul	LC	LC
7.	Tailor Bird	*Orthotomus sutorious*	Tuntuni	LC	LC
8.	White-rumped Shama	*Copsychus malabaricus*	Shama	LC	LC
9.	House Sparrow	*Passer domesticus*	Pati Chorui	LC	LC
10.	Baya Weaver	*Ploceus phillippinus*	Babui	LC	LC
11.	Eagles	*Accipiter badius*	Pati Shikre	LC	LC
12.	Cuckoos	*Cuculus micropterus*	Kokil	LC	LC
13.	King Crows	*Dicrurus adsimilis*	Kak	LC	LC
14.	House Crows	*Corvus splendens*	Pati Kak	LC	LC
15.	Magpie Robin	*Copsychus saularis*	Doel	LC	LC
Mammalian					
1.	Pallas's Squirrel	*Callosciurus erythraeus*	Lalche-buk Kathbirali	LC	LC
2.	Bengal mongoose	*Herpestes edwardsii*	Boro Beji	LC	LC
3.	House Mouse	*Mus musculus*	Indur	LC	LC

Sl. no	English name	Scientific name	Local Name	Conservational status	
				IUCN Bangladesh status	IUCN Global status
4.	Indian Flying Fox	*Pteropus giganteus*	Baro Badur	LC	LC
5.	Domestic Goat	*Capra aegagrus hircus*	Chhagol	LC	-
6.	Domestic Cow	*Bos Taurus*	Goru	LC	-
Not Evaluated (NE), Data Deficient (DD), Least Concern (LC), Near Threatened (NT), Vulnerable (VU), Endangered (EN), Critically Endangered (CR), Not Added (N/A)					

Source: *Field survey of AECL team*

Table 4.53: List of Terrestrial Fauna Identified in and around the Transmission Line Area

Sl. no	English name	Scientific name	Local Name	Conservational status	
				IUCN Bangladesh status	IUCN Global status
Amphibians					
1.	Skipper Frog	*Rana cyanophlyctis*	Kotkoti Bang	LC	LC
2.	Bull Frog	*Rana tigrina*	Sona Bang, Kola Bang	LC	LC
3.	Common Toad	*Bufo melanostictus*	Kuno Bang	LC	LC
Reptiles					
1.	Common House Gecko	*Hemidactylus frenatus*	Mosrin Tiktiki	LC	LC
2.	Yellow speckled wolf snake	*Lycodon jara*	Ghorginni Shap	LC	LC
Birds					
1.	Marsh harrier	*Circus aeruginosus*	Poshchima Pankapashi	LC	LC
2.	Black Kite	*Milvus migrans*	Bhubon Chil	LC	LC
3.	Cattle Egret	*Bubulcus ibis*	Go-Boga	LC	LC
4.	Black Hooded Oriole	*Oriolus xanthornus*	Halde pakhi	LC	LC
5.	Common Myna	*Acridotheres tristis*	Shalik	LC	LC
6.	Red-vented bulbul	*Pycnonotus cafer*	Bangla Bulbul	LC	LC
7.	Tailor Bird	*Orthotomus sutorious*	Tuntuni	LC	LC
8.	King Crows	*Dicrurus adsimilis*	Kak	LC	LC
9.	House Crows	*Corvus splendens*	Pati Kak	LC	LC
10.	White-rumped Shama	*Copsychus malabaricus*	Shama	LC	LC
11.	House Sparrow	*Passer domesticus*	Pati Chorui	LC	LC
12.	Baya Weaver	*Ploceus phillippinus*	Babui	LC	LC

Sl. no	English name	Scientific name	Local Name	Conservational status	
				IUCN Bangladesh status	IUCN Global status
13.	Owl	*Strigiformes*	Pecha	LC	LC
14.	Cuckoos	*Cuculus micropterus*	Kokil	LC	LC
15.	Magpie Robin	*Copsychus saularis*	Doel	LC	LC
Mammalian					
1.	Bengal mongoose	*Herpestes edwardsii*	Boro Beji	LC	LC
2.	House Mouse	*Mus musculus*	Indur	LC	LC
3.	Indian Flying Fox	*Pteropus giganteus*	Baro Badur	LC	LC
4.	Fox	*Canis aureus*	Shial	LC	LC
5.	Jungle cat	*Felis chaus*	Bon biral	LC	LC
6.	squirrle	*Funambulus pennanti*	Dura katbrali	LC	LC
Not Evaluated (NE), Data Deficient (DD), Least Concern (LC), Near Threatened (NT), Vulnerable (VU), Endangered (EN), Critically Endangered (CR), Not Added (N/A)					

Source: *Field survey of AECL team*

4.18.4.2 Aquatic Fauna

There are different types of fishes present the waterbody of surrounding main power plant area. No significant water body was found around the transmission line area except some small local pond during ecological field survey. So, some of the commonly available fishes and other aquatic fauna both in the main power plant and transmission line area are mentioned below in **Table 4.54.**

Table 4.54: List of Aquatic fauna around the project area

Sl No.	Common English Name	Scientific Name	Local Name	Red List Category	
				IUCN Bangladesh status	IUCN Global status
Fish Fauna					
1.	Rohu	*Labeo Rohita*	Rui	LC	LC
2.	Catla	*Catla catla*	Katla	LC	NE
3.	Stinging Catfish	*Saccobranchus fossilis*	Shing	LC	LC
4.	Striped Gourami	*Colisa fasciatus*	Kholsha	LC	LC
5.	Bleeker's Mystus	*Mystus bleekeri*	Tengra	LC	LC
6.	Walking Catfish	*Clarias batrachus*	Magur	LC	LC
7.	Snakehead Murrel	*Channa striatus*	Shol	LC	LC

Sl No.	Common English Name	Scientific Name	Local Name	Red List Category	
				IUCN Bangladesh status	IUCN Global status
8.	River Shad, Hilsha Shad	*Tenualosa ilisha*	Ilish, Ilsha	LC	LC
9.	Snakehead	*Channa gachaua*	Cheng	LC	LC
10.	Tank Goby	*Glossogobius giuris*	Baila	LC	LC
11.	Black Rohu	*Labeo calbasu*	Kalbaosh, Baus	LC	LC
12.	Elongate Glassy Perchlet	*Chanda nama*	Chanda	LC	LC
13.	Climbing Perch Fish	*Anabas testudineus*	Koi	LC	LC
14.	Pama Croaker, Pama	*Otolithoides pama*	Poa	LC	NE
15.	Mozambique tilapia	*Oreochromis mossambicus*	Tilapia	N/A	-
16.	Silver Carp	*Hypophthalmichthys molitrix*	Silver Carp	N/A	-
17.	Grass Carp	*Ctenopharyngodon idella*	Grass Carp	N/A	-
Other Fauna (Birds)					
1.	Bar headed goose	*Anser indicus*	Raj Hans	LC	LC
2.	Greenleg goose	*Anser anser*	Metey Rajhash	LC	LC
3.	Indian Pond Heron	*Ardeola grayii*	Kani Bok	LC	LC
4.	Little cormorant	*Phalacrocorax niger*	Pankawri	LC	LC
5.	Waterhen	*Amaurornis phoenicurus*	Dahuk	LC	LC
6.	Pintail	*Anas acuta*	Lenja Hans	LC	LC
7.	Watercock	*Gallicrex cinerea*	Kora	LC	LC

Source: *Field survey of AECL team*

4.18.5 Findings from Ecological Survey

According to the field survey, there is no critical and natural habitat present in and around the project area. Few alien invasive flora i.e., Eucalyptus and water hyacinth, some alien invasive fauna i.e., grass carp and silver carp are present in and around the project area. List of existing flora and fauna are mentioned in **Table 4.50 – Table 4.54** and they all fall under least concern category according to IUCN.

Any endangered, vulnerable or threatened faunal species were not found during the field visit around the main power plant area as well as transmission line area. There are some nocturnal animals around the project site, but their movement will not be hampered as the construction work will not be undertaken at night time.

According to the study *Pteropus giganteus* (Indian Flying Fox) was found in the study area. But the population of them was not significant, it was rarely common and there is no large roost of them. We considered 0.5 km on both sides of the transmission line as the area of influence and baseline study was undertaken along that strip.,The TL runs through mostly agricultural land but there are few residential areas around the TL route. Normally there are fruit trees around the residential area of Bangladesh. The *Pteropus giganteus* (Indian Flying Fox) feeds mainly on ripe fruits, such as mangoes and bananas etc. So, they are seen occasionally during those fruit seasons.

According to a study (Hasan, M. K., Feerez, M. M., Datta, A. K., Saha, A., & Ahmed, T. (2014). Indian flying fox (*Pteropus giganteus*) roosts in north Bengal of Bangladesh.) *Pteropus giganteus* (Indian Flying Fox) roosters are not present in the Pabna District. The map of Location of the bat roosts in northern part of Bangladesh is shown in Figure 4.39

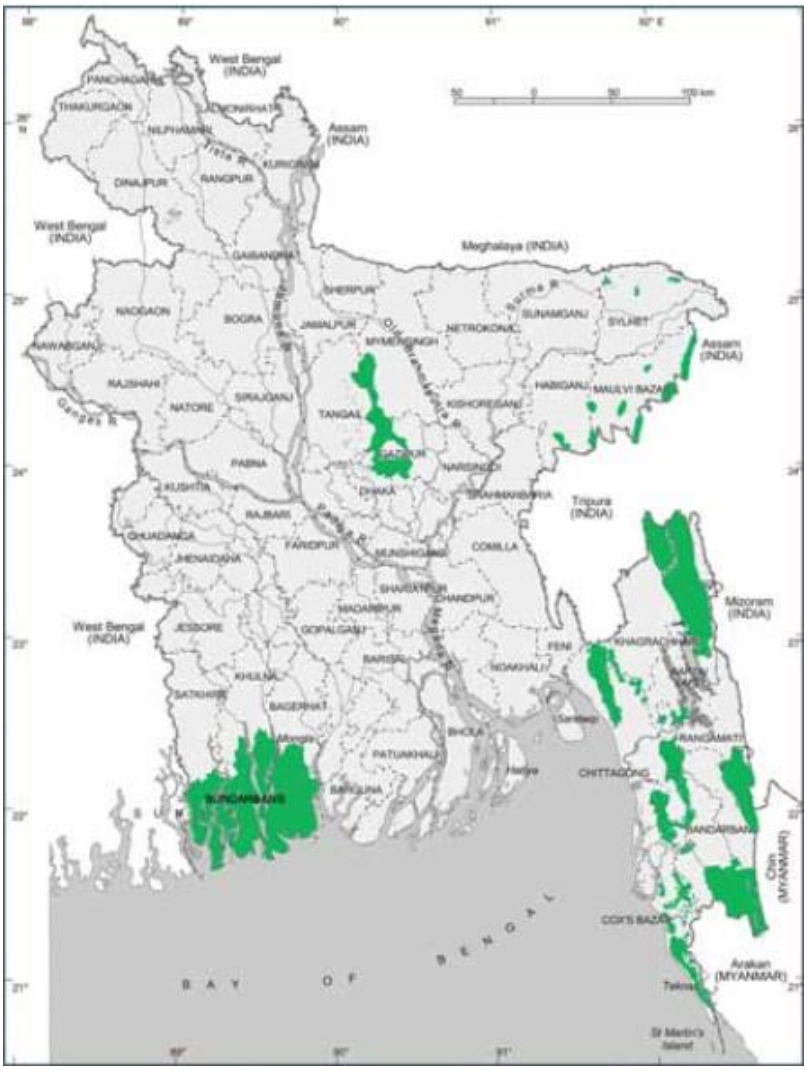


Figure 4.39: Location of the bat roosts in northern part of Bangladesh.

Amphibian	Reptile
	
Rana cyanophlyctis	***Hemidactylus brooki***

Aves		
		
Corvus splendens	***Passer domesticus***	***Acridotheres tristis***

Ploceus phillippinus

Accipiter badius

Dicaeum erythrorhynchos

Copsychus saularis

Milvus migrans

Mammals		
		
Mus musculus	***Capra aegagrus hircus***	***Bos Taurus***

Figure 4.40: Terrestrial Fauna around the project area

Fish Fauna

Catla catla

Tenualosa ilisha

Channa striatus

Anabas testudineus

Clarias batrachus

Mystus bleekeri

Other Fauna

Anser indicus

Anser anser

Ardeola grayii

Anas acuta

Phalacrocorax niger

Amaurornis phoenicurus

Figure 4.41: Aquatic Fauna around the project area

Chapter 5

5 IDENTIFICATION OF POTENTIAL IMPACT

5.1 General Consideration

In case for most projects, potential negative impacts sometime could be far more numerous than beneficial impacts. The regional and national economic benefits associated with the implementation of any development project are considered to fall outside the scope of an IEE, and therefore not considered here. However, it is generally expected that these long-term benefits will ultimately trickle down to the local population and will make a contribution to an improvement in the quality of life. Likewise, the indirect benefits of strengthening of technical capabilities of local persons through association with foreign experts and other training elements that may form part of a project have been considered to fall outside the scope of IEE.

5.2 Scoping of Impacts

Identification of potential impacts due to the Pre-construction, construction and operation of the Project has been done using checklist/impact interaction matrix **(Table 5.1).** In this matrix major, proposed activities related to the project which may create significant impacts have been presented. Identification and prediction methodology for impacts has been described in **Annexure 9.**

Table 5.1: Impact Evaluation and Identification table

Action Affecting Environmental Resources & Values	Impact Duration			Impact Extent			Impact Scale				SEIs Magnitude without Mitigation Measures				Type		Comments
	ST	MT	LT	L	R	N	No	Lo	Med	Hig	Neg	Min	Mod	Maj	Adv	Ben	
Pre-construction Phase																	
Land Acquisition and Resettlement																	400 acres of land will be purchased by willing buyer and willing seller process for the power plant site where there are no informal land users. For the TL 0.7642 acres for 79 tower footings where there is no informal land user, infrastructure or share cropper. Construction of the TL will cause temporary crop damage and restriction in RoW land use which will be compensated for with cash. According to the socio-economic survey, no HHs will be affected by the main site land acquisition and the TL.
Disruption of Earth Surface and Impact due to land filling																	Cutting and filling method will be applied to maintain ground level elevation of 12.3m PWD. In addition to that, some outsourced sand used for land development work. As the sand was procured from nearby river of Kushtia District according to

Action Affecting Environmental Resources & Values	Impact Duration			Impact Extent			Impact Scale				SEIs Magnitude without Mitigation Measures				Type		Comments
	ST	MT	LT	L	R	N	No	Lo	Med	Hig	Neg	Min	Mod	Maj	Adv	Ben	
																	the government guideline for sand collection so there won't be any impact due to land filling
Change in Landscape																	Comparative to adjacent rural and agricultural setup
Impact on ecological habitats																	Due to land development work, there will be temporary impact on ecological habitat
Indigenous people																	No existence of indigenous people within 5km radial zone of the project site; No impact anticipated
Cultural Heritage site																	No cultural heritage site within 5km radial zone of the project area; No impact anticipated
Construction Phase																	
Air Quality																	Dust emission may occur during excavation and construction activity and traffic movement will also cause additional air emission
Noise Hazard																	Equipment installations and constructional work may create noise and vibration
Land Use																	Agricultural land may be permanently lost due to the

Action Affecting Environmental Resources & Values	Impact Duration			Impact Extent			Impact Scale				SEIs Magnitude without Mitigation Measures				Type		Comments
	ST	MT	LT	L	R	N	No	Lo	Med	Hig	Neg	Min	Mod	Maj	Adv	Ben	
																	tower footing and power plant construction.
Impact on Soil quality																	Accidental spillage of different chemicals and hazardous substances may occur occasionally
Impact on Surface Water																	Improper management of soil, sand and other fine materials and surface runoff from the site
Impact on Ground Water																	Improper management of liquid waste and accidental spillage or seepage of different chemicals and over extraction of ground water
Impact due to Solid Waste																	Generation of different kinds of solid and liquid waste, office waste from constructional work and labour camp
Hazardous Materials Managements																	Accidental spillage of liquid fuel, lubricants, other chemical and generation of e-waste may occur occasionally. Leaching from PV module due to improper handling
Traffic and Transportation																	Transportation of construction materials and personnel may create traffic congestion and

Action Affecting Environmental Resources & Values	Impact Duration			Impact Extent			Impact Scale				SEIs Magnitude without Mitigation Measures				Type		Comments
	ST	MT	LT	L	R	N	No	Lo	Med	Hig	Neg	Min	Mod	Maj	Adv	Ben	
																	occasional accidents around the project area
Impact on Terrestrial Habitat																	Due to constructional work, amphibians and aves may be impacted
Impact on Aquatic Habitat																	Discharge of liquid waste and different constructional waste, chemicals etc. may impact aquatic habitat
Occupational Health and Safety																	Irregularly accidents, injury of laborers' may occur in construction period
Sanitation Hazard & Drinking Water																	Concentration of labour force may create un-hygienic condition and lack of safe drinking water may cause diseases
Labor and Working Condition																	Improper maintenance of standard salary, salary deductions; hours of work; overtime arrangements
Social acceptability of Construction workers to the host communities																	Acceptability problem of Local community may occur due to cultural difference with foreign workers
Community Health, Safety and Security																	Possibility of occurring accidents due to lack of safety

Action Affecting Environmental Resources & Values	Impact Duration			Impact Extent			Impact Scale				SEIs Magnitude without Mitigation Measures				Type		Comments
	ST	MT	LT	L	R	N	No	Lo	Med	Hig	Neg	Min	Mod	Maj	Adv	Ben	
																	and security, spread of several contagious and infectious diseases. Possibility of spreading sexually transmitted diseases such as HIV/AIDS. An increase in the number of vehicles for construction work may affect the access of the inhabitants to the infrastructure and service facilities of the community.
Employment Generation																	Major employment opportunity during construction phase
Increase in local business																	Project activity will induce small and medium scale local business opportunity
Operation Phase																	
Air quality																	Generator stack may affect the ambient air quality.
Noise Hazard																	Noise may be generated from substation and transformer room
Impact on Soil Quality																	Improper storage and disposal of hazardous waste, accidental spillage and leaching from PV panel

Action Affecting Environmental Resources & Values	Impact Duration			Impact Extent			Impact Scale				SEIs Magnitude without Mitigation Measures				Type		Comments
	ST	MT	LT	L	R	N	No	Lo	Med	Hig	Neg	Min	Mod	Maj	Adv	Ben	
Impact on Surface Water																	Poor management of sewage may deteriorate surface water quality
Impact on Ground Water																	Over abstraction of ground water, accidental spillage of oil or Hazardous substances from transformer and substation room.
Impact due to Solid waste																	Improper management of solid waste from power plant maintenance and operation
Hazardous Materials Managements																	Generation of used lubricating oil from the plant and improper handling and accidental spillage of hazardous waste (i.e., fuel oil, chemical) may occur. Leaching from PV panel may include hazardous material
Restricted land use																	Due to the TL, there will be restriction in land use as the land owners of the RoW cannot construct anything below the TL but as the land along the RoW is used for agricultural purpose so this restriction does not have any negative impact on the land users.

Action Affecting Environmental Resources & Values	Impact Duration			Impact Extent			Impact Scale				SEIs Magnitude without Mitigation Measures				Type		Comments
	ST	MT	LT	L	R	N	No	Lo	Med	Hig	Neg	Min	Mod	Maj	Adv	Ben	
Impact of Flood																	As the DSEPL has undertaken "Flood Study and Mitigation Report" and going to implement several mitigation measures so there won't be any negative impact due to flood
Traffic and Transportation																	Transportation of different materials and personnel may create traffic congestion
Impact due to Hazardous waste and leaching of PV panels																	Leaching from old, defected, or damaged PV panels, improper handling of PV panel can cause leaching of heavy metals
Impact on Terrestrial Habitat																	Terrestrial ecosystem may get disturbed due to project operation (i.e., noise, soil pollution, lighting etc.). Risk of bird collision and electrocution at transmission line may also take place
Impact on Aquatic habitat																	During flood, if any leakage & accidental spillage happens then aquatic habitat will be impacted
Occupational Health and Safety																	Irregular accidents, injury may occur during maintenance

Action Affecting Environmental Resources & Values	Impact Duration			Impact Extent			Impact Scale				SEIs Magnitude without Mitigation Measures				Type		Comments
	ST	MT	LT	L	R	N	No	Lo	Med	Hig	Neg	Min	Mod	Maj	Adv	Ben	
																	work. Electrical leakage can cause occasional accidents.
Sanitation Hazard & Drinking Water																	Improper management of sewage waste by workers during and lack of safe drinking water may cause diseases
Labor and Working Condition																	Improper maintenance of standard salary, salary deductions; hours of work; overtime arrangements
Community Health and Safety																	Possibility of occurring accidents and spread of several transmittable and infectious diseases. Transmission line may pose potential hazards such as electrocution, lightning strike, etc.
Social acceptability of workers to the host communities																	Acceptability problem of Local community may occur due to cultural difference with foreign workers
Employment Generation																	Major employment opportunity during operation phase
Social and Economic enhancement																	Benefit to local economy due to employment, community development. Uninterrupted electricity supply to national

Action Affecting Environmental Resources & Values	Impact Duration			Impact Extent			Impact Scale				SEIs Magnitude without Mitigation Measures				Type		Comments
	ST	MT	LT	L	R	N	No	Lo	Med	Hig	Neg	Min	Mod	Maj	Adv	Ben	
																	grid will flourish the overall economy of the country

Notation

ST	Short Term (less than 5 years)		Med	Medium	
MT	Medium Term (5~10 years)		Hig	High	
LT	Long Term (More than 10 years)		Neg	Negligible	
L	Local (within 5km radial zone)		Min	Minor	
R	Regional (District level)		Mod	Moderate	
N	National		Maj	Major	
No	None		Adv	Adverse	
Lo	Low		Ben	Beneficial	

Chapter 6

6 PREDICTION AND EVALUATION OF IMPACTS

6.1 General Considerations

This chapter defines the details of investigated environmental impacts due to project location, design, construction, and operations of the proposed power plant and measures for minimizing and / or off-setting adverse impacts identified. The Impacts, which are likely to be occurred in the different phases of the project, are identified, and discussed along with mitigation measures in the following sections.

The DSEPL has appointed several contractors to undertake several constructional activities of the project. During their work they follow the policies of DSEPL (i.e., Environmental policy, waste management policy, social policy, emergency preparedness policy and fire safety policy) which is monitored by DSEPL to ensure environmental sustainability.

6.2 Impact due to Project Location/ during Pre-construction Phase

During the pre-construction phase key activities include-

i. Land purchase for main power plant through willing buyer/willing seller method;
ii. Negotiated land purchase for transmission tower footing;
iii. Cutting and filling of the main power plant land;
iv. Land development work by using outsourced sand;
v. Vegetation clearance of the main power plant land and tower footing area;
vi. Boundary work around the main power plant area;
vii. Access road from main power plant site to nearby LGED road.

Among the above-mentioned activity, the Company has already purchased 229 acres of land till August 2023 through willing buyer and willing seller method and the rest of the land is under process which will be purchased within September 2023. The transmission tower footings require 0.7642 acres of land. Already footing area for 76 towers has been purchased till August 2023 and only purchase of 3 transmission tower footing areas are under process. The construction of tower footing area has been started and out of 79 transmission towers 75 have been completed. Cut/fill activity, vegetation clearance and access road construction of the main power plant site is already complete. The pre-construction phase along the route involves doing MoU with the land owners of the transmission tower footings.

Only dyke will be constructed using sand and geotextile to prevent seepage along the boundary of the main power plant area so that the project does not affect the khal. The dyke will be used for flood protection from the overtopping of the Padma River and flooding due to rainfall. There won't be any concrete construction for dyke.

The project location is beside the existing LGED road which is 200m away from the main power plant site. DSEPL constructed a 200m herringbone road from the existing Local Government Engineering Department (LGED) road on their own land for accessing the Project from the nearby LGED Road.

6.2.1 Land Acquisition and Involuntary Resettlement

In general, land acquisition may affect the environment and people by the following ways:

- Loss of Homestead & Agricultural land;
- Loss of Livelihood.

Total land identified for the main power plant site is 400 acres which is non-agricultural Char land. Among 400 acres, 219.56 acres have already been purchased and the remaining land will be purchased by willing buyer and willing seller process. Total 315 number of plots are at main power plant site and DSEPL has purchased 254 numbers of plots to date. A total of 1054 households (HHs) and 3693 population will be affected due to land purchase of main power plant site. No HHs were affected due to land sale. In addition, they were benefitted as the land price of the surrounding area increased due to the project intervention. Previously the land was fallow land and not used for any cultivation. Involuntary resettlement is not triggered for main power plant as there is no informal land user, structure, trees, vulnerable people. A total of 0.7643 acres of land is required for the construction of the transmission tower footing and 79 HH will be affected for land and trees. A total of 79 HHs comprises of 257 people with average HH size 3.25 will be affected due to land acquisition of the transmission tower footing. A total of 573 different trees are expected to be affected by the TL. During the construction of the tower footing and stringing of the wire there will be limited restriction in land use. As the construction of each angle tower footing takes 7~10 days and suspension tower footing take 4~5days only so the restriction on land use is for a very short period of time. The width of the RoW has been considered as 10m along the TL and allowable height clearance is 8m from lower conductor. As the surrounding land is used for only agricultural work so the height restriction has no impact in land use.

Proposed Mitigation Measures

- ✓ Land and asset price should be considered according to the ADB SPS guideline and the RP study regarding purchase (WB/WS) at the main site and acquisition for the TL where all lost or damaged assets should be compensated for at full replacement value;
- ✓ All affected people should get compensation for the acquisition of proposed land as per Acquisition and Requisition of Immovable Property Act 2017 (ARIPA) and Electricity Act 2018 and ADB SPS SR2;
- ✓ Land of the main power plant area has been purchased following willing buyer and willing seller process and there were no informal land users who will be involuntarily displaced, nor any structures will be displaced. In addition to that, there is no land sellers / users who will be worse off as a result of the land sale / loss;
- ✓ Involuntary resettlement is triggered for land acquisition along TL. Resettlement Plan (RP) should be followed for the compensation related to TL construction and implementation;
- ✓ The project activities should only be initiated after compensating properly to the affected people.

- ✓ Payment of severity allowance for fragmentation of land. Where the remaining land becomes unviable in case of fragmentation, the Project to compensate for the full land parcel;
- ✓ Ensure meaningful consultation with all PAHs and establish a grievance redress mechanism;
- ✓ Prioritization employment of local people at different phases of the project;
- ✓ Prior notification before land development so that crop harvesting does not get impacted.

6.2.2 Landscape and Soil Surface Change

A landscape is a subjective concept that cannot be precisely quantified. However, in general, any project when not designed considering the local landscape, then it creates visual intrusion to the people. The present project may change the local landscape to some extent as the adjacent land area is rural and agricultural type. The land development work has been started and the Company is keeping the land elevation to 12.3 m PWD using cutting and filling method within the project boundary. To raise the main power plant site at elevation 12.3m total 71555m^3 sand was required where 67591 m^3 was procured from cutting of the main power plant site. additional 3964m^3 was outsourced. In addition to that, 50300 m^3 (36575m^3 + 13725m^3) was outsourced for platform development of substation and main control room and 156522 m^3 (135966m^3 + 20556m^3) will be outsourced for dyke and internal road development. In total, 210786 m^3 sand will be outsourced. Please see Annexure 26 & 27.
The sand is sourced from bahadurkhali, Mohanagar, Jugia, Mojnupur balumohal (sand stockpiling area) of Kushtia District, Joynabad balumohal of Kumarkhali District, Ghoramara, Minapara, West Bahirchor, dadapur and Char Golapnagar balumohal of Veramara District. These balumohal are Govenemnt approved balumohal and the document for this is attached as Annexure 28.

The last page of the Annexure 29 shows that Mr. Anwarul Hoque has the license from BIWTA to collect sand from the above-mentioned locations. Mr. Anwarul Hoque sold the sand to Fatema Dredging Project Ltd. (Agreement between Mr. Anwarul Hoque and Fatema Dredging Project Ltd. is attached as Annexure 30 and trade license of Fatema Dredging Project Ltd. is attached as Annexure 31). DSEPL bought sand from Fatema Dredging Project Ltd. (Agreement between Fatema Dredging Project Ltd. and DSEPL is attached as Annexure 32). The sand is transferred by vessel to the nearest khal and then the sand is pumped to the power plant site through overland pipes. The pipelines are temporary and laid over the land for sand transfer. Transportation of sand is the responsibility of Fatema Dredging Project Ltd.

Due to land development work particulate matter in the air may increase.

Proposed Mitigation Measures

- ✓ Regular sprinkling of water will be done on open surface and dust grounds.
- ✓ ;
- ✓ Greening of site by planting of local trees/ vegetation.

6.2.3 Impact on Ecological Habitat

Due to land development work terrestrial habitat may get impacted and aquatic habitat may get disturbed due to any surface runoff to the adjacent water body. Land development work has already started. As the adjacent canal is dry during the winter and pre-monsoon season so there is no aquatic

species at the canal during the land development work and hence no impact till now. But during monsoon season mitigation measures should be taken to conserve the aquatic ecology of the canal.

According to the field survey and desktop review of available information, there is no critical and modified habitat present in and around the project area. All existing flora and fauna fall under least concern category according to IUCN. Any endangered, vulnerable, or threatened faunal species were not found during the field visit around the main power plant area as well as transmission line area. There are some nocturnal animals around the project site, but their movement will not be hampered as the construction work will not be undertaken at night time.

According to the Subclause 10 under Clause 3 of the Balumohal and Soil management Rules 2010 (বালুমহাল ও মাটি ব্যবস্থাপনা আইন, ২০১০) of Land Ministry of Bangladesh, the Bangladesh Inland Water Transport Authority (BIWTA) is responsible for regular dredging, supervision and monitoring the activities of sand extraction and ensuring that the dredging is done according to the hydrographic survey conducted by BIWTA. BIWTA also records, what is the effect on the nature of the river course or the flow of the river due to this dredging activity and whether environmental balance is being disturbed or the public interest is being undermined. According to these observations BIWTA should take necessary technical or administrative decisions and also implement them.

According to Clause 4, the district committee of the Government is responsible for-

a) Preparing the tender form specifying the schedule, plan of the place to be excavated for sand or soil, the probable quantity of excavated sand, the probable Government price or any other matter;

b) Reviewing and approving the tenders received for Balu mahal lease;

c) Supervise and monitor sand mining operations and recommend, if deemed necessary cancellation of leases and sand mining permits;

d) Monitoring the potential impact of sand mining on the environment, taking necessary measures to prevent river bank erosion and to control the noise pollution at sand mining sites;

e) Monitoring the impact and risk on water quality, fish, and other aquatic life due to sand mining, take necessary measures according the observations;

f) Taking necessary measures to stop sand mining during fish spawning and spawning areas;

g) Observing whether the river course is being altered or the people on the river banks are being affected due to alteration and whether the navigation of the waterways is being maintained properly, taking necessary steps according the observation;

h) Monitoring and taking necessary measures if the embankments, structures, or infrastructure are being damaged or likely to be damaged by sand mining operations.

The above clauses depict that the supplier or leasee does not have any bindings or responsibility toward ecological and physical (stability) sensitivity of sourcing areas.

Proposed Mitigation Measures

- ✓ No waste should be dumped in adjacent water bodies;

- ✓ Site should be kept clean so as no pollutant from site should enter the adjacent water bodies along with run-off;
- ✓ Altered green area can be turned into its original visual quality by plantation of trees;
- ✓ Re-vegetation should be done as soon as possible;
- ✓ Proper access restriction measures should be implemented around the boundary. High fencing prevents jumpers, while small mesh fencing with climbing guards prevents ground-dwelling and climbing;
- ✓ Awareness should be built to the workers in favor of conserving wildlife. During vegetation clearance, killing of any kind faunal species should be prohibited;
- ✓ This lighting facility, may cause disturbance to the nocturnal wildlife in and around the site. Replacing bright lighting at the sites with LED lights to avoid attracting insects and use of netting to exclude birds from the panel area;
- ✓ Lights of the construction area should install downwardly to avoid disturbance to the wildlife and birds.

6.2.4 Solid Waste

Improper disposal of solid waste from the site shall lead to unhygienic conditions and aesthetic tiring in the area. Improper disposal of tree root, branches, leaves, cleared vegetation, bushes, plastics, domestic waste can lead to littering in the project site.

Land development would require clearing of existing vegetation and bushes which would eventually generate a small amount of vegetation and wooden debris. Some office and domestic wastes are to be developed during pre-construction phase. Disposal of such wastes and scraps demands good housekeeping, good management and safeguarding to environment.

Proposed Mitigation Measures

- ✓ Organize disposal of all wastes generated during pre-construction phase in the designated disposal sites approved by the Project company;
- ✓ Waste should be properly segregated in different colored drums;
- ✓ Proper disposal and management of waste i.e., timber, shrubs, bushes, grass etc.;
- ✓ No solid waste should be dumped in water bodies;
- ✓ Difficult to dispose wastes will be minimized where practicable.

6.2.5 Indigenous People

There is no existence of indigenous people in and around the vicinity of the project area. So, there is no impact in this regard.

6.2.6 Cultural Heritage

There is no cultural heritage site within 5km radial zone of the project area and no structure of national cultural heritage will be affected due to project development.

6.3 Impact during Construction Phase

During the construction phase, driving of SPC piles, installation of PV panels, installation of transformer, inverter, DG sets, construction of switchyard, storage yard, main substation, 31 nos. block substations, tower footing, installation of towers etc. are the main works that will be done. There is involvement of several local contractors (but there is no EPC) during construction phase and DSEPL team will monitor their work and ensure that they are following the proposed mitigation measures mentioned in the following section. The local contractors don't have their own ESMP, EHS team. They follow the management policy of the DSEPL and DSEPL monitors and ensures them through their field supervisors. The EHS policy or DSEPL is attached as Annexure 33

Cast in situ piles were used for transmission tower base. There will be two types of towers i.e., angle tower and suspension tower. For each angle tower 8 piles are casted and for each suspension tower 16 piles are casted for the construction of footing of the towers. Construction of each angle tower footing takes 7~10 days and suspension tower footing take 4~5days only. After completing the construction of each tower footing, the contractor cleans up and reinstate the site before leaving.

6.3.1 Air Quality

The air quality in the project area may slightly deteriorate for the time being during construction. The major construction activities from which air emission mostly dust emission and slightly exhaust emission may occur are:

- ✓ Delivery of construction materials to site;
- ✓ Handling and mixing of cement;
- ✓ Cutting/filling and sand storage may cause air pollution;
- ✓ Poorly Paved Service Road;
- ✓ Exhaust Emission from DG sets and machineries.

❖ **Potential Environmental Impacts of Dust**

Dust produced cement, construction work, from internal roads etc. will potentially negatively affect the following:

1. Effects of Dust to Employees

Dust can affect Employers in the following way:

- ✓ Eye irritation;
- ✓ Skin irritation;
- ✓ Impairment of normal sweating of the skin as it blocks pores on the skin;
- ✓ chocking of the throat;
- ✓ Respiratory difficulties;
- ✓ Difficulty in breathing;
- ✓ Potential course of chest complication and ailment.

2. Dust Impacts to Vegetation

- ✓ Dust settling on plant leaf surface will block leaves stoma hence interfering with normal respiration of the plants;

- ✓ Dust settling on plants will reduce the evapotranspiration of plants and animals such as butterflies, caterpillars, grasshoppers who feed of foliage will be affected as the dust settled on foliage will render the foliage unpalatable;
- ✓ Heavy dust settling on plant matter will impair on normal growth of the plant; and
- ✓ Heavy dust settled on plants will choke and kill plants.

Proposed Mitigation Measures

The impact of construction activities would be temporary and restricted to the construction phase. The impact will be confined within the close vicinity and is expected to be negligible due to its small magnitude. Following mitigation measures will be taken to minimize the air pollution during the construction stage:

- ✓ Regular sprinkling of water will be done on open surface and dust grounds;
- ✓ Transportation of materials in tarpaulin-covered trucks;
- ✓ The sand and other such dispersible material will be stored at site for minimum working period;
- ✓ Removal of soil/mud from trucks and other appliances prior to leaving the project area;
- ✓ Plantation of trees in the construction yard as quickly as possible. Any open area should be planted with appropriate vegetation (trees, flowers, and grasses);
- ✓ Project management and contractor to enforce strict use of personal protective equipment of labors;
- ✓ Construction equipment will be maintained in good operating condition to reduce exhaust emissions;
- ✓ Complains of dust related ailments among employees and neighbors to be given access to medical attention;
- ✓ The equipment design will be chosen for least suspension of dust/sand into atmosphere;
- ✓ All diesel-powered equipment will be regularly maintained and idling time reduced to minimize emissions;
- ✓ Low sulfur diesel (S<O.5%) will be used in diesel-powered equipment in collaboration with best management practices;
- ✓ Vehicle/equipment air emissions will be controlled by good practice procedures (such as turning off equipment when not in use);
- ✓ Vehicle/equipment exhausts observed emitting significant black smoke in their exhausts will be serviced/ replaced; and
- ✓ Solid waste burning in the project site is strictly prohibited.

6.3.2 Impacts on Acoustic Environment

The proposed solar facility will be located in an area with a rural character which is fairly remote. Increased noise levels are directly linked with various activities associated with the construction phase. The equipment likely required to complete the project construction will typically include Excavator, pile driving machine, crane and various four-wheel drive and service vehicles. Following project activities were considered for the purpose of impact assessment on ambient noise levels during the construction phase:

- ✓ Construction activities including construction of PV foundation, operation of earthmoving and excavation equipment, construction of office buildings, substation and transmission footing;
- ✓ Transportation of PV module, PV module mounting structure and components, construction material, machinery, and personnel;
- ✓ Operation of DG sets;
- ✓ Operation of batching plant;
- ✓ Digging of trenches to accommodate underground power cables.

From the baseline noise level monitoring (Table 4.20), it was found that the noise level inside the main power plant site and the TL route is well below the guideline value. In addition to that, the nearest residents are far from the project boundary so there won,t be much impact due to noise emission from the power plant site. The TL route also runs along the agricultural land and residents are far from the TL route. It should be noted that the baseline monitoring for noise level was conducted while the construction work was going on at both main power plant and TL site. Adopting the below mentioned mitigation measure will reduce the noise level further below.

Proposed Mitigation Measures

The following mitigation measures will be implemented to minimize potential noise impacts during the construction phase in all periods:

- ✓ Noisy construction works to be limited to day time hours (from 7.00 am to 7.00 pm) per Sound Pollution (Control) Rules, 2006, noisy construction works (like mixer machine and use of other noisy machineries etc.) are prohibited from 7.00 pm to 7.00 am.
- ✓ Proper Acoustically designed machinery should be used;
- ✓ Machinery and equipment in use to be serviced regularly to ensure that they are in good condition to minimize excessive noise;
- ✓ Cutting pipes and other noise generating works should be done in a safe zone;
- ✓ Where applicable and possible exceptionally noisy machines to be fitted with noise reduction devices;
- ✓ Any employee who may complaint about ear related pain and or complication while at work to access medical attention at the expense of the contractor;
- ✓ Providing suitable hearing protection to all workers exposed to noise levels above 85dB(A);
- ✓ Workers should wear Personal Protective Equipment (PPE) for protecting them from the sound induced hazard;
- ✓ Construction workers should be advised to limit verbal noise or other forms of noise;
- ✓ Noise protection wall or barrier should be constructed in case of long-term noisy construction;
- ✓ A green belt development program with different kinds of trees would be undertaken.

6.3.3 Change in Land use pattern

The project will result in permanently change in land use of the project site from char land to industrial. The direct resultant impact (adverse) of land use change in the project area (and the other planned components) is the reduction in land area available for cultivation and resultant livelihood impacts on land owners and share croppers.

Proposed Mitigation Measures

- ✓ Compensation will be paid to the land owners for the land permanently acquired for the project. Similarly, assistance will be paid to the persons/households losing their livelihoods according to the RP report;
- ✓ If the agricultural crops are at the ripe stage, the project work may be delayed for allowing the farmers to harvest their crops. If the crops are damaged, farmers should be given financial compensation;
- ✓ Transmission lines will be aligned to minimize impacts on cultivation fields and other important areas;
- ✓ Give proper compensation to farmers and sharecroppers as per RP;
- ✓ Income loss can be mitigated by providing alternative job opportunities for PAPs.

6.3.4 Impact on Soil Quality

During construction phase, there is a risk of accidental spills and leakages from paints, lubricants, fuel and oil drums, vehicles and machinery and storage of chemicals used in construction areas, yards, batching plants, and from storage sites. These spills can pollute soils and contaminate surface water and groundwater in the area.

Disturbance of soils during construction including (and particularly) from movement of vehicles, may lead to destruction of the integrity of upper soil layers. Damaged soil is more readily eroded and washed into water courses during rainfall events and can also form dust during dry periods. Waste effluents due to labour influx and offices can also contaminate soil.

Proposed Mitigation Measures

- ✓ Construct appropriate spill containment facilities for all fuel storage areas;
- ✓ Train personnel and implement safe work practices for minimizing the risk of spillage;
- ✓ Develop site specific waste management plan for various waste streams (e.g., reusable waste, flammable waste, construction debris, food waste etc.) prior construction work;
- ✓ The fuel, chemical and lubricant storage area (fresh and used) will be on hard standing floor and roofing with a secondary containment facility of 110% bigger than the allowable maximum storage capacity;
- ✓ Regular inspections of machinery, equipment, storage areas are needed to ensure that poor maintenance is not responsible for a spillage occurring;
- ✓ To combat spillage, spill responseequipment i.e. safety goggles, gloves, PPE, disposal bags, containers, suction pump, boom skimmer etc. should be available at the site;
- ✓ Properly stripping of top soil and conserve it for future use (greenbelt development);
- ✓ Municipal solid waste generated from the construction site will be transferred to the disposal site in consultation with the Union Parishad[5].

6.3.5 Impact on Surface Water

[5] The smallest rural administrative and local government unit in Bangladesh.

The potential impacts on local hydrology are principally those of altered patterns as a result of onsite construction and earthwork activities. The proposed project may affect natural drainage, surface water quality if not managed the construction works properly. There could be Siltation of water system or drainage from uncovered piles of soil.

As the Padma River is 1.5 km km from the project site so except during river flooding there will not be any negative impact on river water due to project activity. The canal beside the project area remains dry most of the time of the year. The elevated boundary road/ dyke will be constructed within the site using sand and geotextile to prevent seepage. There is no dredging or embankment works on the canal or Padma river.

The project company has installed two septic tanks with soak pits for disposing waste water from the labour camp. Their locations are shown in Figure 1. The capacity of each septic tank is 26.5 m3 and their dimension is 5m X 2.3m X 2.3m. The design has been made considering the 300-number residential workers and 180 liter/day/capita waste water generation. The design considered that amount of waste water generation and discharge is 20.6m3/day from each septic tank and sludge deposition rate is 30 litre/capita/year. Diameter of soak pit is 1.04m and depth is 3.5m.

But the capacity should include waste water generation for 500 non-residential workers at a rate 40 liter/day/capita and 200 residential workers at a rate 120 liter/day/capita according to Bangladesh National Building Code (BNBC) 2020 (chapter VIII, Table 8.5.1(b)). According to this, waste water generation will be 44,000 liters or 44 m^3. If the detention period is considered to be 18 hours then required capacity for septic tank is 33,000 liters or 33m^3. The installed capacity of the two septic tank is 53 m^3. So, the capacity of the septic tanks is sufficient according to BNBC 2020. According to ECR 2023, all water from toilet (including sewage, urination and flushing water, bathing water, sink water) and kitchen should go to septic tank and soak pit as no waste water can be discharged from project area without treatment. Sludge will be disposed once in a year. Detail drawing and design of the existing septic tank and soak pit is provided in Annexure 11.

Proposed Mitigation Measures

- ✓ Stockpiling of spoil soil at a safe distance from the drainage system;
- ✓ Containment of sanitary waste should be adequately disposed of to avoid surface and ground water contamination;
- ✓ Making provision for temporary storage of wastes inside construction yard and disposal of solid wastes in an appropriate manner and at appropriate site at regular interval;
- ✓ Adequate provision has to be retained for the treatment and disposal of cuttings, drilling fluids and other chemicals and lube oil wastes generated during drilling, testing and commissioning stage;
- ✓ Septic tank should be cleaned once in a year and the septic waste will be disposed to the municipal waste dumping yard.

6.3.6 Impact on Ground Water

Spillage and seepage of chemical, over extraction of ground water, oil and lubricants from storage area, waste handling area and generation of sewage / domestic wastes from construction labor camp

area may adversely affect ground water quality in the area. The project would affect ground water quality if the construction works are not managed properly.

From the baseline study it was found (Table 4.15) Pb and Cd of the ground water sample is beyond the Bangladesh standards for drinking water. Right now, Lead (Pb) and Cadmium (Cd) of the ground water sampled from surrounding area extracted from shallow tube well at 70ft is beyond the limit, Previously DSEPL had treatment facility at site for treating ground water for drinking purpose which has less capacity. But now, DSEPL has set up new submersible pump at 220 ft depth along with water treatment plant (WTP) which can treat 1000 litres of drinking water per hour (24m^3/day) for the supply of drinking water for the rest of the construction period and operation phase ahead. The capacity of the WTP is sufficient for the workers involved in this project.

DSEPL has already taken permission from Upazila office for tube well installation (attached as Annxure 12). But according to the Bangladesh Water Rules 2018, Chapter 10, Clause 30, Sub-clause 2 "any non-agricultural industry should apply to Zila office for No objection letter in case of extraction of water by suction method for abstraction up to 1 cusec (1ft^3/sec) water". DSEPL will have to apply for the no objection from the Zila (district) office.

Proposed Mitigation Measures

- ✓ Proper spill control and management at site;
- ✓ Storage of hazardous material and waste in proper manner and disposal of the waste at a designated location around the site following the ESMP;
- ✓ Minimize the extraction and proper management (misuse, leakage, reuse, regular inspection of chemical and hazardous waste spillage or leakage) of ground water should be strictly followed;
- ✓ Regular inspections of machinery, equipment, storage areas are needed to ensure that poor maintenance is not responsible for a spillage occurring.

6.3.7 Impact due to Solid Waste

- **Solid waste due to project work**

During construction, large amount of construction waste that includes unused construction materials, construction debris, excavated spoils, abandoned or broken machine parts, debris, packaging materials, used home appliances, etc. will be produced. Moreover, plastic, papers, cock sheet, cartons, metal or plastic binders, etc. may be produced as solid waste during this stage. If these wastes are not disposed and maintained properly, these would have impact on surrounding environment.

- **Kitchen and Sanitary waste**

During construction phase hundreds of labourers will be engaged in different constructional work. Some of them will be living at the labor shed and kitchen waste and sewage will be generated within the project site. If these are not handled properly then it may impact the surrounding environment negatively.

E- Waste

A variety of E-wastes may be generated during the construction of the main power plant area and the TL. Proper handling and Management of E-Waste is required to avoid any damage to human health,

local environment including land, water, and air. Kinds of E-wastes may be generated from different sources/ activities at division/ unit offices/ operational areas are:

- Faulty/used electronic parts and electrical equipment for construction work,
- Cut pieces of wires and electrical parts etc.

The DSEPL has waste collection and dumping facility. Regularly the wastes from bins placed at important locations i.e., office rooms, different locations of labour sheds, kitchen and dining area, medical room, child care room etc. are collected and dumped into the primary dumping location beside the labour camp. After that, it is transferred monthly at nearby municipal solid waste dumping yard. Solid waste is collected by local vendors but they are not certified as in Bangladesh there are no requirements for municipal solid or hazardous waste collectors to be licensed. Location of the municipal solid waste dumping yard is about 20 km from the power plant site, shown in Figure 6.1.

Proposed Mitigation Measures

- ✓ Segregate all wastes, wherever practical according to the waste management plan;
- ✓ Some segregation bins with color coding indicating degradable and non-degradable waste might be installed at labor shed and work places to prevent scattered throwing of wastes according to the waste management plan;
- ✓ Municipal solid waste generated from the project site will be transferred to the designated municipal disposal site
- ✓ Construction materials left over at the end of construction will be used in other projects rather than being disposed off; some of the waste can be sold or donated or recycled/reused by construction companies, local community groups or institutions;
- ✓ Difficult to dispose wastes (plastic and hazardous waste) will be minimized and where practicable and avoided such as plastic wastes;
- ✓ All recyclable waste will be separately collected and sent for recycling
- ✓ Ensure proper disposal for electrical and municipal solid waste according to the management plan;
- ✓ The solid waste collector must dispose the wastes regularly at an approved municipal solid waste disposal site to ensure that waste does not build up on site and result in aesthetic impacts or odors;
- ✓ Hazardous waste will not be mixed with other solid waste generated, be stored at appropriate hazardous waste storage facility per the waste management plan and disposed of accordingly by waste collector or recycler;

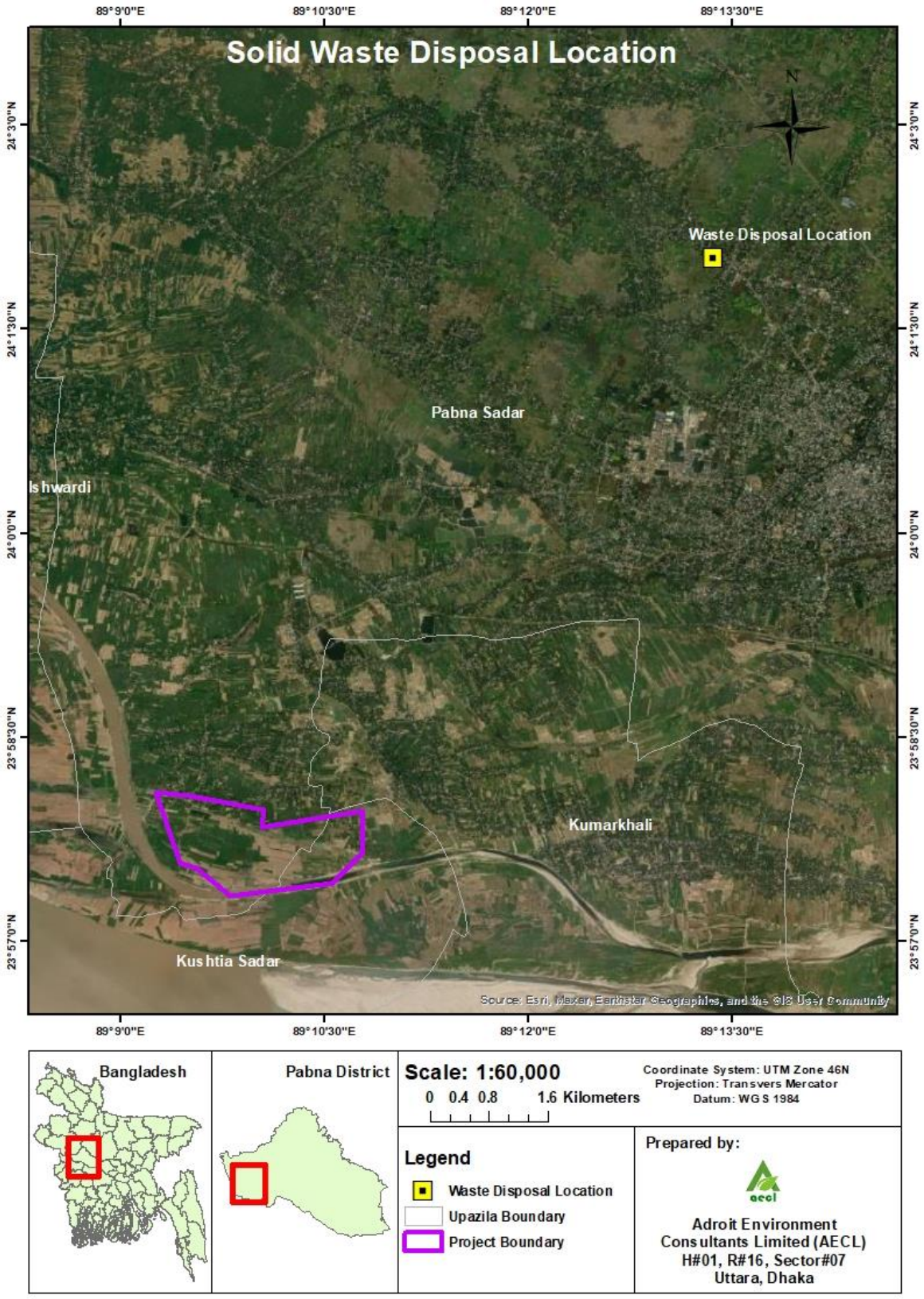


Figure 6.1: Solid Waste Disposal Location

6.3.8 Traffic and Transportation

DSEPL has constructed a 200m herringbone road for accessing the Project from the nearby LGED Road. The LGED Road starts from the Pabna Highway and runs through Heliboard Bazar to Project Site. The route is shown in Figure 3.5. The road up to Bhabanipur is bituminous and after that the rest of the LGED road is earthen and damaged. DSEPL has improved the quality of road after Bhabanipur to Project Site for the transportation of the constructional materials, machineries, and equipment. There are several roads from Pabna sadar to project site but the road which runs through Bhabanipur and Heliboard Bazar towards the project site is wider and better option for heavy vehicular movement than others. For this reason, DSEPL decided to use this route for transporting constructional materials and equipment. Due to the transportation of construction material, machineries and other equipment during construction phase may create heavy vehicular traffic. It also can damage of the earthen road connect to the project site. LGED is responsible for repairing and improving the LGED roads and DSEPL is responsible for the maintenance of the 200m access road. The traffic survey data shows that even during full-fledged construction phase the traffic flow is way less than saturation condition. The details of the traffic survey are presented in Section 4.7.

Potential Negative Environmental Impacts Likely to Result from Increased Vehicular Traffic in the Area

- ✓ Possible traffic congestion of local roads and lanes;
- ✓ Possible of occasional experience of delays on the said local roads;
- ✓ Increased number of vehicles on local roads will result in increased wear and tear of local roads thus reducing lifespan of affected roads;
- ✓ Pedestrians and cyclists using local roads will have to exercise more care with increase of vehicular traffic on the said roads; and
- ✓ There will be an increase of exhaust emission from vehicles, which will pollute local atmospheric air.

Proposed Mitigation Measures

The following measures will be adopted to mitigate possible negative impacts likely to result from increase in vehicular traffic in the area:

- ✓ Contractors, DSEPL's vehicle drivers and labourers and officials should be emphasized on road safety aspects;
- ✓ Only licensed and trained drivers should be appointed;
- ✓ Adequate internal parking provided for all vehicles by DSEPL;
- ✓ Avoid transportation of materials and machinery during the peak traffic periods;
- ✓ Plan suitable traffic routes that has capacity to handle project traffic (including load of each vehicle) to prevent road damage, avoiding narrow routes;
- ✓ Prevent unauthorized access to the construction site;
- ✓ Implementation of a safety program (speed restrictions, lights on trucks, truck load restrictions etc.) within and outside the construction area;
- ✓ All vehicles should have updated fitness certificate;
- ✓ Regular maintenance of vehicles should be conducted;

- ✓ Speed limits, Proper signage, visibility and traffic awareness and pedestrian safety should be followed by the drivers;
- ✓ Each vehicle should not exceed maximum allowable load
- ✓ Should use pilot car and flushing lighting system for carrying the Solar PV mounting piles by large lorries through local narrow roads from the nearest highway to the project site;

6.3.9 Impact on Terrestrial Habitat

According to the field survey and desktop review of available information, there is no critical and natural habitat present in and around the project area. All existing flora and fauna fall under least concern category according to IUCN. Any endangered, vulnerable or threatened faunal species were not found during the field visit around the main power plant area as well as transmission line area. There are some nocturnal animals around the project site, but their movement will not be hampered as the construction work will not be undertaken at night time. There will be no habitat loss due to this project implementation.

Activities during construction phase such as pile driving work, installation of PV panels and transformers, construction of associated facilities and tower footing may generate some negative impact on project area terrestrial habitats i.e., noise, fauna could be adversely affected through construction-related activities (noise, dust, light pollution, and modified habitat loss).

Proposed Mitigation Measures

- ✓ Plantation of local species in surrounding areas of the Project site;
- ✓ Bare surfaces should be grassed as soon as possible after construction to minimize time of exposure;
- ✓ Awareness should be built to the workers in favor of conserving wildlife;
- ✓ This lighting facility, may cause disturbance to the nocturnal wildlife in and around the site. Replacing bright lighting at the sites with LED lights to avoid attracting insects and use of netting to exclude birds from the panel area;
- ✓ Lights of the construction area should install downwardly to avoid disturbance to the wildlife and birds;

6.3.10 Impact on Aquatic Habitat

Source of impacts include:

- ✓ Waste water from labour camp;
- ✓ Surface runoff from construction site, spillage & leakage of oil and lubricants etc.;
- ✓ Runoff erosion from the project site may have negative impact on Aquatic fauna.

The project Company has installed septic tank and soak well for disposing waste water from the labour camp. The government law allows to dispose sanitation water through septic tank and soak pit as the duration of the construction phase is shorter.

Proposed Mitigation Measures

- ✓ Wastewater from labor camp and construction site should be disposed-off through septic tank and soak pits
- ✓ Suggested waste management and disposal in the waste management plan should be followed;
- ✓ Excavation activities should not be undertaken during monsoon season;
- ✓ Piling of raw material at construction site should be avoided;
- ✓ Raw material and debris should be covered, and fuel should be stored per hazardous materials management plan;
- ✓

There is a branch of Padma River (canal) adjacent to the west and south side of the project area. The adjacent land area is predominantly agricultural type. If the above-mentioned mitigation measures are implemented, then it is expected that the impact on aquatic habitat will be negligible. In addition to that, canal beside the project area remains dry most of the time of the year and elevated road around the site boundary within the site will be constructed of sand and geotextile.

6.3.11 Impact due to Hazardous waste and leaching of PV panel

Hazardous material can cause different types of accidents while transporting to or from the project site. They may cause damage during inadequate storage, transportation, treatment, or disposal operations. Improper hazardous-waste storage or disposal frequently contaminates soil, surface water and groundwater supply as harmful water pollution and can also be a source of dangerous land pollution.

There is very minimum possibility of surface water body getting affected due to hazardous waste but soil and ground water may get affected due to it. In addition to that, DSEPL has separate hazardous waste storage area shown in Figure 6.2 The current storage area has hard standing floor, secondary bunding facility, proper safety signage. Hazardous wastes are properly labelled as seen during site visits and is given to hazardous waste collector fortnightly. Hazardous waste which can be reused or have demand in market is sold to authorized dealer approved by DoE.

Despite many advantages, solar photovoltaic (PV) cells used for electricity generation can have negative environmental impacts. Solar panel waste can include heavy metals such as silver, lead, arsenic and cadmium that at certain levels may be classified as hazardous waste. During installation, defects can be found on the panels, improper handling can lead to leaching or more harmful impacts.

Proposed Mitigation Measures

- ✓ All hazardous materials will be kept on hazardous waste storage with hard standing floor and roofing with bunding facility and secondary containment facility of 110% bigger than the allowable maximum storage capacity;
- ✓ An appropriate storage site should be provided for disassembled spare parts (e.g., motors and compressors) that contain oil or other types of fluids. They should be stored in containers that are secured that will not allow oil and other fluids to escape with an impermeable surface and a sealed drainage system;

- ✓ Hazardous components should be segregated having regard to their eventual destinations and the compatibility of the component types;
- ✓ Oil Sludge, spent lubricating oil will be sold only to the DoE approved vendors;
- ✓ Only trained laborers with appropriate PPE should be appointed for unloading work;
- ✓ In case of any spillage, it should be immediately acted up on using spill kits. To combat spillage equipment i.e. safety goggles, gloves, PPE, disposal bags, containers, suction pump, boom skimmer etc. should be available at the site;
- ✓ Regular inspections of machinery, equipment, pipe work, storage areas are needed to ensure that poor maintenance is not responsible for a spillage occurring;
- ✓ Installation method and mounting structure should meet the expected load-bearing capacity, which is requisite assurance from PV system installer.
- ✓ Installation bracket system should be tested and inspected by the third-party testing institution with static mechanical analysis capacity in accordance with local national standards or international standards.
- ✓ Handling and mounting of PV panels should be conducted by expert professionals;
- ✓ PV panels should be checked before and after installation for any kind of damage;
- ✓ Modules should be fixed on the bracket solidly;
- ✓ Any damaged or unfit for use panels should be stored as hazardous waste prior to recycling or disposal as hazardous waste;

Figure 6.2: Hazardous Waste Storage Area

6.3.12 Occupational Health and Safety

The safety of the workers may be at risk during construction activities. The movement of trucks to and from the site, the operation of various equipment and machinery and the actual construction activities will expose the workers to work-related accidents and injuries. Pollutants such as dust and noise could also have negative implications for the health of workers and near-by communities.

In addition, falling debris could injure workers if personal protective equipment (PPE) is not provided or properly used. Back injury could occur if workers lift heavy objects using inappropriate body posture. Other potential hazards might be; driving equipment with improper brake system, lack of concentration while working. The protection of head, eye, ear, and hand, foot of the workers, labors and project personnel could be affected if proper and adequate arrangement is not ensured. Workers

in solar power plant have to work on open space where direct sunlight can cause heat stroke. Moreover, other infectious disease like COVID can cause adverse situation at the site.

Presently, labour camp has been set up with necessary facilities within the project area. Approximately 200 constructions laborers are currently residing inside the camps. They have proper dining, cooking, toilet and first aid facilities. For female workers Child care Room has been set up, so that they work without any tension regarding their children. In addition to that there is already an existing emergency medical room with a doctor and a male medical assistant but they are planning to upgrade their medical room which is currently in under construction state. Emergency and first aid medicines and equipment i.e., (sphygmomanometer, thermometer, adhesive bandages, elastic bandages, dual head stethoscope, antiseptic cream, arodin solution10%, adhesive tape, face mask, hand gloves, hand sanitizer, sharp scissors, safety pins and saline) are available there. Photographs of the labour camp facilities are shown below. The DSEPL authority has also made an MoU with Shimla Hospital and Diagnostic Centre at Shimla Tower, Thana More, Shalgaria, Pabna Sadar, Pabna which is approximately 12.5 km from the main power plant site. According to the MoU, the hospital will provide emergency treatment for any kind of industrial accident, fire accident and natural disaster. The hospital will also provide ambulance facility, hospital bed, priority treatment, oxygen cylinder, other medical equipment and testing facility etc. The MoU with the hospital is provided as Annexure 13..

There is already fire safety equipment installed at different locations of the project area. Fire drills are conducted monthly during training sessions. Completed training schedule of last three months (June 2023 to August 2023) is given in Annexure 34 Available fire safety equipment at site are fire extinguisher, fire bucket. The project site has security guards at different boundary points along with entrance points in 3 shifts for 24 hours. Currently, an EHS manager along with three supervisors is responsible for the occupational health and safety issues.

Fire extinguisher

Fire bucket

First Aid Facilities

First Aid kits

Child care room

Stored medicine

Existing medical room

Figure 6.3: Present condition of labour camps and its facilities.

Proposed Mitigation Measures

- ✓ Develop an OHS management plan covering OHS management structure, monitoring and reporting of OHS performance, specific procedures and requirements as described (but not limited to) those listed below, incidents reporting and management procedure
- ✓ Emergency response policy of the contractor/ Project company should be developed and followed;
- ✓ Training on job-specific risks and regular reminders should be provided to the workers;
- ✓ All persons working on site will be trained about risks and mitigations (Trainings on OHS for PPE, weight lifting, gripping, prolonged postures, vibrations, repetitive actions, safety at workstations, slip, trip, and fall, handling flammable chemicals, first-aid, machinery malfunction etc., infectious diseases, housekeeping, Firefighting, Mock drill, emergency situation handling, site security, PV Panel Cleaning etc.)which should be ensured by the DSEPL authority;

- ✓ DSEPL will ensure workers aware of health and safety risks and mitigation requirements at the project site through training and daily briefing;
- ✓ Necessary first aid facilities and staff (like Skin Cleaning Wipes, Cotton Gauze Pads, Pressure Bandage, Triangular Bandage, Wound Closure Strips, weight machine, sugar level machine Scissors, Tweezer, Cotton Ear Swabs, CPR Instructions, First Aid Guide and etc.) should be available at site;
- ✓ Before starting work all the appropriate safety equipment and the first-aid kit will be assembled and checked as being in working order;, All lifting equipment and cranes will be tested and inspected regularly. All hoist ways will be guarded;
- ✓ All scaffolds will be erected and inspected and the appropriate records maintained by the Contractor which should be ensured by the DSEPL authority;
- ✓ Safety hoops or cages will be provided for ladders with a height in excess of two meters;
- ✓ The Contractor shall provide appropriate safety barriers with hazard warning signs attached around all exposed openings and excavations when the work is in progress which should be ensured by the DSEPL authority;
- ✓ Supervision of works shall be done regularly by contractors and DSEPL's EHS team to ensure that safety conditions are met while any deviation from safety regulations is immediately reclaimed following the best practices regarding safety at work;
- ✓ The workers should be provided with appropriate PPE (Personal Protective Equipment) such as safety goggles, hard hats, safety gloves, metal plated shoes, high visibility vest and other necessaries per identified OHS risks. List of required PPEs is provided in Figure 6.4.
- ✓ All the labors should follow the safety protocol (i.e., Physical distancing, Face coverings, Gloves, Goggles & Face Shields, Hand hygiene, Coughing/Sneezing hygiene, Personal disinfection, request for cleaning supplies and Face coverings to others) due to the Covid situation;
- ✓ Proper facilities of cool drinking water, short intervals during work, wearing loose and light color dresses can mitigate heat stroke to workers;
- ✓ Material Safety Data Sheets (MSDS) for each chemical used should be available and readily accessible at the facility;
- ✓ Train staff on how to prevent and manage emergency incidences as per the guidance provided in Chapter 12 and Disaster Management Plan;
- ✓ Use signage to warn staff about dangerous places. The signage must be visible and placed strategically;
- ✓ A near miss and accident reporting system will be followed and corrective measures shall be taken to avoid / minimize near miss incidents;
- ✓ Safety measures in the form of DO and Don't Do will be displayed at strategic locations;
- ✓ Firefighting equipment should be available within the power plant area;
- ✓ Fire extinguishers should be kept near all storage area, labour camp area to extinguish the fire at its initial stage;
- ✓ Water hoses should be provisioned with long pipes;
- ✓ Arrangement of firefighting equipment's with training to the staffs from workers to officers;
- ✓ Develop and implement specific work instructions for high-risk activities including but not limited to, work at height, permit to work system on high risk activities, log-out tag-out (LOTO) system, electrical works and for construction of transmission tower for implementation by the construction contractor

Figure 6.4: Suggested PPE for Occupational Health & Safety of the workers.

6.3.13 Sanitation Hazard & Drinking water

The health of the project personnel, construction workers and laborers living at the labor camp could be impacted. The most common diseases that can be transmitted through water are diarrheal diseases such as bacillary dysentery, typhoid, paratyphoid, cholera, amoebiasis etc. During construction stage, lot of local labors will work and hence they would generate considerable amount of human waste. These are the potential source for spread of diseases, as various insects will play dominating role in the spread of diseases. Presently, COVID-19 is another alarming issue which can spread during the construction phase due to labor influx.

The project Company has installed septic tank and soak well for disposing waste water from the labour camp (see details in Annexure 11). Besides that, bath rooms, toilets for both male and female workers have been constructed within the project site.

The Company has already made arrangement of safe drinking water for laborers. Treated ground water is used for drinking purpose during construction phase and they have treatment facility at site for that. From the baseline study it was found (Table 4.15) Pb and Cd of the ground water sample is beyond the standard value. Right now, Pb and Cd of the ground water of the surrounding area is beyond the limit if water extracted from shallow tube well. The depth of the previous tube well at project site is 70 ft. DSEPL has set up new submersible pump at 220 ft depth along with WTP which can treat 1000 litres of drinking water per hour for the supply of drinking water for the rest of the construction period and operation phase ahead. Drinking water test result is presented in Table 4.16 and attached as Annexure 10 but the test result for Pb and Cd is pending to demonstrate compliance with Bangladesh and WHO drinking water standards.

Wash room

Labour toilet

Ablution Space

Drinking Water Source

Wash Basin at The Dining Space

Figure 6.5: Sanitation Facilities for Staffs and workers

Proposed Mitigation Measures

- ✓ Proper sanitation system with described septic tank and soak pits be provided to ensure sewage is disposed per applicable requirements;

- ✓ Adequate number of gender segregated toilets and bathrooms should be made for the workers. Standards range is 1 unit to 15 persons;
- ✓ Separate Male and female toilets should be available;
- ✓ DSEPL to provide and ensure that drinking water meets national/local and WHO drinking water standards;
- ✓ There should be arrangement of 4~5 liters per person per day potable water for all;

6.3.14 Labor and Working Condition

Working conditions and terms of employment examples are wages and benefits; wage deductions; hours of work; overtime arrangements and overtime compensation; breaks; rest days; and leave for illness, maternity, vacation or holiday.

During construction phase about 700 workers are involved in the project where 200 workers are residential and rest 500 are non-residential (details described in Table 4.4). The non-residential workers live nearby the project site. Residential workers live at labour shed within the main power plant site. During operation phase, about 550 workers will be involved in the project, where 100 workers will be casual cleaners. Details described in Table below. There is no immigrant worker in this project and around 80~90% worker and officials are from North Bengal.

Dynamic Sun Energy Pvt. Ltd.										
Manpower categories										
Steps	**Manpower**			**Manpower Types**			**Gender Composition**		**Nature of Residence**	
	Total Manpower	**Skilled (%)**	**Unskilled (%)**	**Permanent**	**Temporary**	**Casual Labors**	**Male**	**Female**	**Residential**	**Non-Residential**
Construction Stage	700	70%	30%	40%	60%	-	98%	2%	30%	70%
Operation Stage	450	80%	20%	90%	10%	-	85%	15%	45%	55%
Panel Cleaner (During Operation)	100	80%	20%	-	-	100%	100 %	-	-	100%

The accommodation facility at the project site for the laborers include standard beds with a comfortable mattress, pillow, cover and clean bedding facility. Both natural and artificial lighting are available and the rooms are well ventilated. An adequate supply of potable water (180 litre/day/capita) is available in the dormitories. Adequate number of leak proof, non-absorbent, rust and corrosion-resistant waste bins protected from insects and rodents are available at strategic locations. Vector control and disinfection are carried out throughout the living facilities. Sanitary facilities are located within the same buildings and provided separately for men and women. Adequate facilities for washing and drying clothes are provided. There are prayer rooms, medical facility room, dining area, kitchen, children play room etc. are available at the labour camp/dormitory. Photographs of these facilities are shown in Figure 6.6.

The workers who are and will be working at TL route is in responsibility of the contractors. No workers of the contractors stay at site during night along the TL route. All of them are non-residential workers.

Temporary tent facility is provided for day time for resting of the workers in between their work. No other facility (Dry floor, drinking water or food is available there). As they are non-residential worker so there are no legal bindings to provide labour shed facility to them. Only standard work hour, resting hour, wage, breaks, rest day, leave for illness should be provided along with safe drinking water facility and resting facility.

Labour camp (outside)

Labour camp (inside)

Prayer room

Dining room

Figure 6.6: Facilities in Labour Camp

Proposed Mitigation Measures

- ✓ The Contractor should maintain standard wage, wage deductions; hours of work; overtime arrangements and overtime compensation as per the ILO Core Labour Standards Convention and Bangladesh Labor Act, 2006 which should be ensured by the DSEPL authority through contracts;
- ✓ DSEPL will provide appropriate treatment facilities on-site and through arrangements with the nearest hospital and pay compensation according to Bangladesh Labor Law 2006 which should be ensured by the DSEPL authority;
- ✓ Leave for illness, maternity, vacation, or holiday should also be maintained by the contractor which should be ensured by the DSEPL authority;
- ✓ Child labor and forced labor should strictly be avoided;
- ✓ Temporary labor camp should be made for labors following IFC and EBRD Guidance on Worker's Accommodation, ILO Core Labour Standards Convention and Bangladesh Labor Act, 2006;
- ✓ Discrimination between male and female labors should be prohibited by establishment of clear policy provisions on ant-discrimination;

- ✓ Establish internal (worker's) grievance mechanism which should be accessible to all project employees/ workers as well as those hired by the contractors/ subcontractors.

6.3.15 Social acceptability of Construction workers to the host communities

The labor population involved in construction activities may immigrate into the project area from various part of the country having different cultural, ethnic, and social backgrounds. Such a mixture of the population has its own advantages and disadvantages. The differences in the cultures of laborers and workers (in case hiring is required) and local community may create some problems. In the rural area, the local people especially the religiously conservative section of the community will not accept the foreign workers in general.

Proposed Mitigation measures

- ✓ It is recommended to aware the foreign workers (if any) about the social & religious actability in the area so that they could maintain those when they are in touch with local community;
- ✓ Adequate training or awareness would be given to the migratory workers about local culture and behavior. So, there is no major problem raising in dealing with foreign or migratory worker.

6.3.16 Community Health and Safety

Possible sources of impacts to community health and safety during the construction phase are dust, noise emissions, possibility of occurring accidents and local people may come to contact of hazardous material related to the project. Influx of non-local workers may also lead to increased incidence of disease outbreaks and potential security issues. Improper disposal of sewage and waste may lead to contamination of groundwater and surface water. Increased vehicle on access road due to movement of construction materials might also affect easy access of the inhabitants to the local market and houses close to the road and nearby areas temporarily. There will be structural and surface damage to the road due to movement of heavy vehicles and equipment. The flow of concerned skilled technicians from abroad might bring sexually transmitted diseases, e.g., HIV/AIDS, which might become epidemic if preventive measures from the beginning are not taken.

Proposed Mitigation Measures

- ✓ Water spraying on the access roads and at the construction sites would reduce dust emissions considerably;
- ✓ To reduce noise related impacts, night time movement of vehicles and construction activities will be restricted;
- ✓ Implementation of a safety program (speed restrictions, lights on trucks, truck load restrictions etc.) and should be followed to avoid accidents;
- ✓ Creating awareness among children, women, and old age people in particular and the community in general on traffic safety by using existing mediums such as school, women self-help groups, village union and religious occasions;
- ✓ Proper fencing / boundary should be constructed should be done around the project site to control unauthorized access;

- ✓ Construction camps equipped with proper sanitation facilities and regular pest control (i.e., to pest control for mosquitos or other insects for housing workers / labors);
- ✓ The contractor will also coordinate with local authorities to ensure that any conflicts will be immediately resolved which should be ensured by the DSEPL authority;
- ✓ A grievance mechanism for community will be set up according to the details provided in Chapter 13;
- ✓ The Contractor should train all construction workers in basic sanitation and health care issues (e.g., how to avoid malaria, transmission of sexually transmitted infections (STI), and HIV/AIDS which should be ensured by the DSEPL authority;
- ✓ All wastes should be properly handled and disposed to avoid any outbreak of disease.

6.3.17 Employment Generation

One of the main positive impacts during the construction phase will be the availability of employment opportunities especially to casual workers [6] and several other specialized workers. Employment opportunities are of benefit both economically and in a social sense. In the economic sense it means abundant unskilled and skilled labor will be used in construction hence economic production.

Proposed Mitigation Measures

- ✓ Prioritization of employment of skilled and non-skilled workers from the local communities;
- ✓ Priority given to residents for both professional and nonprofessional positions;
- ✓ In order to increase the size of local employment, women should also be employed in the construction phase.

6.3.18 Increase in local business

There will be development of Local Infrastructure during construction phase. Moreover, connecting roads and communicating facilities will be upgraded during construction phase. As a result, Local business will also be improved. Business opportunities such as tea-stalls, eating joins and restaurants, fruit and vegetable vendors, grocery stores, electronic goods shops, mechanic, and repair shops (electrical and mechanical), small hotels, etc. are most likely to develop. It is felt that many enterprising locals in the vicinity of the project area would reap the benefits of such business and self-employment opportunities.

Proposed Mitigation Measures

- ✓ Service and materials for construction will be to the extent possible locally sourced;
- ✓ Local businessmen should be given priority in hiring supplying agent for food, vehicles, and other daily supplies;
- ✓ Encourage local people with small-scale business plans.

[6] A casual worker is a worker on a temporary employment contract with generally limited entitlements to benefits and little or no security of employment.

6.4 Impact during Operation Phase

6.4.1 Air quality

Solar energy technologies for power plants and electricity transmission line do not produce air emissions or greenhouse gases when operating. But there can be is expected that air pollution may occur due to movement of vehicles in the project premises. Due to sweeping and other field activity. There is an on-site DG set for emergency purpose which will have very limited air quality impact form its emissions when it is in operation.

Proposed Mitigation Measures

- ✓ Implementation of a regular watering and sprinkling for dust suppression;
- ✓ Covering of any aggregate or dusty material to reduce dust emissions;
- ✓ All vehicles of power plant should have updated fitness license;
- ✓ Fit vehicles with appropriate exhaust systems and emission control devices;
- ✓ Limit the idling time of vehicles not more than 2 minutes;
- ✓ All the DG sets on site for emergency backup should be regularly checked and maintained for emission within guideline value.

6.4.2 Noise Hazard

Solar panels in and of themselves do not generate sound. The maximum noise generated from central and string solar inverter will be approx. 50-60 decibels, and approx. no noise will be generated from the micro grid solar inverter. During operation, the main source of noise would be from the sub-station and transformer area.

Proposed Mitigation Measures

- ✓ All equipment and mechanical machineries shall have to be maintained in good working order;
- ✓ All the substation and transformer area should be acoustically designed;
- ✓ The green belt should be of at least 3.5 m width consisting two rows of plantation with the gradual increase of height of plant from inside row to outside row.

6.4.3 Impact on Soil Quality

Potential impact on soil quality can arise due to:

- ✓ Accidental spillage of fuel & lubricant from storage facility or from transport vehicles may negatively impact;
- ✓ Maintenance of transmission line may generate hazardous pollutants, which are likely to be spread over the soils;
- ✓ Improper storage and disposal of sewage wastes, hazardous waste;
- ✓ Surface run-off from spillage area into nearby open land.

Proposed Mitigation Measures

- ✓ Spill control and management procedures at site;
- ✓ Hazardous waste should be carefully handled and disposed off following waste management plan;

- ✓ Sewage Treatment Plant (STP) should be installed for management of sewage waste so that it does not affect soil quality;
- ✓ Municipal solid waste generated from the project site will be transferred to the designated disposal site in consultation with the Union Parishad;
- ✓ Ensure proper disposal for electrical and hazardous materials to prevent accidental spillage according to the E-Waste Guideline 2021 and Solid Waste Management Guidelines 2021 by DoE, during maintenance work.

6.4.4 Impact on Surface Water

There will not be any liquid discharge from the power plant nor from the transmission line. Accidental spillage of chemical and waste water may also impact surface water quality negatively. During operation phase, there will be around 200 permanents officials at dormitory and 350 local cleaning and security staffs working in the project area. The Company will install a STP during operation phase. Details of the suggested STP is given in Annexure 14 Capacity of the STP is 15m^3/day. The design considered estimated waste water is 12 m^3/day for 300 residential workers and officials as there will 200 residential and 350 non-residential intermittent workers during operation phase. The capacity of the current design of STP is not sufficient as the design considered rate of waste water generation is 40 L/capita/day but according to BNBC 2020 (chapter VIII, Table 8.5.1(b)), waste water generation rate for domestic purpose in staff quarter at Pourashova, Upazilas are 120 L/capita/day. The capacity of the STP should be 40 m^3/day because for 200 residential workers and officials required capacity is 30 m^3/day (requirement is 24 m^3/day and additional 6 m^3/day for factor of safety) and for 350 non-residential intermittent workers and officials required capacity is additional 10 m^3/day (requirement is 8 m^3/day for 50% of non-residential worker as they will work intermittently and additional 2 m^3/day for factor of safety). According to the ECR 2023, no waste water can be discharged to the drainage system without proper treatment so all waste water from kitchen, washroom, latrine should be treated through STP before discharge. Treated water from STP will be discharged to the nearest khal through internal drainage system (Layout attached as Annexure 25) The impact of discharge is considered acceptable given the treatment, volume of discharge, sensitivity of the surface water based on its usage if the discharged water complies ECR 2023 guideline values as they were set according to the regular surface water quality characteristics of Bangladesh.

Proposed Mitigation Measures

- ✓ No solid waste should be thrown in the adjacent surface water body;
- ✓ Surface drainage shall be controlled to divert surface runoff away from the project area;
- ✓ Hazardous waste should be carefully handled and disposed off to avoid surface runoff or mixing with waterbody;
- ✓ Strict supervision should be maintained to avoid blockage of natural creeks during the operation period;
- ✓ Sanitary waste should be treated and adequately disposed of in drainage system to avoid surface water contamination;
- ✓ A Sewage Treatment Plant (STP) should be installed and maintained of capacity 40 m^3/day to treat the sewage waste to avoid ground water contamination;
- ✓ The sludge cake from the STP should be disposed to the municipal solid waste dumping site.

The effluent characteristics of the STP should meet both IFC EHS guideline along with Bangladesh standard. The IFC guidelines said the WB EHS standards only apply if no national standards apply. As there is national standard so, it will be applicable. The standard value that should be followed is presented in table below.

Table 6.1: Water parameters before and after treatment in the STP

Parameters	Standard for Liquid waste discharge in Inland surface water as per ECR, 2023	WB EHS guidelines for treated sanitary sewage discharge
pH	6-9	6-9
BOD_5 at 20°C	30 mg/l	30 mg/l
COD	125 mg/l	125 mg/l
Total Nitrogen	-	10 mg/l
Total Phosphorus	-	2 mg/l
Oil and Grease	10 mg/l	10 mg/l
Total Suspended Solid	100 mg/l	50 mg/l
Total Coliform Bacteria	1000 CFU/100 ml	400 MPN/100 ml

6.4.5 Impact on Ground Water

Continuous discharge of domestic sewage, and waste dump and over exploitation of the resource have badly impact on ground water sustainability. Over utilization of ground water is the key factor for ground water depletion. The Company is planning to install 7 rain water harvesting ponds to minimize the ground water use. Capacity of each rainwater harvesting pond will be 3250 m^3 and for the 7 rainwater harvesting ponds will be 22750.00 $m^{3.}$ During the operation & maintenance period, rain water harvesting ponds will be used for cleaning the modules with manual washing and no chemical will be used for cleaning. Approximately 5 liters of water is required to clean each panel. Approximately 2742 m^3/month of water will be required for PV modules cleaning during operation phase. According to the water balance diagram (attached as Annexure 7), the amount of water that will be available during each month based on monthly rainfall data and the storage capacity of the 7 ponds, it will be sufficient for panel cleaning round the year. Only 71m^3/day (details provided in Annexure 7) ground water will be required for domestic purpose which will be stored at underground tanks.

Proposed Mitigation Measures

- ✓ Minimize the extraction to be within permissible limits per approval by Zila office and proper management of ground water should be strictly followed;
- ✓ Storage of hazardous material and waste in proper manner and disposal of the waste at a designated location around the site;

- ✓ A Sewage Treatment Plant (STP) should be installed and maintained of capacity 40 m^3/day to treat the sewage waste to avoid ground water contamination;
- ✓ Regular inspections of machinery, equipment, storage areas are needed to ensure that poor maintenance is not responsible for a spillage occurring.

6.4.6 Impact due to Solid Waste

- **Domestic and Sanitary waste**

As a result of the operation of the proposed project, it is expected that some domestic solid waste will be generated from dormitory and project site. Some food waste, plastic, papers etc. may be produced as solid waste during this stage. Improper disposal of papers, tissues, packaging materials, boxes, plastics can lead to littering in the project and surrounding areas. Sanitary waste will also be produced.

- **Office waste**

The operation of the power plant itself would generate some solid wastes i.e., paper, cartoons, bags, boxes, office wastes, cartons, metal, plastic binders, pallets etc. Therefore, improper waste sanitization and disposal can cause public health risks due to environmental pollution.

E- Waste

A variety of E-wastes will be generated during the operation of the main power plant area. Proper handling and Management of E-Waste is required to avoid any damage to human health, local environment including land, water and air. Kinds of E-wastes generated from different sources/ activities at division/ unit offices/ operational areas are:

- Household appliances (microwaves, electric stoves, electric shavers, fans, iron etc.) including cooling and freezing appliances
- IT equipment, including laptops, CPU, monitors, printers etc.
- Consumer electronics, including televisions and mobiles
- Monitoring and control instruments
- Lamps and luminaires
- Automatic dispensers
- Faulty/used electronic parts and PV panels;
- Cut pieces of wires and electrical parts etc.

Proposed Mitigation Measures

- ✓ All solid waste will be segregated properly as per the waste management plan;
- ✓ Waste segregation bins with color coding indicating degradable and non-degradable and recyclable waste will be installed at labor shed and work places to collect waste according to the waste management plan;
- ✓ Some solid waste has secondary demand (metals, scrap, e-waste and other recyclable materials) and they should be sold to the secondary dealers. Other solid wastes will be disposed to the designated solid waste dumping yard;
- ✓ Scattered throwing and burning of waste should be prohibited;

- ✓ The solid waste collector will be required to dispose the wastes regularly at an approved municipal solid waste disposal site to ensure that waste does not build up on site and result in aesthetic impacts or odors;
- ✓ The Project company should undertake waste segregation at source to separate hazardous from non-hazardous waste;
- ✓ All type of solid waste which will sold to secondary dealers or disposed to the disposal site should have proper movement register from the site for waste transfer;

6.4.7 Traffic and Transportation

Increase in vehicular traffic in the area is likely to be experience during operation phase of the plant due to the movement of the personnel and other project materials and tools. Potential Negative Environmental Impacts Likely to Result from Increased Vehicular Traffic in the Area are:

- ✓ Possible of occasional experience of delays on the said local roads;
- ✓ Increased number of vehicles on local roads will result in increased wear and tear of local roads thus reducing lifespan of affected roads;
- ✓ Pedestrians and cyclists using local roads will have to exercise more care with increase of vehicular traffic on the said roads; and
- ✓ There will be an increase of exhaust emission from vehicles, which will pollute local atmospheric air.

Proposed Mitigation Measures

- ✓ Management to provide for adequate internal parking, for all vehicles coming to the plant premises;
- ✓ All users of said roads to always observe traffic rules this will give pedestrians and cyclist their space and safety while using the road;
- ✓ Restrict truck deliveries, where practicable, to day time working hours (from 7.00 am to 7.00 pm);
- ✓ Restrict the transport of oversize loads;
- ✓ All vehicles should have updated fitness certificate and regularly checked for any kind of leakage;
- ✓ Operate vehicles, if possible, to non-peak periods to minimize traffic disruptions;
- ✓ Enforce on-site speed limit, especially close to the sensitive receptors, schools, health centers, etc.;
- ✓ Marking of the roads, warning signs / lights, road signs to be clearly used.

6.4.8 Sanitation Hazard & Drinking Water

The health of the project personnel, workers could be impacted if arrangement of sanitation and drinking water is not ensured adequately and properly. During operation stage, workers and officials will generate human waste and other waste. These are the potential source for spread of diseases, as various insects (i.e., flee, mosquito etc.) will play dominating role in the spread of diseases. There are chances for the spread of water borne diseases also. Presently, COVID-19 is another alarming issue which can spread during the operation phase.

Around 550 workers and officials will be working at site. Among them only 200 will be residential and other 350 non-residential intermittent workers will work for one shift at different times. There will be one shift of workers and officials working at site during operation phase except 3 shifts in Security section and PV panel cleaning twice monthly. The Company will install a STP during operation phase. Details of the suggested STP is given in Annexure 14. Capacity of the STP is 15m^3/day. The design considered estimated waste water is 12 m^3/day for 300 residential workers and officials as there will 200 residential and 350 non-residential intermittent workers during operation phase. The capacity of the STP is not sufficient as the design considered rate of waste water generation is 40 L/capita/day but according to BNBC 2020 (chapter VIII, Table 8.5.1(b)), waste water generation rate for domestic purpose in staff quarter at Paurashova, Upazilas are 120 L/capita/day. The capacity of the STP should be 40 m^3/day because for 200 residential workers and officials required capacity is 30 m^3/day (requirement is 24 m^3/day and additional 6 m^3/day for factor of safety) and for 350 non-residential intermittent workers and officials required capacity is additional 10 m^3/day (requirement is 8 m^3/day for 50% of non-residential worker as they will work intermittently and additional 2 m^3/day for factor of safety). According to the ECR 2023, no waste water can be discharged to the drainage system without proper treatment so all waste water from kitchen, washroom, latrine should be treated through STP before discharge.

From the baseline study it was found (Table 4.15) Pb and Cd of the ground water sample is beyond the standard value. Right now, Pb and Cd of the ground water of the surrounding area is beyond the limit if water extracted from shallow tube well. The depth of the previous tube well at project site was 70 ft. DSEPL has set up new submersible pump at 220 ft depth along with WTP which can treat 1000 litres of drinking water per hour for the supply of drinking water for the rest of the construction period and operation phase ahead. Drinking water test result is presented in Table 4.16 and attached as Annexure 10 but the test result for Pb and Cd is pending to demonstrate compliance with Bangladesh and WHO drinking water standards.

Figure 6.7: Submersible pump near the labor camp

Proposed Mitigation Measures

- ✓ Project personnel and workers will follow appropriate means of waste removal and sanitation measures;
- ✓ All the employees should follow the safety protocol (i.e., Physical distancing, Face coverings, Gloves, Goggles & Face Shields, Hand hygiene, Coughing/Sneezing hygiene, Personal disinfection, request for cleaning supplies and Face coverings to others) due to the Covid situation;
- ✓ Adequate number of toilets and bathrooms should be made for the workers. Standards range is 1 unit to 15 persons;
- ✓ Separate Male and female toilets should be available;
- ✓ Sanitary waste should be treated and adequately disposed of in drainage system to avoid surface water contamination;
- ✓ A Sewage Treatment Plant (STP) should be installed and maintained of capacity 40 m^3/day to treat the sewage waste per applicable local standards to avoid ground water contamination;
- ✓ The sludge cake from the STP should be disposed to the municipal solid waste dumping site.
- ✓ Drinking water meets national/local or WHO drinking water standards;
- ✓ There should be arrangement of 4~5 liters per person per day potable water for all;
- ✓ Vector control and disinfection should be carried out throughout the living facility area.

6.4.9 Impact due to Hazardous waste

Though there is very minimum possibility of surface water body getting affected due to hazardous waste but soil and ground water may get affected due to it. In addition to that, the solar power plant produces very minimal amount of hazardous waste i.e., fuel oil, lubricants from machineries, spent oil containers, rags used with oil, waste fluorescent tubes etc. Transformer oil will not be replaced. It will only be refilled for makeup amount once in 5 years.

The operating life of the PV panels is about 20 years and in operation phase. Solar panel waste can include heavy metals such as silver, lead, arsenic, and cadmium that at certain levels may be classified as hazardous waste. During operation and maintenance, defects can be found on the panels, miscarriage can lead to leaching which may impact soil, surface, and ground water quality of the project area.

Proposed Mitigation Measures

- ✓ All hazardous waste will be stored in hazardous waste storage per waste management plan, with hard standing floor and roofing with bunding facility and secondary containment facility of 110% bigger than the allowable maximum storage capacity;
- ✓ An appropriate storage site should be provided for disassembled spare parts (e.g., motors and compressors) that contain oil or other types of fluids. They should be stored in containers that are secured that will not allow oil and other fluids to escape with an impermeable surface and a sealed drainage system;
- ✓ Hazardous components should be segregated having regard to their eventual destinations and the compatibility of the component types;

- ✓ Oil Sludge, spent lubricating oil will be sold only to the DoE approved vendors;
- ✓ Trained laborers with appropriate PPE should be appointed for unloading work;
- ✓ In case of any spillage, it should be immediately acted up on using spill kits. To combat spillage equipment i.e. safety goggles, gloves, PPE, disposal bags, containers, suction pump, boom skimmer etc. should be available at the site;
- ✓ Regular inspections of machinery, equipment, pipe work, storage areas are needed to ensure that poor maintenance is not responsible for a spillage occurring;
- ✓ Modules should not be carried by grasping the junction box or the cable;
- ✓ None should stand or walk on the modules;
- ✓ Disassemble of the module or removing the nameplates should be avoided;
- ✓ Applying any kind of paint or adhesive on the module is prohibited;
- ✓ Damaging or scratching the back sheet of the module should be avoided;
- ✓ PV modules should be checked at a regular interval (once monthly) to avoid leaching;
- ✓ Damaged PV modules should be temporarily stored in the hazardous waste storage area and the Company will contact with licensed waste treatment agencies to collect and treat the panels as well as hazardous solid waste in compliance with national regulations.

6.4.10 Labor and Working Condition

Working conditions and terms of employment examples are wages and benefits; wage deductions; hours of work; overtime arrangements and overtime compensation, breaks, rest days and leave for illness, maternity, vacation, or holiday.

Proposed Mitigation Measures

- ✓ The Company will adopt and implement human resources policies and procedures as per the ILO Core Labour Standards Convention, IFC & EBRD Guidance and Bangladesh Labor Act, 2006;
- ✓ The accommodation and management of the workers and officials should follow ILO Core Labour Standards Convention, IFC & EBRD Guidance and Bangladesh Labor Act, 2006;
- ✓ The Company will not make employment decisions based on personal characteristics unrelated to inherent job requirements;
- ✓ Project Company should maintain standard salary, salary deductions; hours of work; overtime arrangements and overtime compensation;
- ✓ Leave for illness, maternity, vacation, or holiday should also be maintained by the Project company;
- ✓ Child labor and forced labor should strictly be prohibited;
- ✓ Discrimination between male and female labor should be avoided;
- ✓ The Company should not employ forced labor, which consists of any work or service not voluntarily performed that is exacted from an individual under threat of force or penalty;
- ✓ Establish Internal (worker's) grievance mechanism which should be accessible to all project employees/workers hired by DSEPL if no alternative is available.

6.4.11 Occupational Health and Safety

Under sunlight, PV modules will produce direct currents. There will be a high voltage of hundreds of volts after the electrical connection. The module strings maintain a high voltage even in the event of insufficient sunlight, and any equipment that may be attached to the wire faces the concealed risk of electric leakage, which may have negative effects on the environment. In addition to that, elevated PV panel cleaning is working at height from 4-6m above ground can impose risk to cleaning worksers.

The protection of head, eye, hand, and foot of the PV panel cleaners is required. Workers in solar power plant must work on open space where direct sunlight can cause heat stroke. Moreover, other infectious disease like COVID can cause adverse situation at the site.

Around 550 workers and officials will be working at site. Among them only 200 will be residential and other 350 non-residential intermittent workers will work for one shift at different times. There will be one shift of workers and officials working at site during operation phase except 3 shifts in Security section and PV panle cleaning twice monthly.

The same medical room facility will be used during the operation phase and the MoU made with the hospital will be continued during the operation phase.

Proposed Mitigation Measures

- ✓ Develop an OHS management plan covering OHS management structure, monitoring and reporting of OHS performance, specific procedures and requirements as described (but not limited to) those listed below, incidents reporting and management procedure
- ✓ The Company will provide appropriate treatment facilities on-site and have arrangements with the nearest local hospital and pay compensation according to ILO Core Labour Standards Convention and Bangladesh Labor Act, 2006;
- ✓ Develop and implement specific work instructions for high-risk activities including but not limited to, work at height, permit to work system on high risk activities, log-out tag-out (LOTO) system, electrical works
- ✓ The workers should wear PPE (Personal Protective Equipment), safety goggles, and other necessaries as per requirements;
- ✓ The abnormal records on the system side should be regularly checked thoroughly to make sure that there is no electrical leakage;
- ✓ Proper protective measures (insulated gloves, insulated shoes, etc.) should be taken to avoid direct contact with 30V or higher voltage to ensure personal safety.
- ✓ Provide adequate lighting in all workrooms;
- ✓ Material Safety Data Sheets (MSDS) for each chemical used should be available and readily accessible at the facility;
- ✓ A safety manual for storage and handling of Hazardous chemicals will be prepared and implemented;
- ✓ Necessary first aid facilities (like Skin Cleaning Wipes, Cotton Gauze Pads, Pressure Bandage, Triangular Bandage, Wound Closure Strips, weight machine, sugar level machine Scissors, Tweezer, Cotton Ear Swabs, CPR Instructions, First Aid Guide etc.) should be available at site;
- ✓ The staff will be trained for first-aid and firefighting procedures. The rescue team will support the first-aid and firefighting team;
- ✓ A first-aid center with the trained personnel (doctor and nurse) should be available;

- ✓ Train staff on how to prevent and manage incidences. This should involve proper handling of electricity, water etc. and sensitization on various modes of escape, conduct and responsibility during such incidences;
- ✓ Use signage to warn staff and/ or visitors of dangerous places. The signage must be visible and placed strategically;
- ✓ Firefighting systems, such as sprinklers, portable extinguishers (appropriate to the flammable hazard in the area) and automated fire extinguishers will be provided at strategic locations with clear labelling of the extinguisher type;
- ✓ Firefighting system will be tested periodically;
- ✓ Develop emergency response plan including evacuation procedures to handle emergency situations;
- ✓ A near miss and accident reporting system will be followed and corrective measures shall be taken to avoid / minimize near miss incidents;
- ✓ Safety measures in the form of DO and Don't Do will be displayed at strategic locations;
- ✓ A Permit to enter the project area will be established to ensure that only authorized persons can entry to the site;
- ✓ Proper facilities of cool drinking water, short intervals during work, wearing loose and light color dresses can mitigate heat stroke to workers;

6.4.12 Community Health and Safety

Possible sources of impacts to community health and safety during the operation phase, possibility of occurring accidents and local people may come to contact of hazardous material related to the project. Influx of non-local workers may also lead to increased incidence of disease outbreaks and potential security issues. Improper management of solid waste, sanitation system may lead to different contagious diseases in local people. As the power plant will be constructed near the bank of river on a low land side, upper side of the bank may face flooding situation during monsoon season. So, DSEPL authority made a new drainage study. The new drainage study shows that there will be ditch on the north side of the power plant connected to the southern sumps to dispose the extra water easily. So that, the water can't cause any flood to the community area. Ditch no. 6, 7, 8 and 9 will be responsible to dispose the water.

Presence of transmission line may pose potential hazards such as electrocution, lightning strike, etc., due to accidental failure of power transmission. Overhead transmission lines have always been associated with concerns on health risks from exposure to electromagnetic field (EMF) from overhead transmission lines and substations. However, despite all the studies that have been carried out over the past 30 years, there is still no persuasive evidence that the fields pose any health risks.

Proposed Mitigation Measures

- ✓ Isolate local people from project area for safety purpose;
- ✓ Proper fencing /boundary work should be done around the project site to control the movement of local people;
- ✓ Creating awareness among children, women, and old age people and the community in general on traffic safety by using existing mediums such as school, women self-help groups, village union and religious occasions;

- ✓ Implementation of a safety program (speed restrictions, lights on trucks, truck load restrictions etc.) and should be followed to avoid accidents;
- ✓ Kitchen waste and sanitary waste should be properly handled and disposed at designated area to avoid outbreak of diseases;
- ✓ The community must be kept informed of emergency procedures and protocol in case of an accident in the plant;
- ✓ The DSEPL EHS team should train all operation workers in basic sanitation and health care issues (e.g., how to avoid malaria, transmission of sexually transmitted infections (STI), and HIV/AIDS
- ✓ The EHS team will also coordinate with local authorities to ensure that any conflicts will be immediately resolved which should be ensured by the DSEPL authority;
- ✓ Clear and visible danger and warning signs will be posted at designated areas to alert the community of the safety risks. In addition, transmission towers should be equipped with danger boards, barbed wire, and galvanized ground wire for earthing purposes;
- ✓ A grievance mechanism for community will be set up according to the details provided in Chapter 13.

6.4.13 Impact on Terrestrial Habitat

Solar panel glare can put negative impact on birds, flying above the solar panel. In researches it was found that solar installations appear to contribute to bird mortality. Scientists aren't entirely sure why this is, but one prevailing idea, known as the "lake-effect" hypothesis, is that large solar panel areas make illusion to the birds and make them mistake the installations for bodies of water and crash into them. The concentrating solar reflection acts as mirror which generates so much heat that it can incinerate insects and burn the feathers of birds that fly through. In addition to that, improper management of solid waste may adversely impact the fauna of that area, they may get affected or infected due to disposal of hazardous waste. Illumination at night time for operation work may also disturb the eco-system and the nocturnal species of the surrounding area.
According to our study *Pteropus giganteus* (Indian Flying Fox) was found in the study area. But the population of them was not significant, it was rarely common and there is no large roost of them. According to a study (Hasan, M. K., Feerez, M. M., Datta, A. K., Saha, A., & Ahmed, T. (2014). Indian flying fox (*Pteropus giganteus*) roosts in north Bengal of Bangladesh.) *Pteropus giganteus* (Indian Flying Fox) roosters are not present in the Pabna District. The wingspan of *Pteropus giganteus* (Indian Flying Fox) is 1.2 ~1.5m and the span between two wires of TL is 4m. If the two wings are not touched with the two wires at a time, then no species can get electrified. So, there is no possibility of electrification of *Pteropus giganteus* (Indian Flying Fox) species. DSEPL is installing bird guards on the transmission line which will resist birds to perching on the line.

The project company will use Photo-voltaic Panels, which are less reflective than all other solar panels used for solar power plants. For reducing the electrocution problem, they are planning to use bird guards on the transmission line which will resist birds to perching on the line.

Proposed Mitigation Measures

- ✓ Anti-reflective coating on solar panels will be used to reduce the solar glare negative impact on flying birds;

- ✓ Proper disposal and management of solid and liquid waste should be maintained;
- ✓ No waste should be dumped here and there within the project area during operation;
- ✓ Lights of the power plant area should install downwardly to avoid disturbance to the wildlife and birds;
- ✓ Plantation of local species in within the Project site;
- ✓ A greenbelt area should be developed along the project boundary;
- ✓ Awareness should be built to the workers in favor of conserving wildlife and no poaching is allowed;
- ✓ This lighting facility, may cause disturbance to the nocturnal wildlife in and around the site. Replacing bright lighting at the sites with LED lights to avoid attracting insects and use of netting to exclude birds from the panel area;
- ✓ Proper installation of bird guards on the transmission line should be implemented to discourage birds from perching or nesting in unsafe locations and to prevent birds' wings to touch the line or the ground components.

6.4.14 Impact on Aquatic Habitat

- ✓ Aquatic habitat would be affected due to disposal of solid waste into adjacent surface water body;
- ✓ If any hazardous waste is thrown to the surface water body, then it may greatly impact the aquatic flora and fauna;
- ✓ Runoff erosion from the project site may have negative impact on aquatic fauna.

The proposed project will not discharge any liquid waste. The elevated road around the site boundary will be made of sand and geotextile. The canal beside the project area remains dry most of the time of the year and only during monsoon period there is a very low flow. During flooding, the substation, transformer, office room and PV panels will be above the flood level according to the Flood study report, so there won't be any impact from the project even during the flooding occurs.

Proposed Mitigation Measures

- ✓ Specific procedures and necessary preparedness to contain any accidental spill at source and to prevent their spread in the surrounding environment;
- ✓ Site should be kept clean so as no pollutant from site should enter the water bodies along with run-off;
- ✓ Wastewater should not be disposed-off in the water bodies without proper treatment.

6.4.15 Social acceptability of workers to the host communities

The officials and workers involved in operation period may immigrate into the project area from various part of the country having different cultural, ethnic and social backgrounds. Such a mixture of the population has its own advantages and disadvantages. The differences in the cultures of officials and workers (in case hiring is required) and local community may create some problems. In the rural area, the local people especially the religiously conservative section of the community will not accept the foreign workers in general.

Proposed Mitigation measures

- ✓ It is recommended to aware the foreign officials and workers (if any) about the social & religious actability in the area so that they could maintain those when they are in touch with local community;
- ✓ Adequate training or awareness would be given to the migratory workers about local culture and behavior. So, there is no major problem raising in dealing with foreign or migratory worker.

6.4.16 Employment Generation

One of the main positive impacts during the operation phase will be the availability of employment opportunities. The increase in temporary and permanent jobs in staffs, engineers and officers would result in more transaction of money locally for purchasing of different goods and services. Several local people will be engaged in project related activities i.e., cleaning of PV panels, office staff, security personnel and crop cultivation work under the PV panels. Employment opportunities are of benefit both economically and in a social sense.

Proposed Mitigation Measures

- ✓ Encourage local and equitable employment;
- ✓ Salaries and other benefits based on qualification and experience;
- ✓ In order to increase the size of local employment, women should also be employed;
- ✓ Priority given to residents for both professional and nonprofessional positions.

6.4.17 Social and Economic enhancement around project area

Energy is one of the major factors fostering economic development in Bangladesh. After the completion of the project national grid will gain around 100 MW electricity which will be distributed all over the country. This additional input will increase the electricity coverage area. It will speed up economic development around the project area and a lot of people around the project site will be benefitted through improved employment system, small business (tea-stalls, eating joins and restaurants, fruit and vegetable vendors, grocery stores, electronic goods shops, mechanic, and repair shops (electrical and mechanical), small hotels, etc.) and socio-economic development of the locality. The cumulative positive impacts of the project will result in increased mobility, employment generation, and above all better economic integration of the area with the major market and trade centers within and outside the districts. Aid in the development of the power sector in Bangladesh as well as the infusion of the financial capital, this project will result in the increase of the overall growth of the GDP in the country.

Proposed Mitigation Measures

- ✓ Service and materials for construction will be to the extent possible locally sourced;
- ✓ Local businessmen should be given priority in hiring supplying agent for food, vehicles and other daily supplies;
- ✓ Encourage local people with small-scale business plans;
- ✓ Ensure uninterrupted electricity generation and supply.

Chapter 7

7 ENVIRONMENTAL MANAGEMENT PLAN (EMP)

7.1 General Considerations

In the context of a project, Environmental Management Plan (EMP) is concerned with the implementation of the measures necessary to minimize and offset the adverse impacts and to enhance beneficial impacts. Unless the mitigation and benefit enhancement measures are identified in IEE and fully implemented, the prime function of the IEE cannot be achieved. Thus, the objectives of ESMP for the present project are:

- ✓ Identification of monitoring requirements and Monitoring indicators;
- ✓ Mitigation measures to reduce or eliminate negative impacts; and
- ✓ Enhancement measures to maximize positive impacts.

List of contractors are attached as **Annexure 15.**

7.3 Mitigation/Benefit Enhancement Measures

For effective and environmentally friendly operation of a project, a set for guiding tools and suggestions are necessary which need to be followed at various stages of project installation, operation, and maintenance. This plan generally has various components of management depending on the type of project activity and types of discharge and their pollution potential. The Project company may also be needed to expand the suggested outline of the ESMP proposed in this report.

All beneficial and adverse impacts which may likely to occur at different phases of the project are identified and aspect of mitigation and benefit enhancement measures has also been discussed in section 6.0. In view of the earlier discussion summary of recommended mitigation and benefit enhancement measures, proposed ESMP are presented in **Table 7.1**.

Table 7.1: Recommended environmental mitigation/enhancement measures

Issues/aspects	Location	Mitigation measures	Monitoring Parameters	Applicable Standards	Frequency of Monitoring	Responsibility	
						Implementation	Supervision
Pre-Construction Phase							
Land Acquisition and Involuntary Resettlement	Within the project site	✓ Land and asset price should be considered as per current market price of land according to the ADB SPS guideline and the RP study regarding purchase (WB/WS) at the main site and acquisition for the TL where all lost or damaged assets should be compensated for at full replacement value; ✓ All affected people should get compensation for the acquisition of proposed land as per Acquisition and Requisition of Immovable Property Act 2017 (ARIPA) and Electricity Rules, 2020Act 2018 and ADB SPS SR2; ✓ Land should be of the main power plant area has been purchased by following willing buyer and willing seller process and there were no informal land users who will be involuntarily displaced, nor any structures will be displaced. In addition to that, there is no land sellers / users who will be worse off as a result of the land sale / loss; ✓ Involuntary resettlement is triggered for land acquisition along TL. Resettlement and Restoration Plan (RRP) should be followed for the compensation related to TL construction and implementation; ✓ The project activities should only be initiated after compensating properly to the affected people. ✓ Payment of severity allowance for fragmentation of land. Where the remaining land becomes unviable in case of fragmentation, the Project to compensate for the full land parcel; ✓ Ensure meaningful consultation with all PAHs and Establishing a grievance redress mechanism; ✓ Prioritization employment of local people at different phases of the project; ✓ Prior notification before land development so that crop harvesting does not get impacted. ✓				Project Company / Contractor	Project Company
Landscape and Soil Surface Change	Within the project site	✓ Any built up part Regular sprinkling of the Plant water will be done on open surface and dust grounds. ✓ Project should be designed considering key criteria of landscape like coherence, readability, hierarchy, and stability. It is understood that Dynamic Sun Energy Private Ltd. will have a modern architectural view, which does not provide any significant visual intrusion. One simple way by which the altered; ✓ Altered green area can be turned into its original previous visual quality is the to an extent possible by plantation of local trees around the project area.				Project Company / Contractor	Project Company
Impact on Ecological Habitat	Within the project site	✓ No waste should be dumped in adjacent water bodies; ✓ Site should be kept clean so as no pollutant from site should enter the adjacent water bodies along with run-off; ✓ Altered green area can be turned into its original visual quality by plantation of trees; ✓ Re-vegetation should be done as soon as possible; ✓ Proper access restriction measures boundary work should be implemented around the boundary. High fencing prevents jumpers, while small mesh fencing with climbing guards prevents ground-dwelling and climbing; ✓ Awareness should be built to the workers in favor of conserving wildlife. During vegetation clearance, killing of any kind faunal species should be prohibited.; ✓ This lighting facility, may cause disturbance to the nocturnal wildlife in and around the site. Replacing bright lighting at the sites with LED lights to avoid attracting insects and use of netting to exclude birds from the panel area; ✓ Lights of the construction area should install downwardly to avoid disturbance to the wildlife and birds.				Project Company / Contractor	Project Company
Solid Waste	Within the project site	✓ Organize disposal of all wastes generated during pre-construction phase in the designated disposal sites approved by the Project authority company; ✓ Waste should be properly segregated in different colored drums; ✓ Proper disposal and management of waste i.e., timber, shrubs, bushes, grass etc.;				Project Company / Contractor	Project Company

Issues/aspects	Location	Mitigation measures	Monitoring Parameters	Applicable Standards	Frequency of Monitoring	Responsibility	
						Implementation	Supervision
		✓ No solid waste should be dumped in water bodies; ✓ Difficult to dispose wastes will be minimized where practicable.					
Indigenous People	Around the project site	✓ No management plan required.				-	-
Cultural Heritage	Around the project site	✓ No management plan required. In case of any archeological artifacts are found during excavation at the project site, IFC's Chance Find Protocol should be followed.				-	-
Construction Phase							
Impact on Air Quality	Within project area	✓ Regular sprinkling of water will be done on open surface and dust grounds; ✓ Transportation of materials in tarpaulin-covered trucks; ✓ The sand and other such dispersible material will be stored at site for minimum working period; ✓ Removal of soil/mud from trucks and other appliances prior to leaving the project area; ✓ Plantation of trees in the construction yard as quickly as possible. Any open area should be planted with appropriate vegetation (trees, flowers, and grasses); ✓ Project management and contractor to enforce strict use of personal protective clothing and equipment of labors; ✓ Construction equipment will be maintained in good operating condition to reduce exhaust emissions; ✓ Complains of dust related ailments among employees and neighbors to be given access to medical attention; ✓ The equipment design will be chosen for least suspension of dust/sand into atmosphere; ✓ All diesel-powered equipment will be regularly maintained and idling time reduced to minimize emissions; ✓ Low sulfur diesel (S<O.5%) will be used in diesel-powered equipment in collaboration with best management practices; ✓ Vehicle/equipment air emissions will be controlled by good practice procedures (such as turning off equipment when not in use); ✓ Vehicle/equipment exhausts observed emitting significant black smoke in their exhausts will be serviced/ replaced; and ✓ Solid waste burning in the project site is strictly prohibited.	SO2, NOx, CO, SPM, PM_{10} and $PM_{2.5}$ at baseline monitoring locations	Air Pollution (Control) Rules 2022 (Schedule-1) & IFC EHS Guideline, 2007	Once in 3 months	3rd party consultant	Project Company
Impacts on Acoustic Environment	Within project area	✓ Noisy construction works to be limited to day time hours (from 7.00 am to 7.00 pm); ✓ Proper Acoustically designed machinery should be used; ✓ Machinery and equipment in use to be serviced regularly to ensure that they are in good condition to minimize excessive noise; ✓ Cutting pipes and other noise generating works should be done in a safe zone; ✓ Where applicable and possible exceptionally noisy machines to be fitted with noise reduction devices; ✓ Any employee who may complaint about ear related pain and or complication while at work to access medical attention at the expense of the contractor; ✓ Providing suitable hearing protection to all workers exposed to noise levels above 85dB(A); ✓ Workers should wear Personal Protective Equipment (PPE) for protecting them from the sound induced hazard; ✓ Construction workers should be advised to limit verbal noise or other forms of noise; ✓ Noise protection wall or barrier should be constructed in case of long-term noisy construction; ✓ A green belt development program with different kinds of trees would be undertaken; ✓ ECoP 10 should be strictly followed by the contractor which should be ensured by the DSEPL.	Noise at baseline monitoring locations at day and night	Noise Pollution (Control) Rules 2006 (Schedule-1) & IFC EHS Guideline, 2007	Once in 3 months	3rd party consultant	Project Company

Issues/aspects	Location	Mitigation measures	Monitoring Parameters	Applicable Standards	Frequency of Monitoring	Responsibility	
						Implementation	Supervision
Change in Land use pattern	In and around the project site	✓ Compensation will be paid to the land owners for the land permanently acquired for the project. Similarly, assistance will be paid to the persons/households losing their livelihoods according to the RP report; ✓ If the agricultural crops are at the ripe stage, the project work may be delayed for allowing the farmers to harvest their crops. If the crops are damaged, farmers should be given financial compensation; ✓ Transmission lines will be aligned to minimize impacts on cultivation fields and other important areas; ✓ Give proper compensation to farmers and sharecroppers as per RP; ✓ Income loss can be mitigated by providing alternative job opportunities for PAPs.					
Impact on Soil Quality	Within project area	✓ Construct appropriate spill containment facilities for all fuel storage areas; ✓ Train personnel and implement safe work practices for minimizing the risk of spillage; ✓ Develop site specific waste management plan for various waste streams (e.g., reusable waste, flammable waste, construction debris, food waste etc.) prior construction work; ✓ The fuel, chemical and lubricant storage area (fresh and used) will be on hard standing floor and roofing with a secondary containment facility of 110% bigger than the allowable maximum storage capacity; ✓ Regular inspections of machinery, equipment, storage areas are needed to ensure that poor maintenance is not responsible for a spillage occurring; ✓ In case of any spillage, it should be immediately acted up on. To combat spillage, spill response equipment i.e. safety goggles, gloves, PPE, disposal bags, containers, suction pump, boom skimmer etc. should be available at the site; ✓ Properly stripping of top soil and conserve it for future use (greenbelt development); ✓ Municipal solid waste generated from the construction site will be transferred to the disposal site in consultation with the Union Parishad .	pH, Cd, Cr, Pb, Zn, Al, Cu, Ni, and Si at baseline monitoring locations	WHO (1996) Permissible limit of Heavy Metals in Soil and Plants	Once in 6 months	3rd party consultant	Project Company
Impact on Surface Water	Near Project Site	✓ Stockpiling of spoil soil at a safe distance from the drainage system; ✓ Strict supervision should be maintained to avoid blockage of natural drainage during the construction period; ✓ Containment of sanitary waste should be adequately disposed of to avoid surface and ground water contamination; ✓ Making provision for temporary storage of wastes inside construction yard and disposal of solid wastes in an appropriate manner and at appropriate site at regular interval; ✓ Adequate provision has to be retained for the treatment and disposal of cuttings, drilling fluids and other chemicals and lube oil wastes generated during drilling, testing and commissioning stage; ✓ There should be 3 septic tanks of 26.5m3 capacity; ✓ Septic tank should be cleaned once in a year and the septic waste will be disposed to the municipal waste dumping yard; ✓ ECoP 3 & 4 should be followed by the contractor which should be ensured by the DSEPL.	Temperature, pH, TDS, TSS, DO, BOD, COD, EC, Fe, Cr, Pb, Cd, Zn, Al, Cu, Ni, Sulphate, Nitrate, and Phosphate at baseline monitoring locations Visual: Maintaining proper drainage	Environment Conservation Rules (ECR) 2023 (Schedule-2 (Ka)(1)) and & IFC EHS Guideline, 2007.	Once in 6 months	3rd party consultant	Project Company
Impact on Ground Water	Within project area	✓ Proper spill control and management at site; ✓ Storage of hazardous material and waste in proper manner and disposal of the waste at a designated location around the site following the ESMP; ✓ Minimize the extraction and proper management (misuse, leakage, reuse, regular inspection of chemical and hazardous waste spillage or leakage) of ground water should be strictly followed; ✓ Regular inspections of machinery, equipment, storage areas are needed to ensure that poor maintenance is not responsible for a spillage occurring.	Drinking water: Temperature, pH, TDS, As, Hardness, Cr, Pb, Alkalinity, Fe, Cd, Sulphate, Zn, Al, Phosphate, Cu, Ni, Nitrate, TC, and FC at	Environment Conservation Rules (ECR) 2023 (Schedule-2 (Kha)) and & WHO Drinking Water Guidelines	Quarterly	3rd party consultant	Project Company

Issues/aspects	Location	Mitigation measures	Monitoring Parameters	Applicable Standards	Frequency of Monitoring	Responsibility	
						Implementation	Supervision
			baseline monitoring locations				
Impact due to Solid Waste	Within project area	✓ Segregate all wastes, wherever practical according to the waste management plan; ✓ Some segregation bins with color markingcoding indicating degradable and non-degradable waste might be installed at labor shed and work places to prevent scattered throwing of wastes according to the waste management plan; ✓ Municipal solid waste generated from the project site will be atransferred to the designated municipal disposal site; ✓ The contractor should be committed to ensure cConstruction materials left over at the end of construction will be used in other projects rather than being disposed off; some of the waste can be sold or donated or recycled/reused by construction companies, local community groups or institutions; ✓ Difficult to dispose wastes (plastic and hazardous waste) will be minimized and where practicable and avoided such as plastic wastes; ✓ All recyclable waste will be separately collected and sent for recycling Electrical waste should be recycled; ✓ Ensure proper disposal for electrical and municipal solid waste according to the management plan; ✓ The solid waste collector must dispose the wastes regularly at an approved refusemunicipal solid waste disposal site to ensure that waste does not build up on site and result in aesthetic impacts or odors; ✓ Hazardous waste will not be mixed with other solid waste generated, be stored at appropriate hazardous waste storage facility per the waste management plan and disposed of accordingly by waste collector or recycler;	Quantity of solid waste, segregation, disposal process and transfer		Quarterly	EHS Team	Project Company
Traffic and Transportation	In and around the project site	✓ Emphasizing Contractors, DSEPL's vehicle drivers and labourers and officials should be emphasized on road safety aspects; ✓ Only licensed and trained drivers should be appointed; ✓ Management to provide for Aadequate internal parking provided for all vehicles by DSEPL; ✓ Avoid transportation of materials and machinery during the off-peak traffic periods; ✓ Plan suitable traffic routes that has capacity to handle project traffic (including load of each vehicle) to prevent road damage, avoiding narrow routes; ✓ Prevent unauthorized access to the construction site; ✓ Implementation of a safety program (speed restrictions, lights on trucks, truck load restrictions etc.) within and outside the construction area; ✓ All vehicles should have updated fitness certificate; ✓ Regular maintenance of vehicles should be conducted; ✓ Speed limits, Proper signage, visibility and traffic awareness and pedestrian safety should be followed by the drivers; ✓ Each vehicle should not exceed maximum allowable load ✓ Should use pilot car and flushing lighting system for carrying the Solar PV mounting piles by large lorries through local narrow roads from the nearest highway to the project site;	Incoming & outgoing traffic, traffic movement records		Monthly	EHS Team	Project Company
Terrestrial Habitat	In and around the project site	✓ Plantation of local species in surrounding areas of the Project site; ✓ Bare surfaces should be grassed as soon as possible after construction to minimize time of exposure; ✓ Only locally occurring, indigenous grasses should be used; ✓ The construction area and immediate surroundings should be monitored regularly for emergent invasive vegetation; ✓ Awareness should be built to the workers in favor of conserving wildlife;	Implementation status of the mitigation measures		Quarterly	EHS Team	Project Company

Issues/aspects	Location	Mitigation measures	Monitoring Parameters	Applicable Standards	Frequency of Monitoring	Responsibility	
						Implementation	Supervision
		✓ This lighting facility, may cause disturbance to the nocturnal wildlife in and around the site. Replacing bright lighting at the sites with LED lights to avoid attracting insects and use of netting to exclude birds from the panel area; ✓ Lights of the construction area should install downwardly to avoid disturbance to the wildlife and birds					
Aquatic habitat	In and around the project site	✓ Wastewater from labor camp and construction site should not be disposed-off through septic tank and soak pitsin natural water bodies; ✓ Proper disposal and Suggested waste management of construction wasteand disposal in the waste management plan should be followed; ✓ No solid, liquid or hazardous waste should be dumped in water bodies during construction; ✓ Excavation activities should not be undertaken during monsoon season; ✓ Piling of raw material at construction site should be avoided; ✓ Raw material and, debris should be covered, and fuel should be stored on paved surfaces under covered areasper hazardous materials management plan;	Implementation status of the mitigation measures		Quarterly	EHS Team	Project Company
Impact due to Hazardous waste and leaching of PV panel	Within the project site	✓ All hazardous materials will be kept on hazardous waste storage with hard standing floor and roofing with bunding facility and secondary containment facility of 110% bigger than the allowable maximum storage capacity; ✓ An appropriate storage site should be provided for disassembled spare parts (e.g., motors and compressors) that contain oil or other types of fluids. They should be stored in containers that are secured that will not allow oil and other fluids to escape with an impermeable surface and a sealed drainage system; ✓ Hazardous components should be segregated having regard to their eventual destinations and the compatibility of the component types; ✓ Oil Sludge, spent lubricating oil will be sold only to the DoE approved vendors; ✓ SkilledOnly trained laborers with appropriate PPE should be appointed for unloading work; ✓ In case of any spillage, it should be immediately acted up on using spill kits. To combat spillage equipment i.e. safety goggles, gloves, PPE, disposal bags, containers, suction pump, boom skimmer etc. should be available at the site; ✓ Regular inspections of machinery, equipment, pipe work, storage areas are needed to ensure that poor maintenance is not responsible for a spillage occurring; ✓ Installation method and mounting structure should meet the expected load-bearing capacity, which is requisite assurance from PV system installer. ✓ Installation bracket system should be tested and inspected by the third-party testing institution with static mechanical analysis capacity in accordance with local national standards or international standards. ✓ Handling and mounting of PV panels should be conducted by expert professionals; ✓ PV panels should be checked before and after installation for any kind of damage; ✓ Modules should be fixed on the bracket solidly.; ✓ Any damaged or unfit for use panels should be stored as hazardous waste prior to recycling or disposal as hazardous waste;	Fuel tank and chemical storage operation, maintenance and leakage inspection, Storage area condition, availability of spill kit, inventory		Monthly	EHS Team	Project Company
Occupational Health and Safety	Within the project site	✓ Develop an OHS management plan covering OHS management structure, monitoring and reporting of OHS performance, specific procedures and requirements as described (but not limited to) those listed below, incidents reporting and management procedure ✓ DSEPL will provide appropriate of treatment facilities on-site and through arrangements with the nearest hospital and pay compensation ✓ Emergency response policy of the contractor/ Project authoritycompany should be developed and followed;	Daily inspection on PPE usage Review of implementation records of specific		Daily for PPE usage Weekly inspection of transmission	EHS Team	Project Company

Issues/aspects	Location	Mitigation measures	Monitoring Parameters	Applicable Standards	Frequency of Monitoring	Responsibility	
						Implementation	Supervision
		✓ Training on job-specific risks and regular reminders should be provided to the workers; ✓ All persons working on site will be provided information about risks on Site and arrangements will be made for workers to discuss health and safety with the Contractor which should be ensured by the DSEPL authority; ✓ DSEPL should will ensure that, the contractor is making the workers aware of health and safety risks and mitigation requirements at the project site through training and daily briefing; ✓ Necessary first aid facilities and staff (like Skin Cleaning Wipes, Cotton Gauze Pads, Pressure Bandage, Triangular Bandage, Wound Closure Strips, weight machine, sugar level machine Scissors, Tweezer, Cotton Ear Swabs, CPR Instructions, First Aid Guide and etc.) should be available at site; ✓ Before starting work all the appropriate safety equipment and the first-aid kit will be assembled and checked as being in working order; , ✓ All lifting equipment and cranes will be tested and inspected regularly. All hoist ways will be guarded; ✓ All scaffolds will be erected and inspected and the appropriate records maintained by the Contractor which should be ensured by the DSEPL authority; ✓ Safety hoops or cages will be provided for ladders with a height in excess of two meters; ✓ The Contractor shall provide appropriate safety barriers with hazard warning signs attached around all exposed openings and excavations when the work is in progress which should be ensured by the DSEPL authority; ✓ Supervision of works shall be done regularly by contractors and DSEPL's EHS team to ensure that safety conditions are met while any deviation from safety regulations is immediately reclaimed following the best practices regarding safety at work; ✓ The workers should wearbe provided with appropriate PPE (Personal Protective Equipment),) such as safety goggles, hard hats, safety gloves, metal plated shoes, high visibility vest and other necessaries per identified OHS risks. List of required PPE is provided in Figure….. ✓ All the labors should follow the safety protocol (i.e., Physical distancing, Face coverings, Gloves, Goggles & Face Shields, Hand hygiene, Coughing/Sneezing hygiene, Personal disinfection, request for cleaning supplies and Face coverings to others) due to the Covid situation; ✓ Proper facilities of cool drinking water, short intervals during work, wearing loose and light color dresses can mitigate heat stroke to workers; ✓ Material Safety Data Sheets (MSDS) for each chemical used should be available and readily accessible at the facility; ✓ Train staff on how to prevent and manage emergency incidences as per the guidance provided in Chapter 12 and Disaster Management Plan; ✓ Use signage to warn staff about dangerous places. The signage must be visible and placed strategically; ✓ A near miss and accident reporting system will be followed and corrective measures shall be taken to avoid / minimize near miss incidents; ✓ Safety measures in the form of DO and Don't Do will be displayed at strategic locations; ✓ Firefighting equipment should be available within the power plant area; ✓ Fire extinguishers should be kept near all storage area, labour camp area to extinguish the fire at its initial stage; ✓ Water hoses should be provisioned with long pipes; ✓ Arrangement of firefighting equipment's with training to the staffs from workers to officers; ✓ Develop and implement specific work instructions for high risk activities including but not limited to, work at height, permit to work system on high risk activities, log-out tag-out (LOTO) system, electrical works and for construction of transmission tower for implementation by the construction contractor.	high-risk procedures (including photos) Inspection of transmission tower construction contractor safety performance against OHS plan Documented record of all incident, accident and its remedial process Proper fencing, isolation of site from general access, marked passage for workers and visitors, Internal Grievance,		tower construction safety Monthly for others		

Issues/aspects	Location	Mitigation measures	Monitoring Parameters	Applicable Standards	Frequency of Monitoring	Responsibility	
						Implementation	Supervision
Sanitation Hazard and Drinking Water	Within the project site	✓ Proper sanitation system with described septic tank and soak pits be provided to ensure sewage is disposed per applicable requirements; ✓ Adequate number of gender segregated toilets and bathrooms should be made for the workers. Standards range is 1 unit to 15 persons; ✓ Separate Male and female toilets should be isolated as per requirement available; ✓ DSEPL to provide and ensure that dDrinking water meets national/local and WHO drinking water standards; ✓ There should be arrangement of 4~5 liters per person per day potable water for all;	Drinking water quality against Environment Conservation Rules (ECR) 2023 (Schedule-2 (Kha)) and & WHO Drinking Water Guidelines Septic tank/wastewater disposal, outlet characteristics and sanitation facility to the workers	Environment Conservation Rules (ECR) 2023 (Schedule-2 (Kha)) and & WHO Drinking Water Guidelines	Quarterly	EHS Team	Project Company
Labor and Working Condition	Within the project site	✓ The Contractor should maintain standard wage, wage deductions; hours of work; overtime arrangements and overtime compensation as per the ILO Core Labour Standards Convention and Bangladesh Labor Act, 2006 which should be ensured by the DSEPL authority through contracts; ✓ DSEPL will provide appropriate treatment facilities on-site and through arrangements with the nearest hospital and pay compensation according to Bangladesh Labor Law 2006 which should be ensured by the DSEPL authority; ✓ Leave for illness, maternity, vacation, or holiday should also be maintained by the contractor which should be ensured by the DSEPL authority; ✓ Child labor and forced labor should strictly be avoided; ✓ Temporary labor camp should be made for labors following IFC and EBRD Guidance on Worker's Accommodation, ILO Core Labour Standards Convention and Bangladesh Labor Act, 200 62006; ✓ Discrimination between male and female labors should be prohibited by establishment of clear policy provisions on ant-discrimination; ✓ Establish internal (worker's) grievance mechanism which should be accessible to all project employees/ workers as well as those hired by the contractors/ subcontractors.	Implementation status of the mitigation measures		Quarterly	EHS Team	Project Company
Social acceptability of Construction workers to the host communities	Within the project site	✓ It is recommended to aware the foreign workers (if any) about the social & religious actability in the area so that they could maintain those when they are in touch with local community; ✓ Adequate training or awareness would be given to the migratory workers about local culture and behavior. So, there is no major problem raising in dealing with foreign or migratory worker.	Implementation status of the mitigation measures		Quarterly	EHS Team	Project Company
Community Health and Safety	Around the project site	✓ Water spraying on the access roads and at the construction sites would reduce dust emissions considerably; ✓ To reduce noise related impacts, night time movement of vehicles and construction activities will be restricted; ✓ Implementation of a safety program (speed restrictions, lights on trucks, truck load restrictions etc.) and should be followed to avoid accidents; ✓ Creating awareness among children, women, and old age people in particular and the community in general on traffic safety by using existing mediums such as school, women self-help groups, village union and religious occasions; Proper fencing / boundary should be constructed should be done around the project site to control unauthorized access;	Site inspection of implementation of the described measures Review of community GRM records		Weekly site inspection Monthly on community GRM	EHS Team	Project Company

Issues/aspects	Location	Mitigation measures	Monitoring Parameters	Applicable Standards	Frequency of Monitoring	Responsibility	
						Implementation	Supervision
		✓ Construction camps equipped with proper sanitation facilities and regular pest control (i.e., to pest control for mosquitos or other insects for housing workers / labors); ✓ The contractor will also coordinate with local authorities to ensure that any conflicts will be immediately resolved which should be ensured by the DSEPL authority; ✓ A grievance mechanism for community will be set up according to the details provided in Chapter 13; ✓ The Contractor should train all construction workers in basic sanitation and health care issues (e.g., how to avoid malaria, transmission of sexually transmitted infections (STI), and HIV/AIDS which should be ensured by the DSEPL authority; ✓ All wastes should be properly handled and disposed to avoid any outbreak of disease					
Employment Generation	In and around the project site	✓ Prioritization of employment of skilled and non-skilled workers from the local communities; ✓ Priority given to local residents for both professional and nonprofessional positions; ✓ In order to increase the size of local employment, women should also be employed in the construction phase.	Implementation status of the mitigation measures		Quarterly	EHS Team	Project Company
Increase in local business	In and around the project site	✓ Service and materials for construction will be to the extent possible locally sourced; ✓ Local businessmen should be given priority in hiring supplying agent for food, vehicles, and other daily supplies; ✓ Encourage local people with small-scale business plans.	Implementation status of the mitigation measures		Quarterly	EHS Team	Project Company
Operation Phase							
Air quality	Within the project site	✓ Implementation of a regular watering and sprinkling for dust suppression; ✓ Covering of any aggregate or dusty material to reduce dust emissions; ✓ All vehicles of power plant should have updated fitness license; ✓ Fit vehicles with appropriate exhaust systems and emission control devices; ✓ Limit the idling time of vehicles not more than 2 minutes.; ✓ All the DG sets on site for emergency backup should be regularly checked and maintained for emission within guideline value.	SO2, NOx, CO, SPM, PM_{10} and $PM_{2.5}$ at baseline monitoring locations	Air Pollution (Control) Rules 2022 (Schedule-1) & IFC EHS Guideline, 2007	Once in 6 months	3rd party consultant	Project Company
Noise Hazard	Within the project site	✓ All equipment and mechanical machineries shall have to be maintained in good working order; ✓ All the substation and transformer area should be acoustically designed; ✓ The project authorityProject company will have to optimize the plant layout in such way that the noise impact will be minimized; ✓ Project boundary wall should be more than man height; ✓ The green belt should be of at least 3.5 m width consisting two rows of plantation with the gradual increase of height of plant from inside row to outside row.	Noise at baseline monitoring locations at day and night	Noise Pollution (Control) Rules 2006 (Schedule-1) & IFC EHS Guideline, 2007	Once in 6 months	3rd party consultant	Project Company
Impact on Soil Quality	Within the project site	✓ Spill control and management procedures at site; ✓ Hazardous waste should be carefully handled and disposed off; following waste management plan; ✓ Sewage Treatment Plant (STP) should be installed for management of sewage waste so that it does not affect soil quality; ✓ Municipal solid waste generated from the project site will be transferred to the designated disposal site in consultation with the Union Parishad; ✓ Ensure proper disposal for chemical, electrical and hazardous materials to prevent accidental spillage according to the E-Waste Guideline 2021 and Solid Waste Management Guidelines 2021 by DoE, during maintenance work.	pH, Cd, Cr, Pb, Zn, Al, Cu, Ni, and Si at baseline monitoring locations	World Health Organization (WHO) (1996) Permissible Limits of Heavy Metals in Soil and Plants.	Once in 6 months	3rd party consultant	Project Company

Issues/aspects	Location	Mitigation measures	Monitoring Parameters	Applicable Standards	Frequency of Monitoring	Responsibility	
						Implementation	Supervision
Impact on Surface Water	Around the project site	✓ No solid waste should be thrown in the adjacent surface water body; ✓ Surface drainage shall be controlled to divert surface runoff away from the project area; ✓ Hazardous waste should be carefully handled and disposed off to avoid surface runoff or mixing with waterbody; ✓ Strict supervision should be maintained to avoid blockage of natural creeks during the operation period; ✓ Sanitary waste should be treated and adequately disposed of in drainage system to avoid surface water contamination; ✓ A Sewage Treatment Plant (STP) should be installed and maintained of capacity 40 m3/day to treat the sewage waste to avoid ground water contamination; ✓ The sludge cake from the STP should be disposed to the municipal solid waste dumping site	Temperature, pH, TDS, TSS, DO, BOD, COD, EC, Fe, Cr, Pb, Cd, Zn, Al, Cu, Ni, Sulphate, Nitrate, and Phosphate at baseline monitoring locations Visual: Maintaining proper drainage	Environment Conservation Rules (ECR) 2023 (Schedule-2 (Ka)(1)) and & IFC EHS Guideline, 2007	Once in 6 months	3rd party consultant	Project Company
Impact on Ground Water	Within the project site	✓ Minimize the extraction to be within permissible limits per approval by Zila office and proper management of ground water should be strictly followed; ✓ Storage of hazardous material and waste in proper manner and disposal of the waste at a designated location around the site; ✓ A Sewage Treatment Plant (STP) should be installed and maintained of capacity 40 m3/day to treat the sewage waste to avoid ground water contamination; ✓ Regular inspections of machinery, equipment, storage areas are needed to ensure that poor maintenance is not responsible for a spillage occurring.	Drinking water: Temperature, pH, TDS, As, Hardness, Cr, Pb, Alkalinity, Fe, Cd, Sulphate, Zn, Al, Phosphate, Cu, Ni, Nitrate, TC, and FC at baseline monitoring locations Visual: Make an inventory of water usage (groundwater and rainwater) and wastewater discharge	Environment Conservation Rules (ECR) 2023 (Schedule-2 (Kha)) and & IFC	Once in 3 months	3rd party consultant	Project Company
Impact due to Solid Waste	Within the project site	✓ All solid waste will be segregated properly as per the waste management plan; ✓ Waste segregation bins with color coding indicating degradable and non-degradable and recyclable waste will be installed at labor shed and work places to collect waste according to the waste management plan; ✓ Some solid waste has secondary demand (metals, scrap, e-waste and other recyclable materials) and they should be sold to the secondary dealers. Other solid wastes will be disposed to the designated solid waste dumping yard; ✓ Scattered throwing and burning of waste should be prohibited; ✓ The solid waste collector will be required to dispose the wastes regularly at an approved municipal solid waste disposal site to ensure that waste does not build up on site and result in aesthetic impacts or odors; ✓ The Project company should undertake waste segregation at source to separate hazardous from non-hazardous waste; ✓ All type of solid waste which will sold to secondary dealers or disposed to the disposal site should have proper movement register from the site for waste transfer.; ✓	Monthly inspection of waste collection and storage areas, review of waste inventory and monitor final disposal location		Monthly	EHS Team	Project Company
Traffic and Transportation	In and around the project site	✓ Management to provide for adequate internal parking, for all vehicles coming to the plant premises;	Incoming & outgoing traffic, traffic movement records		Once in 6 months	EHS Team	Project Company

Issues/aspects	Location	Mitigation measures	Monitoring Parameters	Applicable Standards	Frequency of Monitoring	Responsibility	
						Implementation	Supervision
		✓ All users of said roads to always observe traffic rules this will give pedestrians and cyclist their space and safety while using the road; ✓ Restrict truck deliveries, where practicable, to day time working hours; (from 7.00 am to 7.00 pm); ✓ Restrict the transport of oversize loads; ✓ All vehicles should have updated fitness certificate and regularly checked for any kind of leakage; ✓ Operate vehicles, if possible, to non-peak periods to minimize traffic disruptions; ✓ Enforce on-site speed limit, especially close to the sensitive receptors, schools, health centers, etc.; ✓ Marking of the roads, warning signs / lights, road signs to be clearly used					
Sanitation Hazard & Drinking Water	Within the project site	✓ Project personnel and workers will follow appropriate means of waste removal and sanitation measures; ✓ All the employees should follow the safety protocol (i.e., Physical distancing, Face coverings, Gloves, Goggles & Face Shields, Hand hygiene, Coughing/Sneezing hygiene, Personal disinfection, request for cleaning supplies and Face coverings to others) due to the Covid situation; ✓ Adequate number of toilets and bathrooms should be made for both malethe workers. Standards range is 1 unit to 15 persons; ✓ Separate Male and female workers willtoilets should be madeavailable; ✓ Sanitary waste should be treated and adequately disposed of in drainage system to avoid surface water contamination; ✓ A Sewage Treatment Plant (STP) should be installed and maintained of capacity 40 m3/day to treat the sewage waste per applicable local standards to avoid ground water contamination; ✓ The sludge cake from the STP should be disposed to the municipal solid waste dumping site. ✓ Drinking water meets national/local or WHO drinking water standards; ✓ There should be arrangement of 4~5 litres per person per day potable water for all; ✓ Vector control and disinfection should be carried out throughout the living facility area.	Drinking water quality against Environment Conservation Rules (ECR) 2023 (Schedule-2 (Kha)) and & IFC EHS Guideline, 2007 Sewage treatment plant output sampling against ECR 2023 (Schedule-3), WB EHS guidelines for treated sanitary sewage discharge once in 3 months	Environment Conservation Rules (ECR) 2023 (Schedule-2 (Kha)) and & IFC EHS Guideline, 2007 ECR 2023 (Schedule-3), WB EHS guidelines for treated sanitary sewage discharge	Quarterly	EHS Team	Project Company
Impact due to Hazardous Waste and leaching of PV pane	Within the project site	✓ All hazardous waste will be stored in hazardous waste storage per waste management plan, with hard standing floor and roofing with bunding facility and secondary containment facility of 110% bigger than the allowable maximum storage capacity; ✓ An appropriate storage site should be provided for disassembled spare parts (e.g., motors and compressors) that contain oil or other types of fluids. They should be stored in containers that are secured that will not allow oil and other fluids to escape with an impermeable surface and a sealed drainage system; ✓ Hazardous components should be segregated having regard to their eventual destinations and the compatibility of the component types; ✓ Oil Sludge, spent lubricating oil will be sold only to the DoE approved vendors; ✓ Trained laborers with appropriate PPE should be appointed for unloading work; ✓ In case of any spillage, it should be immediately acted up on using spill kits. To combat spillage equipment i.e. safety goggles, gloves, PPE, disposal bags, containers, suction pump, boom skimmer etc. should be available at the site; ✓ Regular inspections of machinery, equipment, pipe work, storage areas are needed to ensure that poor maintenance is not responsible for a spillage occurring; ✓ Modules should not be carried by grasping the junction box or the cable; ✓ None should stand or walk on the modules;	Review hazardous waste inventoryFuel tank and chemical storage operation, maintenance and leakage inspection		Monthly	EHS Team	Project Company

Issues/aspects	Location	Mitigation measures	Monitoring Parameters	Applicable Standards	Frequency of Monitoring	Responsibility	
						Implementation	Supervision
		✓ Disassemble of the module or removing the nameplates should be avoided; ✓ Applying any kind of paint or adhesive on the module is prohibited; ✓ Damaging or scratching the back sheet of the module should be avoided; ✓ PV modules should be checked at a regular interval (once monthly) to avoid leaching; ✓ Damaged PV modules should be temporarily stored in the hazardous waste storage area and the Company will contact with licensed waste treatment agencies to collect and treat the panels as well as hazardous solid waste in compliance with national regulations.					
Labor and Working Condition	Within the project site	✓ The proponent Company will adopt and implement human resources policies and procedures as per the ILO Core Labour Standards Convention, IFC & EBRD Guidance and Bangladesh Labor Act, 2006; ✓ The proponent accommodation and management of the workers and officials should follow ILO Core Labour Standards Convention, IFC & EBRD Guidance and Bangladesh Labor Act, 2006; ✓ The Company will not make employment decisions based on personal characteristics unrelated to inherent job requirements; ✓ Proponent Project Company should maintain standard salary, salary deductions; hours of work; overtime arrangements and overtime compensation; ✓ Leave for illness, maternity, vacation, or holiday should also be maintained by the project authorityProject company; ✓ Child labor and forced labor should strictly be prohibited; ✓ Discrimination between male and female labor should be avoided; ✓ The proponent willCompany should not employ forced labor, which consists of any work or service not voluntarily performed that is exacted from an individual under threat of force or penalty.; ✓ Establish Internal (worker's) grievance mechanism which should be accessible to all project employees/workers hired by DSEPL and contractors and subcontractors if no alternative is available.	Implementation status of the mitigation measures		Quarterly	EHS Team	Project Company
Occupational Health and Safety	Within the project site	✓ Develop an OHS management plan covering OHS management structure, monitoring and reporting of OHS performance, specific procedures and requirements as described (but not limited to) those listed below, incidents reporting and management procedure ✓ The Company will provide appropriate treatment facilities on-site and have arrangements with the nearest local hospital and pay compensation according to ILO Core Labour Standards Convention and Bangladesh Labor Act, 2006; ✓ Develop and implement specific work instructions for high risk activities including but not limited to, work at height, permit to work system on high risk activities, log-out tag-out (LOTO) system, electrical works ✓ The workers should wear PPE (Personal Protective Equipment), safety goggles, and other necessaries as per requirements; ✓ The abnormal records on the system side should be regularly checked thoroughly to make sure that there is no electrical leakage; ✓ Proper protective measures (insulated gloves, insulated shoes, etc.) should be taken to avoid direct contact with 30V or higher voltage to ensure personal safety. ✓ Provide adequate lighting in all workrooms; ✓ Material Safety Data Sheets (MSDS) for each chemical used should be available and readily accessible at the facility; ✓ A safety manual for storage and handling of Hazardous chemicals will be prepared and implemented;	Daily inspection on PPE usage Review of implementation records of specific high-risk procedures (including photos) Proper fencing, isolation of site from general access, marked passage for workers and visitors, Documented record of all incident, accident and its remedial process, OHS training records & orientation of workers for safety		Daily for PPE use Monthly for Others	EHS Team	Project Company

Issues/aspects	Location	Mitigation measures	Monitoring Parameters	Applicable Standards	Frequency of Monitoring	Responsibility	
						Implementation	Supervision
		✓ Necessary first aid facilities (like Skin Cleaning Wipes, Cotton Gauze Pads, Pressure Bandage, Triangular Bandage, Wound Closure Strips, weight machine, sugar level machine Scissors, Tweezer, Cotton Ear Swabs, CPR Instructions, First Aid Guide and etc.) should be available at site; ✓ The staff will be trained for first-aid and firefighting procedures. The rescue team will support the first-aid and firefighting team; ✓ A first-aid center with the trained personnel (doctor and nurse) should be available; ✓ Train staff on how to prevent and manage incidences. This should involve proper handling of electricity, water etc. and sensitization on various modes of escape, conduct and responsibility during such incidences; ✓ Use signage to warn staff and/ or visitors of dangerous places. The signage must be visible and placed strategically; ✓ Firefighting systems, such as sprinklers, portable extinguishers (appropriate to the flammable hazard in the area) and automated fire extinguishers will be provided at strategic locations with clear labelling of the extinguisher type; ✓ Firefighting system will be tested periodically; ✓ Develop emergency response plan including evacuation procedures to handle emergency situations; ✓ A near miss and accident reporting system will be followed and corrective measures shall be taken to avoid / minimize near miss incidents; ✓ Safety measures in the form of DO and Don't Do will be displayed at strategic locations; ✓ A Permit to enter the project area will be established to ensure that only authorized persons can entry to the site; Proper facilities of cool drinking water, short intervals during work, wearing loose and light color dresses can mitigate heat stroke to workers;					
Community Health and Safety	Around the project site	✓ Isolate local people from project area for safety purpose; ✓ Proper fencing /boundary work should be done around the project site to control the movement of local people; ✓ All users of said roads to always observe traffic rules this will give pedestrians and cyclist their space and safety while using the road; ✓ Marking of the roads to be clearly done; ✓ Speed limit and proper sign board should be provided along the said road; ✓ Creating awareness among children, women, and old age people in particular and the community in general on traffic safety by using existing mediums such as school, women self-help groups, village union and religious occasions; ✓ Implementation of a safety program (speed restrictions, lights on trucks, truck load restrictions etc.) and should be followed to avoid accidents; ✓ Kitchen waste and sanitary waste should be properly handled and disposed at designated area to avoid outbreak of diseases.; ✓ The community must be kept informed of emergency procedures and protocol in case of an accident in the plant and in case of increased emissions from the project operations; ✓ The DSEPL EHS team should train all operation workers in basic sanitation and health care issues (e.g., how to avoid malaria, transmission of sexually transmitted infections (STI), and HIV/AIDS which should be ensured by the DSEPL authority;	Site inspection of implementation of the described measures Review of community GRM records		Weekly site inspection Monthly on community GRM	EHS Team	Project Company

Issues/aspects	Location	Mitigation measures	Monitoring Parameters	Applicable Standards	Frequency of Monitoring	Responsibility	
						Implementation	Supervision
		✓ The EHS team will also coordinate with local authorities to ensure that any conflicts will be immediately resolved which should be ensured by the DSEPL authority; ✓ Clear and visible danger and warning signs will be posted at designated areas to alert the community of the safety risks. In addition, transmission towers should be equipped with danger boards, barbed wire, and galvanized ground wire for earthing purposes; ✓ A grievance mechanism for community will be set up according to the details provided in Chapter 13.					
Impact on Terrestrial Habitat	In and around the project site	✓ Anti-reflective coating on solar panels will be used to reduce the solar glare negative impact on flying birds; ✓ Lights of the power plant area should install downwardly to avoid disturbance to the wildlife and birds; ✓ Plantation of local species in surrounding areas of within the Project site; ✓ A greenbelt area should be developed along the project boundary; ✓ Awareness should be built to the workers in favor of conserving wildlife and no poaching is allowed; ✓ This lighting facility, may cause disturbance to the nocturnal wildlife in and around the site. Replacing bright lighting at the sites with LED lights to avoid attracting insects and use of netting to exclude birds from the panel area; ✓ Proper installation of bird guards on the transmission line should be implemented to discourage birds from perching or nesting in unsafe locations and to prevent birds' wings to touch the line or the ground components. ✓	Implementation status of the mitigation measures		Quarterly	EHS Team	Project Company
Impact on Aquatic Habitat	In and around the project site	✓ Specific procedures and necessary preparedness to contain any accidental spill at source and also to prevent their spread in the surrounding environment; ✓ Site should be kept clean so as no pollutant from site should enter the water bodies along with run-off; ✓ Wastewater should not be disposed-off in the water bodies without proper treatment.	Implementation status of the mitigation measures		Quarterly	EHS Team	Project Company
Social acceptability of workers to the host communities	In and around the project site	✓ It is recommended to aware the foreign officials and workers (if any) about the social & religious actability in the area so that they could maintain those when they are in touch with local community; ✓ Adequate training or awareness would be given to the migratory workers about local culture and behavior. So, there is no major problem raising in dealing with foreign or migratory worker.	Implementation status of the mitigation measures		Quarterly	EHS Team	Project Company
Employment Generation	In and around the project site	✓ Encourage local and equitable employment; ✓ Salaries and other benefits based on qualification and experience; ✓ In order to increase the size of local employment, women should also be employed; ✓ Priority given to local residents for both professional and nonprofessional positions.	Implementation status of the mitigation measures		Quarterly	EHS Team	Project Company
Social and Economic enhancement around project area	National & local	✓ Service and materials for construction will be to the extent possible locally sourced; ✓ Local businessmen should be given priority in hiring supplying agent for food, vehicles and other daily supplies; ✓ Encourage local people with small-scale business plans; ✓ Ensure uninterrupted electricity generation and supply .	Implementation status of the mitigation measures		Quarterly	EHS Team	Project Company

7.4 Waste Management Plan

A waste management plan outlines how waste materials should be handled, collected, treated, and disposed of in an environmentally responsible and efficient manner. This waste management plan has been developed according to Solid Waste Management Rules, 2021, E-waste Management Rules, 2021 and World Bank Group's Environmental, Health, and Safety (EHS) Guidelines for Waste Management Facilities (2007) for both construction and operation phase.

In a broad sense, the solid waste of the project can be classified into three categories. They are:

(i) Municipal Waste/Kitchen Waste/Office Waste
(ii) Hazardous Waste
(iii) E-Waste

7.4.1 Municipal Waste/Kitchen Waste/Office Waste

(a) Segregation: Project management should implement a good house-keeping practice, such as, sorting and placing loose materials generated from different activities in the established areas away from common workspace, cleaning up excessive waste debris and oil from generator regularly, metal scraps and paint containers. The production of waste materials should be minimized by 3R (Reduce, Recycle and Reuse) approach. Suppliers should be requested to minimize packaging where practicable. All solid waste should be segregated properly in different colored bins. Refuse containers should be provided at each worksite. Wastes should be segregated into Biodegradable waste, Recyclable waste, and non-recyclable waste;

- **Biodegradable waste**: food waste, dry leaves, etc. for composting and reuse;
- **Recyclable waste:** paper, wood, cotton, reusable hardware, glass, metal scrap, etc.
- **Non-recyclable waste:** Polythene and plastics which cannot be treated for reuse.

Biodegradable	Green Container	
Recyclable	Yellow Container	
Other (Inorganic/Hazardous waste)	Red Container	

Difficult to dispose wastes (plastic and hazardous waste) should be minimized and where practicable and avoided such as plastic wastes. Potable water should be supplied in bulk containers to reduce the quantity of plastic waste (plastic bins). Plastic bag use should be avoided in kitchen and offices. All metals, scrap and other recyclable materials should be recycled to authorized dealers and records should be maintained. The waste should be finally collected and handed over a licensed/authorized (by DoE) waste handler.

(b) Storage: All sites should be maintained clean, tidy and safe and be provided and maintained with appropriate facilities as temporary storage of all wastes before transporting to final disposal. All wastes generated during construction should be disposed of in the designated disposal sites approved by the Project management. All type of solid waste which should be sold

or disposed to the disposal site should have proper movement register from the site for waste transfer.

(c) Dumping: Prior to the disposal sites reach their full capacity, all wastes should be transferred to the designated waste dumping yard of Upazila parishad. Vehicles transporting solid waste should be via an enclosed vehicle or should be fully covered with a tarp to prevent spilling waste along the route. All personnel in waste management practices and procedures should be trained and instructed as a component of the environmental induction process. Waste which could be sold or donated or recycled/reused by construction companies, local community groups or institutions should prioritise such opportunity. All type of solid waste which should be sold or disposed to the disposal site should have proper movement register and waste transfer challan.

(d) Waste Inventory – A waste inventory should be maintained to keep records of wastes being dumped, transferred or replaced from the project site. Amount of the wastes, dumping date with time, transferring or replacing date with time, type of waste, dumping truck number etc. should be recorded in the inventory.

EHS manager should be responsible to maintain this waste management plan in the project site with the coordination of workers, staffs and project management, and requires that construction contractor (including for transmission line) apply the same.

7.4.2 Hazardous Waste

(a) Segregation: Hazardous components should be segregated having regard to their eventual destinations and the compatibility of the component types. Any damaged or unfit for use panels should be stored as hazardous waste prior to recycling or disposal as hazardous waste.

(b) Storage: An appropriate hazardous waste storage should be provided for all hazardous waste including waste PV panel, disassembled spare parts (e.g., motors and compressors) that contain oil or other types of fluids.

(c) Dumping: Skilled labourers should be appointed for unloading work. Oil sludge, spent lubricating oil should be sold only to the DoE approved vendors. All type of hazardous waste which should be sold or disposed to the disposal site should have proper movement register and waste transfer challan.

(d) Waste Inventory: A waste inventory should be maintained to keep records of wastes being dumped, transferred or replaced from the project site. Amount of the wastes, dumping date with time, transferring or replacing date with time, type of waste, dumping truck number etc. should be recorded in the inventory.

EHS manager should be responsible to implement the hazardous waste management plan in the project site with the coordination of workers, staffs and project management.

7.5 Hazardous Material Management Plan

All hazardous materials should be kept in a container which has facility of secondary containment. They should be stored in containers that are secured that should not allow oil and other fluids to escape with an impermeable surface and a sealed drainage system. In case of any spillage, it should be immediately acted up on using spill kits. To combat spillage equipment i.e. safety goggles, gloves,

PPE, disposal bags, containers, suction pump, boom skimmer etc. should be available at the site. MSDS should be maintained in both storage area and main office building so that every staff and workers should be aware of the material storage. An inventory should be maintained to record the amount of usage and newly stored material. EHS manager should be responsible to monitor the inventory once in a week.

7.6 Labour Management Plan

A labour management plan, also known as a workforce management plan, is a strategic approach that an organization employs to effectively manage its workforce. This plan outlines the strategies, policies, and practices that ensure the organization has the right number of employees with the right skills in the right place and at the right time to meet its operational needs and goals. The plan aims to optimize labour resources while ensuring employee satisfaction and compliance with labour laws and regulations.

This Labour Management Plan has been developed according to Bangladesh Labour Act, 2006 (Amended in 2013 and 2018), ILO Core Labour standards and IFC Performance Standard 2: Labour and Working Conditions, 2012 for all workers and labourers involved in main power plant and TL site.

7.6.1 Overview of Labour Involved in the Project

The LMP applies to all Project workers whether full-time, part-time, temporary, seasonal or migrant workers. The LMP is applicable to the Project in the following manner:

- Direct Workers: People employed or engaged directly by the Project Implementation Unit (PIU) on its behalf to work specifically in relation to the Project;
- Contracted Workers: People employed or engaged by contractors to perform work related to core function i.e. construction of buildings, driving piles, installing PV panels, etc. for the project, regardless of location;

The project will engage primary suppliers, skilled and unskilled labor (local and international), security forces. However, in case of workers are engaged, it should be ensured that no child and/or force labor are engaged and OHS plan for the labors should be followed.

7.6.4 Policies and Procedures

This section outlines main policies and procedures to be followed during the implementation of the project.

As specified in the Bangladesh Labour Act, 2006 and ILO Core Labour standards the employment of project workers will be based on the principles of non-discrimination and equal opportunity. There will be no discrimination with respect to any aspects of the employment relationship, such as recruitment, compensation, working conditions and terms of employment, access to training, promotion or termination of employment. The following measures will be developed by the contractors and monitored by PIU to ensure fair treatment of all employees:

- As per Labour Code requirements, recruitment procedures will be transparent, public and non-discriminatory with respect to ethnicity, religion, disability, gender, and other grounds included in the Labour Code
- Applications for employment will be considered in accordance with the application procedures established by the Contractor
- Labour will be preferentially recruited from the local areas
- The contracted workers will not pay any hiring fees. If any hiring fees are to be incurred, these will be paid by the Contractor
- The labour contracts will be developed in Bangla so as to be understandable by all workers
- In addition to written documentation, an oral explanation of conditions and terms of employment will be provided to workers who may have difficulties with understanding the documentation
- While communicating with women workers, it is to be ensured that they understand their rights and process of raising issues and grievances related to their employment

7.6.4.1 Age of Employment

In the Bangladesh Labor Act, 2006, Section 34, it is mentioned that no child shall be employed to work in any occupation. Section 44 mentions that anyone under age 14 is considered as child and under 18 but over 14 is considered as adolescent. World Bank strictly prohibits child labor and clearly mentioned that the minimum age of 18 years is required for anyone to get employment in such works. Section 37 of the act suggests a fitness certificate required for adolescents to get employed and they can be appointed to do the light works.

According to the World Bank standards and guidelines, the minimum age of employment for this project shall be 18 years (given the potential hazardous situation posed by COVID-19) and to ensure compliance, all employees will be required to produce National Identification Cards as proof of their identity and age which is the national identification document required for employment.

If any contractor employs a person under the age of 18 years, measures to address the same will be taken by the PIU.

7.6.4.2 Working Hours

- No adult worker should ordinarily be required or allowed to work in a workplace for more than eight hours in any day.
- No adult worker should ordinarily be required or allowed to work in a workplace for more than forty-eight hours in any week. Provided that the total hours of work of an adult worker shall not exceed sixty hours in any week and on the average fifty-six hours per week in any year.
- Any worker in any workplace should not be liable to work either-
    - for more than six hours in any day unless he has been allowed an interval of at least one hour during that day for rest or meal;
    - for more than five hours in any one day unless he has been allowed an interval of at least half an hour during that day for rest or meal; or

  - for more than eight hours unless he has had an interval under clause (a) or two such intervals under clause (b) during that day for rest or meal.
- No women should, without her consent, be allowed to work in a site between the hours of 10.00 PM and 6.00 AM.

7.6.4.3 Time of Payment of Wages

- The wages of every worker should be paid before the expiry of the seventh day after the last day of the wage period in respect of which the wages are payable.

7.6.4.4 Extra-allowance for overtime

- Where a worker works in a workplace on any day or week for more than the hours fixed under this Plan, he should, in respect of overtime work, be entitled to allowance at the rate of twice his ordinary rate of basic wage and dearness allowance and ad-hoc or interim pay, if any.

7.6.4.5 Shelter and Rooms for Child

- In every workplace wherein more than fifty workers are ordinarily employed, adequate and suitable shelters or rest rooms, and a suitable lunch room, with provision for drinking water, where workers can eat meals brought by them, should be provided and maintained for the use of the workers.
- In the workplaces wherein more than 25 female workers are employed, separate shelter rooms are to be maintained and in site wherein less than 25 female workers are employed, separate and adequate spaces with screen should be provided.
- In every workplace, wherein forty or more workers are ordinarily employed, there should be provided and maintained a suitable room or rooms for the use of children under the age of six years of such women.

7.6.4.6 Drinking Water Facilities

- In every workplace effective arrangement should be made to provide and maintain at a suitable point conveniently situated for all workers employed therein, a sufficient supply of wholesome drinking water;
- In every workplace wherein two hundred fifty or more workers are ordinarily employed, provision should be made for cooling the drinking water during the hot weather by effective means and for distribution thereof;
- In every workplace, there should be provision of 80-180 liter per capita per day for potable use.

7.6.4.7 Latrines and Urinals

During construction and operation phase, every establishment should have-

- Conveniently situated and accessible sufficient latrines and urinals at the ratio of 1:15 should be provided to workers at all times while they are in the workplace;

- such latrines and urinals should be provided separately for male and female workers;
- such latrines and urinals should be adequately lighted and ventilated.

7.6.4.8 Dust and Fume

- Effective measures should be taken to prevent its accumulation in any work-room and it inhalation by workers, and if any exhaust appliance is necessary for this purpose, it should be applied as near as possible to the point of origin of the dust, fume or other impurity, and such point shall be enclosed so far as possible.

7.6.4.9 First-Aid Appliances

- In every workplace there should be provided and maintained first-aid appliances, so as to be readily accessible during all working hours first-aid boxes or cupboards equipped with the contents prescribed by rules.
- Every first-aid box or cupboard should be kept in charge of a responsible person who is trained in first-aid treatment and who should always be available during the working hours of the workplace site.
- In every workplace wherein three hundred or more workers are ordinarily employed, there should be provided and maintained a sick room with dispensary of the prescribed size, containing the prescribed equipment or similar facilities, in the charge of such medical and nursing staff as may be prescribed.

7.6.4.10 Right to, and liability for, payment of maternity benefit

- Every woman employed in a workplace site shall be entitled to and her employer shall be liable for, the payment of maternity benefit in respect of the period of eight weeks preceding the expected day of her delivery and eight weeks immediately following the day of her delivery.

7.6.6 Grievance Redress Mechanism

An internal grievance redress mechanism should be formed to resolve workers' and staffs' complaints or problems regarding the workplace or any other issues. A complaint box should be set near the working site, where workers' can provide their grievances in written format. A two-tier project-specific Grievance Redress Mechanism (GRM) should be established. The first tier is the grass-roots level mechanism. At this level, the grievances are reported to GR & CSR Manager and EHS Manager. If the issue/s cannot be resolved by the GR & CSR Manager and EHS Manager within 7 days, they will be brought to second tier which is grievance redress committee (GRC) at Dynamic Sun Energy Pvt. Ltd. established committee for potential resolution. This internal grievance redress committee will consult properly with workers and staffs to ensure issues are managed in an amicable way. Any grievance should be addressed and resolved within the shortest possible time to avoid unrest in workplace among workers and staffs. Details provided in Chapter 12.

7.6.7 Contractor's Responsibility

The below mentioned clauses are incorporated in all the agreements made with several contractors for labor management by DSEPL:

- All workmanship must be of good standard and acceptable to Engineer-in-Charge. All workers employed must of the best skilled level. Any below standard workers will be expelled from the site;
- Contractor must run his works in full swing. No plea, no argument whatsoever will be entertained/allowed in this case;
- If personal injury is caused to a worker by accident arising out of and in the course of his employment, his contractor should be liable to pay compensation in accordance with the provisions;
- DSEPL has a zero tolerance policy for not employing child labour and force labour for its own business as well as all of its contractors and subcontractors;
- Contractor must ensure that he or his workers do not involve themselves in any kinds of antisocial activities.

7.7 Labour Accommodation Management Plan

A Labour Accommodation Management Plan (LAMP) is a strategic document or framework that outlines the management and maintenance practices for accommodations provided to labourers, workers, or employees by companies, especially those engaged in construction, industrial, or other labour-intensive sectors.

The primary goal of a Labour Accommodation Management Plan is to ensure the well-being, safety, and overall living conditions of the labour force. This Labour Accommodation Management Plan has been developed according to Bangladesh Labour Act, 2006 (Amended in 2018) and IFC & EBRD Guidance Note on Workers' Accommodation: Processes and Standards (2009).

(a) General Living Facilities

- The location of the facilities is important to prevent exposure to wind, fire, flood and other natural hazards.

(b) Room/Dormitory Facilities

- Density standards are expressed either in terms of minimal volume per resident or of minimal floor space. Usual standards range from 10 to 12.5 cubic meters (volume) or 4 to 5.5 square meters (surface).
- A minimum ceiling height of 2.10 meters should be provided.
- In collective rooms, which are minimized, in order to provide workers with some privacy, only a reasonable number of workers should be allowed to share the same room. Standards range from 2 to 8 workers.
- Every resident should be provided with adequate furniture such as a table, a chair, a mirror and a bedside light.

- Separate sleeping areas should be provided for men and women, except in family accommodation.
- Sanitary facilities should be located within the same buildings and provided separately for men and women.
- It is the responsibility of the EHS manager to ensure that rooms/dormitories and sanitary facilities are in good condition.

(c) Bed Arrangements and Storage Facilities

- Each worker should be provided with a comfortable mattress, pillow, cover and clean bedding. There should be a minimum space between beds of 1 meter.
- Double and triple deck bunks are not advisable for fire safety and hygiene reasons, and their use should be minimized. Where they are used, there must be enough clear space between the lower and upper bunk of the bed. Standards range from to 0.7 to 1.10 meters.
- Facilities for the storage of personal belongings for workers should be provided. Standards vary from providing an individual cupboard for each worker to providing 475-litre big lockers and 1 meter of shelf unit.
- Separate storage for work boots and other personal protection equipment, as well as drying/airing areas may need to be provided depending on conditions.

(d) Heating, Air-Circulation, Ventilation and Light

- For facilities located in hot weather zones, adequate ventilation and/or air circulation systems should be provided.
- Both natural and artificial lighting should be provided and maintained in living facilities. It is best practice that the window area represents not less than 5% to 10% of the floor area.
- Emergency lighting should be provided.

(e) Toilet Facilities

- An adequate number of toilets should be provided to workers. Standards range from 1 unit to 15 persons to 1 unit per 6 persons. For urinals, usual standards are 1 unit to 15 persons.
- Toilet facilities should be conveniently located and easily accessible. Standards range from 30 to 60 meters from rooms/dormitories.
- Toilet rooms should be located so as to be accessible without any individual passing through any sleeping room. In addition, all toilet rooms should be well-lit, have good ventilation or external windows, have sufficient hand wash basins and be conveniently located.
- Toilets and other sanitary facilities should be ("must be" in cold climates) in the same building as rooms and dormitories.

(f) Showers/Bathrooms and Other Sanitary Facilities

- An adequate number of shower/bathroom facilities should be provided to workers. Standards range from 1 unit to 15 persons to 1 unit per 6 persons.

- An adequate number of hand wash facilities should be provided to workers. Standards range from 1 unit to each 15 persons to 1 unit per 6 workers. Hand wash facilities should consist of a tap and a basin, soap and hygienic means of drying hands.
- Shower/bathroom facilities should be provided with an adequate supply of cold and hot running water.
- The flooring for shower facilities should be of hard washable materials, damp-proof and properly drained. Shower/bathroom flooring is made of anti-slip hard washable materials.

(g) Canteen, Cooking and Laundry Facilities

- Canteen, cooking and laundry facilities should be built in adequate and easy to clean materials.
- There should be at least one canteen for every one hundred workers nearby the site.
- Kitchen should be kept neat and clean with sufficient cooking facilities and ventilation.
- Adequate facilities for washing and drying clothes should be provided.

(h) Drainage

- The labour accommodation area should have adequate drainage facilities to avoid the accumulation of stagnant water.

(i) Rooms for Children

- In every establishment, wherein forty or more workers are ordinarily employed, there should be a suitable room or rooms for the use of children under the age of six years of such women.

(j) Water Facilities

- An adequate supply of potable water must be available in the same buildings where bedrooms or dormitories are provided. Drinking water must meet ECR, 2023 and WHO drinking water standards.
- Depending on climate, weather conditions and accommodation standards, 80 to 180 litres per person per day should be available.
- Drinking water quality should be regularly monitored.

(k) Wastewater and Solid Waste

- Wastewater, sewage, food and any other waste materials should be adequately discharged, in compliance with local or World Bank standards – whichever is more stringent.
- Standards range from providing an adequate number of rubbish containers to providing leak proof, non-absorbent, rust and corrosion-resistant containers should be protected from insects and rodents.
- It is best practice to locate rubbish containers 30 meters from each shelter on a wooden, metal, or concrete stand. Such containers must be emptied at regular intervals (to be determined based on temperatures and volumes generated) to avoid unpleasant odours associated with decaying organic materials.

- Pest extermination, vector control and disinfection should be carried out throughout the living facilities in compliance with local requirements and/or good practice. Where warranted, pest and vector monitoring should be performed on a regular basis.

(l) Cleanliness

- The labour accommodation area should be cleared in the morning every day.
- If the area remains dirty for three consecutive days, EHS manager should be informed immediately.

(m) Communicable Disease Management

- The prevention and control of communicable diseases should be accomplished by proper sanitation, safe water and food supply, isolation, vaccination and immunization.
- If any personnel get affected with communicable disease, proper treatment should be provided in isolated room far from the accommodation area. Source of the disease should be found out by a medical investigation team to terminate the spread out.

7.8 Occupational Health and Safety Plan

An Occupational Health and Safety (OHS) plan is outlines procedures for ensuring the health, safety, and well-being of its employees, visitors, contractors, and anyone else who may be affected by its operations. The primary goal of an OHS plan is to prevent workplace accidents, injuries, illnesses, and potential hazards. Such a plan is essential for maintaining a safe and productive work environment while complying with legal and regulatory requirements. This OHS Plan has been developed according to National Occupational Health and Safety Policy, 2013 and World Bank Group's General Environmental, Health, and Safety (EHS) Guidelines, 2007.

7.8.1 Personal Protective Equipment (PPE)

The purpose of personal protective equipment (PPE) is to provide an effective barrier between a worker and potentially dangerous objects, substances, and processes. GPL will ensure all personnel have the right PPE while perform the job.

7.8.1.1 Basic Personal Protective Equipment

At a minimum, basic PPE for all workers involved in project activities (whether they are employeed by DSEPL or contractors) must include:

- Hard hat;
- Safety Glasses;
- High vis vests;
- Gloves (applicable to task); and
- Safety footwear.

Supervisor of each work task should ensure suitable PPE for each task is worn at all times, and DSEPL EHS team will conduct site inspection to ensure PPE is worn.

Note: All personal protective equipment must meet the applicable standard as defined by legislation and policy.

7.8.1.2 Inspection Defective/Damaged PPE

Workers must inspect PPE prior to use to verify it is fit for use. Defective or damaged PPE must be immediately removed from use. All PPEs removed from service will be tagged as out of service.

7.8.1.3 Selecting Personal Protective Equipment

PPE will be selected based on the following information:

- Hazard assessments;
- Material safety data sheet (MSDS);
- Legislative jurisdictional and ADB SPS requirements

7.8.1.4 Mandatory Full Time PPE Requirements

❖ **Head Protection**

- Personnel should wear hard hats that are in good condition and meet legislative jurisdictional requirements and standards.
- Only head apparel designed to be worn under a hard hat should be allowed.
- Hardhats are required while welding. They are to be fitted with the appropriate shield
- Eye and Face Protection
- All personnel must wear properly fitting eye and face protection commensurate with PCL policy on active work sites.
- Face and eye protection should be kept clean and in good repair.
- If a worker cannot wear safety glasses, as documented by a physician's note, alternate
- arrangements must be made to verify the individual's face and eyes are protected.
- All components of prescription glasses that are being used for eye protection must meet approved applicable regulatory standards.
- The prescription glasses will include side-shields that must meet the applicable regulatory standards.
- Coverall glasses or goggles shall be required for prescription glasses that do not meet the standard.
- Face shields are required when grinding/cutting steel, concrete, chemical use.
- When using a face shield, safety glasses are also required under the face shield.

❖ **Hand Protection**

- All personnel must have appropriate gloves available for their task on their persons.
- Gloves should be worn when conducting work activities with hazards that may cause injury to hands.

❖ **Foot Protection**

- All personnel on a work site must wear safety footwear.
- The minimum is a CSA approved, Grade one (green triangle), 6" high cut boot appropriate to the task.
- No running shoes of any kind are permitted on work sites.

- Safety footwear must be in good repair. It is the responsibility of the supervisor to verify that their footwear is in proper working condition.

❖ **High Visibility Vests**

- High visibility apparel should be worn whenever worker and mobile equipment are working in a common area.

❖ **Hearing Protection**

- Personnel should receive an overview of hearing protection requirements during the project orientation.
- The training should include identification of any hearing protection required areas, the hazards associated with noise exposure, and the purpose, use, maintenance, and limitations of the protective equipment provided on site.
- Personnel should not be exposed to noise in excess of the occupational exposure limits (OEL) listed below: 85 dBA Lex daily noise exposure level; 140 dBC peak sound level.

❖ **Limb and Body Protection**

- Where there is risk of injury to a worker's limb and/or body, adequate limb and body protection must be worn and equipment designed to protect employees from injury to their limbs and body must be used (i.e. chainsaw chaps).
- Where there is risk of injury due to congested work area and/or the movement of heavy equipment in and/or around the work area, all employees must wear high visibility apparel. When work is being done in extreme hot or cold temperatures, the protective clothing being worn must be reviewed to verify that it is adequate.
- Personnel must be informed of any special precautions that need to be taken or special protective clothing that needs to be worn. At a minimum a 4-inch sleeve is required (no tank tops / muscle shirts are permitted).

❖ **Fire Retardant Clothing**

- Fire retardant clothing (FRC) must be used where there is risk of fire (i.e., welding) or explosion, legislative requirements dictate, or client requirements dictate.
- Where FRC is required, the outer layer of worker's clothes, including rain gear, must be made of fire retardant material.

❖ **Clothing and Jewelry**

For personal protection and to limit the spread of construction related contaminates throughout the facility, workers will not be permitted to wear:

- loose fitting clothing or jewelry
- greasy or oily clothing;
- torn or ragged clothing;
- cut-off or "muscle" shirts (4" sleeve shirt is the minimum sleeve length allowed); or
- short pants

Work site personnel wearing shirts, other clothing and stickers displaying any offensive language or opinion will be asked to remove the offensive material or leave the site immediately.

7.8.2 Internal Grievance Redress Mechanism

An internal grievance redress mechanism should be formed to resolve workers' and staffs' complaints or problems regarding the workplace or any other issues. A complain box should be set near the working site, where workers' can provide their grievances in written format. This internal grievance redress committee will consult properly with workers and staffs to ensure issues are managed in an amicable way. The committee should be comprised of 4 members including Dynamic Sun Energy Pvt. Ltd. Director (convener), Plant manager, EHS Manager, member from contractor, and Grievance Redress (GR) & Corporate Social Responsibility (CSR) Manager. Any grievance should be addressed and resolved within the shortest possible time to avoid unrest in workplace among workers and staffs.

7.8.3 Document and Record Management

- EHS Manager is responsible for all the project E&S documentation and records, authorizing, issuing and maintaining these documents. The EHS Manager should also be responsible for coordinating function and local documentation to minimize repetition.
- All documentation should be controlled documents, and will be given a unique reference number;
- All controlled documentation should contain the following:
    - A creation date;
    - A revision date and number;
    - A unique reference number;
    - A title describing the document.
- Details of accident or incident, or near-miss should be properly recorded and their mitigations followed-up;
- Details of defective machines and equipment should be recorded with date of installation, date of commissioning, duration of performance, date of failure, duration of absence, reinstallation and recommissioning date, manufacturing company, supplier/dealer contact information should be recorded;
- Installation of new machines and equipment should be recorded;
- Details of construction materials with proper amount and supplier details should be recorded;
- Performance report of health and safety equipment should be checked and recorded twice in every month;
- A near miss and accident reporting system will be followed and corrective measures should be taken to avoid / minimize near miss incidents;
- All the reports and record files should be reviewed twice in a year by the project management.

7.8.4 Working at Heights

- Suitable, stable and strong enough equipment should be used for the job which should be maintained and checked regularly;
- Precautions should be taken when working on or near fragile surfaces;

- Protection should provided from falling objects;
- A ladder should not be rest against weak upper surfaces, for example glazing or plastic gutters;
- For strenuous or heavy tasks, ladders or stepladders should be used but maximum of 30 minutes at a time;
- Incompetent person (who doesn't have the skills, knowledge and experience to do the job) should not be involved in this type of tasks;
- Overreach on ladders or stepladders should be prohibited.

7.8.5 Electrical Works

- Energized electrical circuits should be avoided from contacts;
- All electrical devices should be treated as if they are lived or energized;
- The power source should be disconnected before servicing or repairing electrical equipment;
- Only tools and equipment with non-conducting handles should be used when working on electrical devices;
- Metallic pencils or rulers should not be used while dealing with electrical equipment;
- Rings or metal watchbands should not be worn during electrical works;
- When it is necessary to handle equipment that is plugged in, hands should be dry and nonconductive gloves, protective clothes and shoes with insulated shoes should be worn;
- If water or a chemical is spilled onto equipment, power should be shut off at the main switch or circuit breaker and the equipment should be unplugged as soon as possible;
- If an individual comes in contact with a live electrical conductor, the equipment, cord or the person should not be touched. The power source should be disconnected from the circuit breaker or the plug should be pulled out using a leather belt;
- Equipment producing a "tingle" should be disconnected and reported promptly for repair.
- A defective circuit should not be attempted to correct by interstation of another fuse or breaker, particularly one of larger capacity;
- Capacitors should be drained before working near them and the short circuit should be kept on the terminals during the work to prevent electrical shock;
- Another person's equipment or electrical control devices should not be touched unless instructed to do so;
- All electric contacts and conductors should be enclosed so that no one can accidentally encounter them;
- Electrical equipment should never be handled when hands, feet, or body are wet or perspiring, or when standing on a wet floor;
- When it is necessary to touch electrical equipment (for example, when checking for overheated motors), the back of the hand should be used. Thus, if accidental shock were to cause muscular contraction, none would freeze to the conductor;
- Highly flammable liquids should not be stored near electrical equipment;

7.8.6 PV Panel Cleaning

- Cleaners should brush any loose dirt off before spraying them with water which will make the squeegeeing process quicker and easier;
- Panels should be cleaned twice in a month;

- Exposure to sun and direct heat should be avoided while panel cleaning. Dawn and dusk period is considered to be the best time of panel cleaning.
- Workers cleaning panel should adhere to the working at height procedures

7.8.7 Medical/First Aid Facilities

- Workers and staffs should have access to medical/first aid facilities within the project site;
- Doctors and nurses should be available 24/7 at the medical center;
- A standby ambulance should be maintained during working period;
- Nearby hospitals should be communicated to get rapid and proper assistance from that side in case of any kind of occurrence and incident;
- Bed facilities at the site should be available to take proper treatments;
- Common medicines should be made available in the medical center;
- Necessary first aid facilities (like Skin Cleaning Wipes, Cotton Gauze Pads, Pressure Bandage, Triangular Bandage, Wound Closure Strips, weight machine, sugar level machine Scissors, Tweezer, Cotton Ear Swabs, CPR Instructions, First Aid Guide and etc.) should be available at site;
- Health Care Card should be issued to all the workers and staffs for availing free-health check-up once in a month and other facilities;
- In case of emergencies, medical staffs should move to the incident place for treatment and rescue operation;
- Details of each patient with provided treatment and medicine list should be recorded in the medical center and reviewed by the EHS manager or Assistant EHS manager once in a month.
- At least 5 qualified first aiders should be maintained on site

7.8.8 Workmanship and Health related issues

7.8.8.1 Over-exertion

Over-exertion, ergonomic injuries and illnesses, such as repetitive motion and manual handling, are among the most common causes of injuries in construction and decommissioning sites.

- Trainings should be providing to workers in lifting and materials handling techniques in construction and decommissioning projects, including the placement of weight limits above which mechanical assists or two-person lifts are necessary
- Tools and workstation should be selected and designed to reduce force requirements and holding times, and which promote improved postures, including, where applicable, user adjustable work stations
- Administrative controls should be implemented into work processes, such as job rotations and rest or stretch breaks.

7.8.8.2 Slip and Falls

Slips and falls on the same elevation associated with poor housekeeping, such as excessive waste debris, loose construction materials, liquid spills, and uncontrolled use of electrical cords and ropes

on the ground, are also among the most frequent cause of lost time accidents at construction and decommissioning sites.

- Good house-keeping practices should be implemented, such as the sorting and placing loose construction materials or demolition debris in established areas away from foot paths;
- Excessive waste like debris and liquid spills should be cleaned up regularly;
- Electrical cords and ropes should be located in common areas and marked corridors;
- Slip retardant footwear should be used.

7.8.8.3 Work in Heights

Falls from elevation associated with working with ladders, scaffolding, and partially built or demolished structures are among the most common cause of fatal or permanent disabling injury at construction or decommissioning sites. If fall hazards exist, a fall protection plan should be in place which includes one or more of the following aspects, depending on the nature of the fall hazard.

- Trainings should be provided regarding the use of temporary fall prevention devices, when working at heights equal or greater than two meters or at any height if the risk includes falling into operating machinery, into water or other liquid, into hazardous substances, or through an opening in a work surface;
- Trainings should be provided regarding the use of personal fall arrest systems, such as full body harnesses and energy absorbing lanyards as well as fall rescue procedures to deal with workers whose fall has been successfully arrested;
- Control zones and safety monitoring systems should be used to warn workers of their proximity to fall hazard zones, as well as securing, marking, and labeling covers for openings in floors, roofs, or walking surfaces.

7.8.8.4 Struck by Objects

Construction and demolition activities may pose significant hazards related to the potential fall of materials or tools, as well as ejection of solid particles from abrasive or other types of power tools which can result in injury to the head, eyes, and extremities.

- A designated and restricted waste drop or discharge zone should be used for safe movement of wastes from upper to lower levels;
- Sawing, cutting, grinding, sanding, chipping should be conducted with proper guards and anchoring as applicable;
- Clear traffic ways should be maintained to avoid driving of heavy equipment over loose scrap;
- Temporary fall protection measures should be used in scaffolds and out edges of elevated work surfaces, such as hand rails and toe boards to prevent materials from being dislodged.

7.8.8.5 Moving Machineries

Vehicle traffic and use of lifting equipment in the movement of machinery and materials on a construction site may pose temporary hazards, such as physical contact, spills, dust, emissions, and noise. Heavy equipment operators have limited fields of view close to their equipment and may not see
pedestrians close to the vehicle.

- The location of vehicle traffic, machine operation, and walking areas should be planned and segregated;
- Vehicle traffic should be controlled through the use of one-way traffic routes, establishment of speed limits, and on-site trained flag-people wearing high-visibility vests or outer clothing covering to direct traffic
- The visibility of personnel should be ensured through their use of high visibility vests when working in or walking through heavy equipment operating areas, and training of workers to verify eye contact with equipment operators before approaching the operating vehicle;
- Inspected and well-maintained lifting devices should be used which are appropriate for the load, such as cranes, and securing loads when lifting them to higher job-site elevations.

7.8.8.6 Training

- Job-specific trainings should be provided to workers and staffs;
- When new machineries are introduced, workers should be aware of it's details;
- Workers and staffs should be aware of emergency management plan of their workplace;
- Workers and staffs should be able to handle any adverse situation which may occur;
- They should be well-known and trained about fire extinguishing process, rescue plan and communication matrix.

7.8.8.7 Proper Signage and Safety

- Safety measures in the form of DO and Don't Do will be displayed at strategic locations;
- Firefighting equipment should be available within the power plant area;
- Fire extinguishers should be kept near all storage area, labour camp area to extinguish the fire at its initial stage;
- Water hoses should be provisioned with long pipes;
- Arrangement of firefighting equipment's with training to the staffs from workers to officers;
- Supervision of works should be done regularly by contractors and DSEPL's EHS team to ensure that safety conditions are met while any deviation from safety regulations is immediately reclaimed following the best practices regarding safety at work;

7.8.9 Security

- Proper fencing and/or physical barriers should be provided to keep the general public off the site and to keep materials and equipment inside the site;
- Entrance and exit points should be closed when not in use and opened only when required for specific deliveries or other authorized entries.
- Walkway areas and workplace areas should be illuminated to an adequate degree of brightness. For safe access & egress, each site should have specific identified emergency route lighting which will automatically initiate when there is an electrical power loss.
- All visitors must report to the project office prior to going on site and be provided with an escort. All visitors should be required to sign in and out at the project area.
- Any personnel and sub-contractors/trade contractors that return to the project after hours or on weekends must be authorized to do so by the project superintendent or operations designate.

- Only authorized vehicles should be allowed on site

7.9 Green Belt Development

In the surrounding areas, trees of specific species can reduce the pollution as well as can provide enhanced oxygen for the surrounding area. Suitable plant species for green belt development is presented in **Table 7.2**

Table 7.2: Suitable plant Species for "Green Belt Development"

Sl No.	Name of the Plant	Name in Bangla	Type	Function
1.	Australian Wattle	আকাশমণি	Tree	Reduces Particulate Matter
2.	Bael tree	বেলগাছ	Tree	Reduces Particulate Matter
3.	The Siris Tree	শিরিষগাছ	Tree	Reduces Particulate Matter
4.	White Siris	করই	Tree	Reduces Particulate Matter
5.	Sugar Apple	আতাগাছ	Tree	Reduces Particulate Matter
6.	Kadam	কদম	Tree	Reduces Particulate Matter
7.	Nim	নিম	Tree	Reduces Particulate Matter
8.	Bamboo	বাঁশ	Tree	Reduces Particulate Matter
9.	Australian Whistling Pine	ঝাউ	Tree	Reduces Particulate Matter
10.	Rangan	রঙ্গন	Shrub	Noise Attenuation
11.	Kamini	কামিনী	Shrub	Noise Attenuation
12.	Karabi	করবি	Shrub	Noise Attenuation
13.	Guava tree	পেয়ারা	Shrub	Noise Attenuation
14.	Tagar	টগর	Shrub	Noise Attenuation
15.	Mastered Green	সরিষা	Forb/Herb	NO_x Absorption

According to the layout of the project site there will be green area of 4.2 acres of the total project area. During operation phase, proponent intends to cultivate local crops to enhance the land use which will also add to green coverage of the project area. After starting the crop cultivation activity, total coverage of greenery will become more.

7.10 3R (Reduce, Reuse, Recycle) Plan

Minimizing the use of resources in the manufacture, distribution and use of products consumed by factories with maximum reuse, recycling and recovery has embodied as a concept of 3Rs (Reduce, Reuse and Recycle). In recent days, the 3Rs principle has started to gain more attention due to the depletion of natural resources and increase of pollution level in the environment.

Only domestic and sanitary waste water will be generated from the project site during operation phase. DSEPL has installed septic tank and soak well for domestic and sanitary waste water for construction period. DSEPL will install STP for sewage treatment during operation phase. The project proponent is going to install 7 rain water harvesting ponds to minimize the usage of ground water. Capacity of each rainwater harvesting pond will be 3250 m^3. They will reserve 22,750 m^3 of water for

PV panel cleaning. There will be no other chemical in the washing water and will be collected to reuse in plantation and cropping purpose. To optimize the use of electricity, they will use LED lights. Other than this, the project already committed to make no liquid discharge from the process and implement zero liquid discharge.

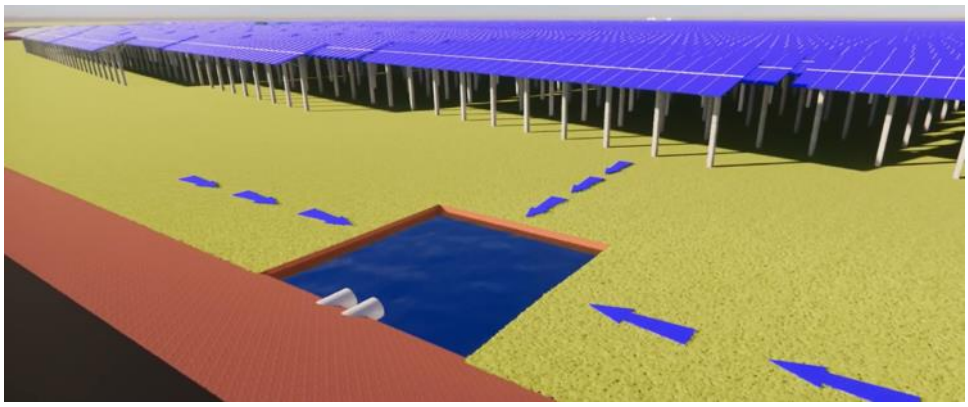


Figure 7.1: Proposed Rainwater Harvesting Pond

7.11 Corporate Social Responsibility (CSR)

Corporate Social Responsibility (CSR) activities have significant implications for a company's internal and external stakeholders, including nearby communities, civil society organizations, regulators, international financial organizations, NGOs and news media. Local people have the concern about corporate accountability and the impact of corporate strategies and operations on the physical, economic, and socio-political environments.

The Project company under "Corporate Social Responsibility (CSR)" to improve the quality of life of the local community will take some initiatives as mentioned below:

- Project company will donate to local schools, colleges, mosques, madrasas and temples.
- Providing financial assistance in technical education and scholarships to meritorious students of local educational institutions.
- Assist to arrange regular free health check-up camps in collaboration with local NGOs and hospitals.
- Support for installation of deep tube wells at important places in surrounding areas for clean drinking water. Technical training will be imparted to the local youth.
- Farming of cash crops will be arranged on vacant land under solar panels and local men and women will be employed in farming activities.
- The Project company will co-ordinate with the relevant government officials in maintenance work of the surrounding roads connected to the project site; Service and materials for construction will be to the extent possible locally sourced;
- Local businessmen should be given priority in hiring supplying agent for food, vehicles and other daily supplies.

7.12 ESMP Implementation Team

For proper implementation of the ESMP, there should be a core group of people in the power plant who should be well trained on environmental issues but all personnel at site should be given basic training on environmental and health & safety. The skills of staff should be refreshed and upgraded periodically through need-based training program. There will be separate team for construction and operation phase. Both teams are shown in **Figure 7.2** and **7.3** The responsibility of the ESMP implementation team is presented in the **Table 7.3** below.

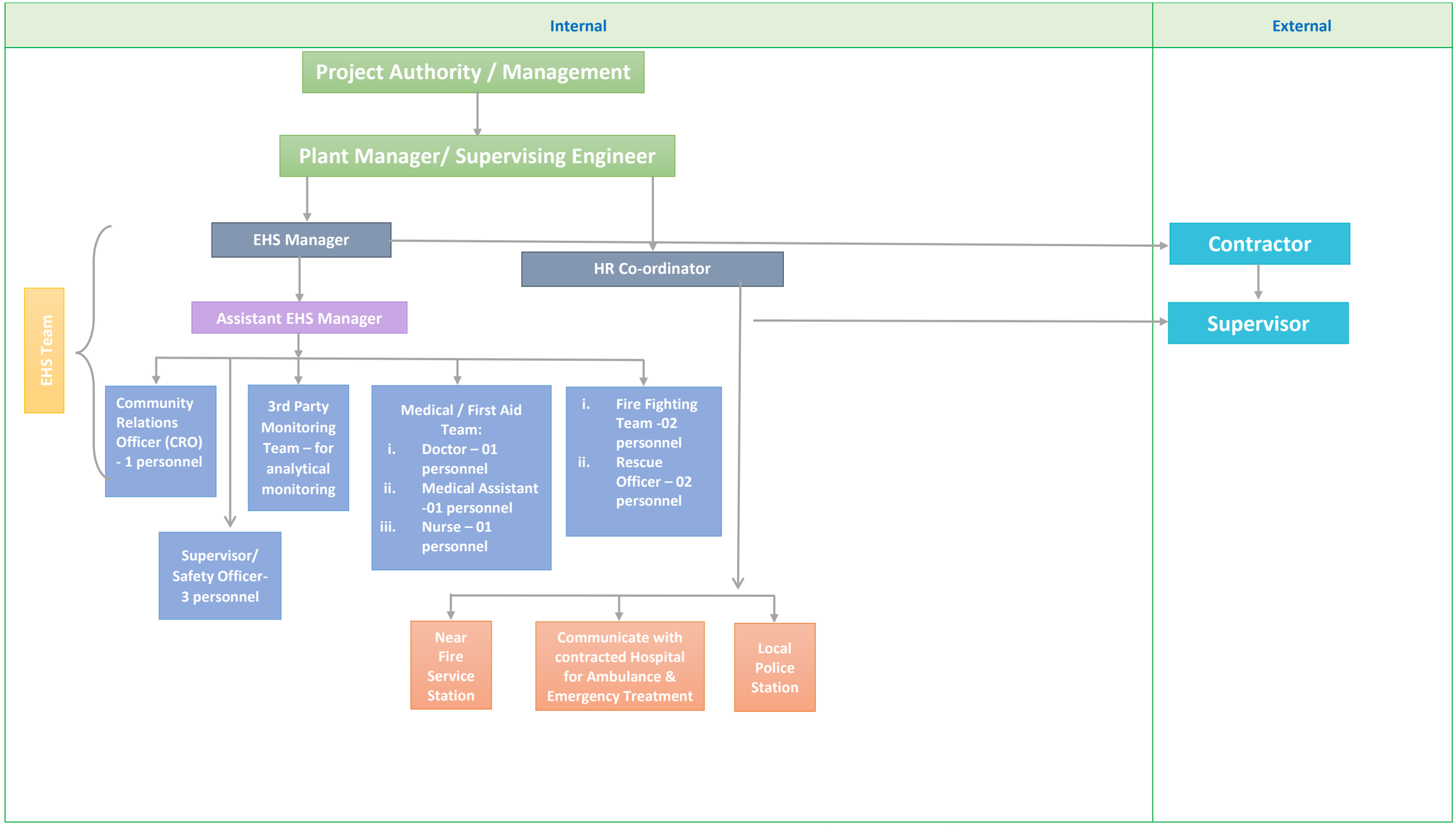


Figure 7.2: EMP Implementation Team (Construction Phase)

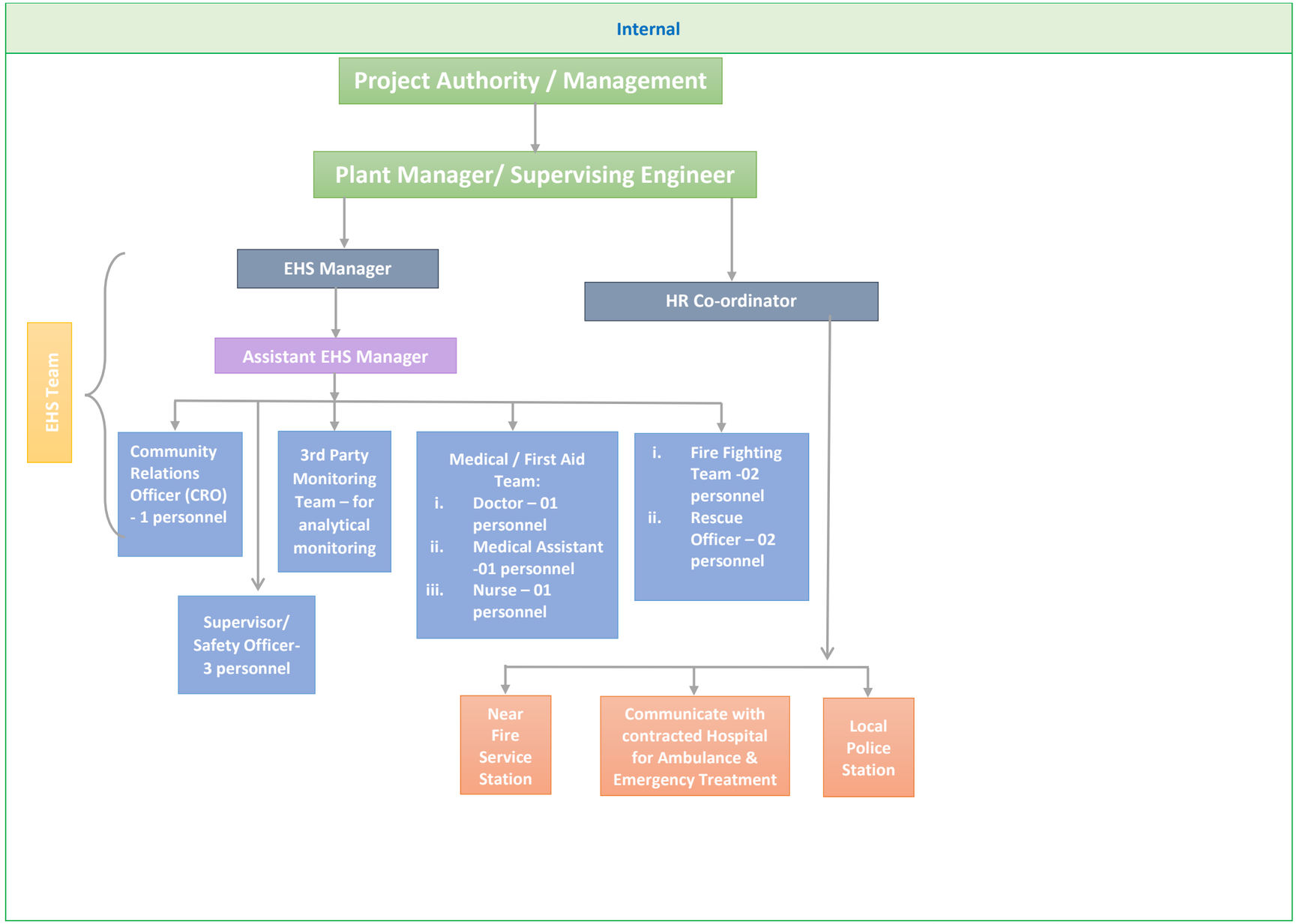


Figure 7.3: EMP Implementation Team (Operation Phase)

Table 7.3: Responsibility of Team Members

Sl. No.	Person	Responsibility
1.	Project Authority (Director)	• Project Authority/ Management is overall responsible for complying with all local and ADB requirements. • Should take final decision in any kind of emergency.
2.	Plant Manager/Supervising Engineer	• Responsible to oversee implementation of the project on time and furnishing both financial and physical progress; • has the overall responsibility and accountability for environmental and social performance of the Project through effective management and well-established project review and oversight mechanisms; • should review ESMP implementation status; • Contact with higher management and take necessary steps during any emergency. • Ensure training and sufficient resources are provided to implement the ESMP
3.	Environmental Health and Safety Manager (Team Leader)	• Inspect the facility to identify safety, health, and environmental risks; • Develop and implement inspection policies and procedures, and a schedule of routine inspections; • Develop and implement health and safety procedures for all areas of the company; • Maintain records of employee exposure to hazardous waste and/or pollutants, as required; • Conduct visual monitoring according to **Table 8.1** and **8.3** during construction and operation phase; • Should take actions and instruct relevant officials for several activities during emergency situation; • Monitor the performance of EPC Contractor during construction phase. • Ensure training plan is implemented
4.	Assistant Environmental Health and Safety Manager	• Assist EHS Manager to inspect the facility to identify safety, health, and environmental risks • Prepare and schedule training to cover emergency procedures, workplace safety, and other relevant topics; • Monitor compliance with safety procedures; • Ensure that material safety data sheets are maintained and readily accessible when needed;

Sl. No.	Person	Responsibility
		• Make reports on visual monitoring according to **Table 8.1** and **8.3** during construction and operation phase; • Review 3rd Party Monitoring Reports and send them to EHS Manager; • Ensure undertaking suggested monitoring and prepare monitoring reports during operation phase and supervise monitoring during construction phase;
5.	Community Relations Officer (CRO)	• Will maintain the Grievance logbook; • Will try to resolve the grievances at root level; • In case of unsolved complaints, arrange GRC meeting and keep the records of the meetings; • Monitor the status of the commitments made during the GRC meetings; • Regular consulting with project related peoples regarding their views about the project; • Undertake and implement CSR activities.
6.	3rd Party Monitoring Team	• Conduct analytical monitoring according to **Table 8.2** and **8.4** during construction and operation phase; • Make reports and submit them to the EHS manager.
7.	Medical/First Aid Team	• Provide primary health check-up and medicine facilities; • Treat patients affected with common illnesses; • Provide first-aid to the affected persons before sending them to actual medical aid;
8.	Fire Fighting Team (consists of 2 fire fighting officers)	• Conduct mock drills on a regular basis to make workers and staffs aware of fire emergency response; • Rescue affected personnel during any kind of fire hazard; • Check fire extinguishers at the strategic locations regularly; • Check proper signage and markings around the fire prone areas; • Carry out a fire risk assessment of the premises and review it regularly; • Provide staff information, fire safety instruction and training; • Mitigate the Fire as per procedure (Trained). • Report to EHS Manager about any kind of unusualness and scarcity of extinguishers immediately.

Sl. No.	Person	Responsibility
9.	Rescue Officer	• Solely dedicated to rescue personnel during any adverse situation such as, earthquake, flooding, fire hazard, terrorist attack and so on; • Provide trainings to workers and staffs about basic lifesaving hacks and methods; • Report to EHS Manager about any kind of unusualness immediately.
10.	Human Resources (HR) Coordinator	• Reports to the project management & plant manager and responsible for providing information and managing all human resources matters pertaining to the emergency situation; • Responsible for communicating with contracted hospital for ambulance and emergency treatment including arranging meeting and transportation of casualties and medical cases to hospital; • Responsible for communicating with local police station; • Responsible for providing welfare support and advice to employees and their families; • Responsible for arranging temporary accommodation, and assistance for personnel being evacuated from emergency site; • Responsible for coordinating with the nearby fire service station in case of any emergency.
11.	EPC Contractor (during construction)	• Manage and supervise environmental health & safety issues during their work; • Ensure a safe and healthy working environment and systems of work through sensitizing employees on occupational health and safety during construction phase.
12.	Supervisor	• Monitor workers' performance and safety issues related to them; • Ensure that workers are wearing proper PPEs during construction works; • Report to EPC Contractor and Assistant EHS Manager regarding any near miss or accidents take place.
13.	Security	• Stop entry of all external vehicles and personnel from outside the premises; • During emergency situation shall stand in readiness for further instructions from EHS Manager and shall act as per the instructions given by him;

Sl. No.	Person	Responsibility
		• Direct all the vehicles (such as ambulances, fire tenders etc.) coming for help from outside organizations to the incident spot; • During nights if any incident happens which is alarming or which can cause emergency, security guard should immediately inform the same to the EHS Manager by mobile phone and act as directed by him.

7.13 ESMP Monitoring and Review

The environmental unit of Dynamic Sun Energy Private Limited shall periodically review, monitor and audit the effectiveness of the ESMP, including all sub-plans. The frequency of audits should reflect the intensity of activities (typically more common during construction), severity of environmental and social impacts and non-compliances raised in prior audits.

7.13.1 Review of the ESMP

The review of the ESMP should consider the following:

- Adequacy of data collection, analysis and review;
- Documentation review
- Reporting;
- Identification of non-compliances; and
- Corrective actions implemented.

The ESMP shall also be reviewed periodically by Dynamic Sun Energy Private Limited to evaluate environmental controls and procedures to make sure they are still applicable to the activities being carried out. Reviews will be undertaken by the EHS Manager of Dynamic Sun Energy Private Limited as follows:

- The full ESMP implementation shall be reviewed at least annually;
- Relevant parts of the ESMP shall be reviewed following a non-compliance, reportable incident or near miss or complaints;
- Relevant parts of the ESMP shall be reviewed following the receipt of an updated sub plan;
- Relevant parts of the ESMP shall be reviewed on request of stakeholders, Contractor, Supervising Engineer, DOE or the lender;

The review shall include analysis of the data collection and analysis of data, monitoring reports, incident reports, complaints/grievances and feedback from stakeholders, community reports, and consultation meeting minutes and training records to evaluate the effectiveness of ESMP procedures. Site visits, interviews and other auditing methods may also be used.

7.14 Cost of ESMP implementation

Table 7.4: ESMP Implementation Cost

Item	Number	Duration	Total cost per year (Taka)
Construction Phase			
Environmental monitoring during Construction period	Refer Table 8.5	6 months	**395,000.00**
Occupational Health, Safety and Security implementation	Lump sum	6 months	**500,000.00**
Community Health Safety and Security implementation	Lump sum	6 months	**250,000.00**
Capacity Building and Training	02	6 months	**200,000.00**
First Aid, Emergency medicine & Medical services	Lump sum	6 months	**50,000.00**
CSR Activity	Lump sum	6 months	**250,000.00**
Sub-Total =			**16,45,000.00**
Contingency budget (10% of subtotal cost)			**16,4,500.00**
Total			**18,09,500.00**
Operation Phase			
Environmental monitoring during Operation period	Refer Table 8.6	Yearly	**790,000.00**
Occupational Health, Safety and Security implementation	Lump sum	Yearly	**500,000.00**
Community Health Safety and Security implementation	Lump sum	Yearly	**500,000.00**
Capacity Building and Training	04	Yearly	**400,000.00**
First Aid, Emergency medicine & Medical services	Lump sum	Yearly	**100,000.00**
Greenbelt development	Lump sum	Yearly	**500,000.00**
CSR Activity	Lump sum	Yearly	**500,000.00**
Sub-Total=			**32,90,000.00**
Contingency budget (10% of subtotal cost)			**3,29,000.00**
Total			**36,19,000.00**

7.15 Contingency plan

A contingency plan is a plan devised for an outcome other than in the usual (expected) plan. It is often used for risk management for an exceptional risk that, though unlikely, would have catastrophic consequences. Contingency budget will be 10% of subtotal estimated cost of ESMP implementation cost mentioned in **Table 7.4**

7.16 Decommissioning and Dismantling

At the stage of the project planning & implementation process, the necessity for planning and timing of the decommissioning of the construction equipment & structures after the completion of construction and end of life power plant project is important. Dynamic Sun Energy Private Limited authority should plan to prepare a full-scale decommissioning plan for the project after construction and after the life expectancy of the project to clean up the site.

7.16.1 After Completion of the Construction of Plant

The project proponent/designated contractor is responsible for the decommissioning of the Equipment and temporary structure at the project site. After the completion of the construction, there will have plenty of construction equipment, scrap metal, construction materials, different types of waste chemicals. It will be ensured by the project proponent/designated contractor that no hazardous substance will be discharged to the atmosphere.

7.16.2 At the End of Plant's Life

After the power plant reaches its end of life, Project company should dismantle the entire project and restore the project site back to the normal unless otherwise mentioned by the BPDB. Decommissioning may involve adverse impacts not perceived fully at this stage of the project. As the environmental and social condition of that time is not fully predictable, so a detail time & project specific decommissioning plan should be prepared prior to closure of the power plants. Such a plan might consider:

i. Damage to Solar Panels:

Depending on the type used, photovoltaic cells may contain toxic substances such as silver, arsenic, lead and cadmium. If any solar panel is damaged during the dismantling of the facility, these toxins are likely to spill and leach into the soil and water of the area, posing a serious threat to environmental and public health.

ii. Unsafe Disposal of Solar Panels:

If the solar panels are not handled or disposed of properly during the decommissioning phase, any toxic substances contained within them are likely to escape into the surrounding air, water or soil, creating serious environmental and public health risks

Proposed mitigation measures that should be considered are as follows:

- ✓ Strict adherence to all appropriate waste management techniques, including the reuse and recycling of materials wherever possible;
- ✓ Disposable of hazardous waste materials in a legal and responsible manner;
- ✓ Damaged and old PV modules should be temporarily stored in the hazardous waste and give them to licensed waste treatment agencies to treat the panels as well as hazardous solid waste in compliance with national regulations;
- ✓ All the dismantled infrastructures and debris shall be segregated and stored separately with cover facility to negotiate with contamination effects of such wastes;
- ✓ The metal structure will be sold out to the approved recyclers, whereas, debris will be disposed-off as per their characteristics;
- ✓ All waste generated from decommissioning phase shall be collected and disposed of at the nearest identified disposal site;
- ✓ All necessary Personal Protection Equipment (PPE) shall be used by the workers during demolition work;
- ✓ Solar Panels as utilized for the project even after 20 years will have the 70 – 80% power generation capacity. Due to technology improvement, after 20 years recycling or reutilization of these panels are very much likely;

- ✓ Remediation of soil and/or groundwater contamination (if applicable); and
- ✓ Rehabilitation and enhancement of terrestrial habitats within the power plants footprints;
- ✓ It is to be ensured that dismantling is carried out during the non-monsoon season and all the drainage channels will keep intact by creating bunds around them;
- ✓ Mitigation measures to control dust and air emissions during the construction phase will be implemented;
- ✓ Soil and groundwater monitoring to determine subsurface impacts (if any) for the restoration to baseline conditions;
- ✓ Impacts during the decommissioning phase will be similar to those for the construction phase. So, mitigation measures suggested for construction phase should be followed.

Chapter 8

8 MONITORING, EVALUATION AND REPORTING

8.1 Introduction

Environmental monitoring is an essential tool in relation to environmental management as it provides the basic information for rational management decisions. The prime objectives of monitoring are-

- To check on whether mitigation and benefit enhancement measures are actually being adopted and are effective in practice;
- To provide a means whereby impacts which were subject to uncertainty at the time of preparation of IEE, or which were unforeseen, can be identified, and steps to be taken to adopt appropriate control measures;
- To provide information on the actual nature and extent of key impacts and the effectiveness of the mitigation measures which, through a feedback mechanism, can be taken into account in the planning and execution of similar projects in future.

There are two basic forms of monitoring:

- Visual observation or checking, coupled with inquiries
- Physical measurement of selected parameters

In the case of industrial projects in general, monitoring is done by physical measurement of some selected parameters like air, water, noise etc. It should be mentioned here that the monitoring program should be such so that it can ensure compliance with national environmental standards. The importance of this monitoring program is also for ensuring that the plant does not create adverse environmental changes in the area and providing a database of operations and maintenance, which can be utilized if unwarranted complaints are made. The monitoring locations will be same as the baseline study and the standard value mentioned in the baseline study should be considered to compare the achieved data via monitoring.

8.2 Monitoring During Construction

The environmental monitoring during the construction phase should primarily be focused on addressing the possible negative impacts arising from:

- Deterioration of Air Quality
- Increased traffic
- Generation of noise
- Generation and disposal of sewage, solid waste and construction waste

The environmental monitoring should also focus on enhancing the possible beneficial impacts arising from employment of local workforce for construction works. **Table 8.1 & 8.2** summarizes the potentially significant environmental parameters needed to be monitored during the construction

phase. DSEPL is responsible for overall environmental monitoring during the construction phase of the project for which they will appoint a 3rd party consultant team.

Table 8.1: Monitoring Plan during Construction Phase of the Project (Visual)

Issue	Key aspects	Monitoring Frequency	Responsibility
Traffic volume	Incoming & outgoing traffic, traffic movement records	Monthly	DSEPL
Site Security	Proper fencing, isolation of site from general access, marked passage for workers and visitors	Quarterly	
Personal Protective Equipment	Ensure every single person involved in the construction activity wear proper PPE	• daily inspection by supervisors • weekly/ monthly inspection by manager/ engineers	
Incident record & reporting	Documented record of all incident, accident and its remedial process.	Quarterly	
Solid waste	Quantity of solid waste, segregation, disposal process and transfer	Quarterly	
Access to medical facility	Check access to medical facility with contracted hospital and first aid facility at site	Quarterly	
Grievance Redress Mechanism	Any significant complaint from External (neighbours) and Internal (workers) and their remedial procedure	• Monthly for internal • Monthly on Community GRM	
Safety orientation & training of workers	Frequency of training & orientation of workers for safety	Quarterly	
Sanitation & drinking water facility to workers	Availability of safe drinking water and it's quality, septic tank/wastewater disposal and sanitation facility to the workers Septic tank/wastewater disposal, outlet characteristics and sanitation facility to the workers	Quarterly	
Chemical Storage and Management	Fuel tank and chemical storage operation, maintenance and leakage inspection	Monthly	
Hazardous Waste Storage	Storage area condition, availability of spill kit, inventory	Monthly	

Issue	Key aspects	Monitoring Frequency	Responsibility
Site Drainage	Maintaining proper drainage	Quarterly	
Occupational Health and Safety	Daily inspection on PPE usage Review of implementation records of specific high-risk procedures (including photos) Inspection of transmission tower construction contractor safety performance against OHS plan Documented record of all incident, accident and its remedial process	Daily for PPE usage Weekly inspection of transmission tower construction safety Monthly for others	
Community Health and Safety	Site inspection of implementation of the described measures Review of community GRM records	Weekly site inspection Monthly on community GRM	
Terrestrial Habitat	Implementation status of the mitigation measures	Quarterly	
Aquatic Habitat	Implementation status of the mitigation measures	Quarterly	
Labor and Working Condition	Implementation status of the mitigation measures	Quarterly	
Social acceptability of Construction workers to the host communities	Implementation status of the mitigation measures	Quarterly	
Employment Generation	Implementation status of the mitigation measures	Quarterly	
Increase in local business	Implementation status of the mitigation measures	Quarterly	

Table 8.2: Monitoring Plan during Construction Phase of the Project (Analytical)

Issue	Parameters	Applicable Standards	Monitoring Locations	Monitoring Frequency	Responsibility
Ambient Air Quality	SO_2, NOx, CO, SPM, PM_{10} and $PM_{2.5}$	Air Pollution (Control) Rules 2022 (Schedule-1) & IFC EHS Guideline, 2007	Given in Table 4.17	Once in 3 months	DSEPL and implemented by 3rd party consultant
Noise level	Noise at different locations at day and night	Noise Pollution (Control) Rules 2006 (Schedule-1) & IFC EHS Guideline, 2007	Given in Table 4.19	Once in 3 months	

Issue	Parameters	Applicable Standards	Monitoring Locations	Monitoring Frequency	Responsibility
Soil	pH, Cd, Cr, Pb, Zn, Al, Cu, Ni, and Si	World Health Organization (WHO) (1996) Permissible Limits of Heavy Metals in Soil and Plants.	Given in Table 4.23	Once in 6 months	
Surface water	Temperature, pH, TDS, TSS, DO, BOD, COD, EC, Fe, Cr, Pb, Cd, Zn, Al, Cu, Ni, Sulphate, Nitrate, and Phosphate.	Environment Conservation Rules (ECR) 2023 (Schedule-2 (Ka)(1)) and & IFC EHS Guideline, 2007	Given in Table 4.12	Once in 6 months	
Ground water	Temperature, pH, TDS, As, Hardness, Cr, Pb, Alkalinity, Fe, Cd, Sulphate, Zn, Al, Phosphate, Cu, Ni, Nitrate, TC, and FC.	Environment Conservation Rules (ECR) 2023 (Schedule-2 (Kha)) and & WHO Drinking Water Guidelines	Given in Table 4.14	Once in 6 months	
Drinking water	Temperature, pH, TDS, As, Hardness, Cr, Pb, Alkalinity, Fe, Cd, Sulphate, Zn, Al, Phosphate, Cu, Ni, Nitrate, TC, and FC.	Environment Conservation Rules (ECR) 2023 (Schedule-2 (Kha)) and & WHO Drinking Water Guidelines	Given in Table 4.16 (a), 4.16 (b)	Once in 3 months	
Waste water (Septic tank outlet)	pH, BOD5 at 20°C, COD, Total Nitrogen, Total Phosphorus, Oil and Grease, TSS, TC	ECR 2023 (Schedule-3), WB EHS guidelines for treated sanitary sewage discharge	Outlet of Septic tank	Once in 3 months	

8.3 Monitoring During Operation

Post construction monitoring is limited to a number of impact parameters to see the actual performance of the project. Environmental monitoring requires set of indicators that could be conveniently measured, assessed and evaluated periodically to observe the trends of change in base line environmental quality. . The project company should be responsible for overall environmental monitoring during the operation phase of the project for which they will appoint a 3rd party consultant team. The environment monitoring during the operation phase should primarily be focused on addressing the following issues:

-
- Air and noise emission from Transformer and substation area

- Solid waste generation
- Fire hazard or any medical emergency

Table 8.3 & 8.4 summarizes the potentially significant environmental parameters needed to be monitored during the operation phase.

Table 8.3: Monitoring plan during Operational Phase of the Project (Visual)

Issue	Key aspects	Minimum Monitoring Frequency	Responsibility
Hazardous Waste	Review hazardous waste inventory, Check and document PV module that leaches in an inventory, Storage area condition, availability of spill kit, inventory monthly	Monthly	DSEPL
Traffic volume	Incoming & outgoing traffic, traffic movement records	Once in 6 months	
Site Security	Proper fencing, isolation of site from general access, marked passage for workers and visitors	Once in 6 months	
Personal Protective Equipment	Ensure every single person involved in the construction activity wear proper PPE	• daily inspection by supervisors • weekly/ monthly inspection by manager/ engineers	
Incident record & reporting	Review the documented record of all incident, accident and its remedial process.	Monthly	
Solid waste	Monthly inspection of waste collection and storage areas, review of waste inventory and monitor final disposal location	Monthly	
Access to medical facility	Check access to medical facility with contracted hospital and first aid facility at site	Once in 6 months	
Grievance Redress Mechanism	Any significant complaint from External (neighbours) and Internal (workers) and their remedial procedure	• Monthly for internal • Monthly Community GRM	
Safety orientation & training of workers	Review implementation of training & orientation of workers for safety	Monthly	
Sanitation & drinking water facility to workers	Drinking water quality against Environment Conservation Rules	Quarterly	

Issue	Key aspects	Minimum Monitoring Frequency	Responsibility
	(ECR) 2023 (Schedule-2 (Kha)) and & IFC EHS Guideline, 2007 Sewage treatment plant output sampling against ECR 2023 (Schedule-3), WB EHS guidelines for treated sanitary sewage discharge once in 3 months		
Chemical Storage and Management	Fuel tank and chemical storage condition and operation, maintenance and leakage inspection	Quarterly	
Site Drainage	Maintaining proper drainage	Quarterly	
Water inventory	Review water usage record, Make an inventory of water usage (groundwater and rainwater) and wastewater discharge	Monthly	
Occupational Health and Safety	Daily inspection on PPE usage Review of implementation records of specific high-risk procedures (including photos) Proper fencing, isolation of site from general access, marked passage for workers and visitors, Documented record of all incident, accident and its remedial process, OHS training records & orientation of workers for safety	Daily for PPE use Monthly for Others	
Community Health and Safety	Site inspection of implementation of the described measures Review of community GRM records	Weekly site inspection Monthly on community GRM	
Labor and Working Condition	Implementation status of the mitigation measures	Quarterly	
Terrestrial Habitat	Implementation status of the mitigation measures	Quarterly	
Aquatic Habitat	Implementation status of the mitigation measures	Quarterly	
Social acceptability of workers to the host communities	Implementation status of the mitigation measures	Quarterly	
Employment Generation	Implementation status of the mitigation measures	Quarterly	

Issue	Key aspects	Minimum Monitoring Frequency	Responsibility
Social and Economic Enhancement around project area	Implementation status of the mitigation measures	Quarterly	

Table 8.4: Monitoring plan during operational phase of the Project (Analytical)

Issue	Parameters	Applicable Standards	Monitoring Locations	Monitoring Frequency	Responsibility
Ambient Air Quality	SO2, NOx, CO, SPM, PM_{10} and $PM_{2.5}$	Air Pollution (Control) Rules 2022 (Schedule-1) & IFC EHS Guideline, 2007	Given in Table 4.17	Once in 6 months	Project company by 3rd party consultant
Noise level	Noise at different locations at day and night	Noise Pollution (Control) Rules 2006 (Schedule-1) & IFC EHS Guideline, 2007	Given in Table 4.19	Once in 6 months	
Soil	pH, Cd, Cr, Pb, Zn, Al, Cu, Ni, and Si.	World Health Organization (WHO) (1996) Permissible Limits of Heavy Metals in Soil and Plants.	Given in Table 4.23	Once in 6 months	
Surface water	Temperature, pH, TDS, TSS, DO, BOD, COD, EC, Fe, Cr, Pb, Cd, Zn, Al, Cu, Ni, Sulphate, Nitrate, and Phosphate.	Environment Conservation Rules (ECR) 2023 (Schedule-2 (Ka)(1)) and & IFC EHS Guideline, 2007	Given in Table 4.12	Once in 6 months	
Ground water	Temperature, pH, TDS, As, Hardness, Cr, Pb, Alkalinity, Fe, Cd, Sulphate, Zn, Al, Phosphate, Cu, Ni,	Environment Conservation Rules (ECR) 2023 (Schedule-2 (Kha)) and & WHO Drinking Water Guidelines	Given in Table 4.14	Once in 6 months	

Issue	Parameters	Applicable Standards	Monitoring Locations	Monitoring Frequency	Responsibility
	Nitrate, TC, and FC.				
Drinking water	Temperature, pH, TDS, As, Hardness, Cr, Pb, Alkalinity, Fe, Cd, Sulphate, Zn, Al, Phosphate, Cu, Ni, Nitrate, TC, and FC.	Environment Conservation Rules (ECR) 2023 (Schedule-2 (Kha)) and & WHO Drinking Water Guidelines	Given in Table 4.16	Once in 3 months	
Wastewater	pH, BOD5 at 20°C, COD Total Nitrogen, Total Phosphorus, Oil and Grease, TSS, TC	ECR 2023 (Schedule-3), WB EHS guidelines for treated sanitary sewage discharge	2 Outlets of STPs	Once in 3 months	

8.4 Cost of Monitoring

The following are the cost of monitoring for the environmental parameters during construction and operation period of the proposed project respectively:

Table 8.5: Cost Estimate for Environmental Monitoring during Construction

Item	Parameter	Unit cost (Taka)	Unit per year	Total cost per year (Taka)
Ambient Air Quality	SO2, NOx, CO, SPM, PM_{10} and $PM_{2.5}$	15,000.00	24	3,60,000.00
Noise level	Noise at different locations at day and night	5,000.00	24	1,20,000.00
Soil	pH, Cd, Cr, Pb, Zn, Al, Cu, Ni, and Si.	25,000.00	02	50,000.00
Surface water	Temperature, pH, TDS, TSS, DO, BOD, COD, EC, Fe, Cr, Pb, Cd, Zn, Al, Cu, Ni, Sulphate, Nitrate, and Phosphate.	30,000.00	04	1,20,000.00

Item	Parameter	Unit cost (Taka)	Unit per year	Total cost per year (Taka)
Drinking water	Temperature, pH, TDS, As, Hardness, Cr, Pb, Alkalinity, Fe, Cd, Sulphate, Zn, Al, Phosphate, Cu, Ni, Nitrate, TC, and FC.	35,000.00	04	1,40,000.00
Total cost				7,90,000.00

Table 8.6: Cost estimate for Environmental Monitoring during Operational Phase

Item	Parameters	Unit cost (Taka)	Unit per year	Total cost per year (Taka)
Ambient Air Quality	SO2, NOx, CO, SPM, PM_{10} and $PM_{2.5}$	15,000.00	12	1,80,000.00
Noise level	Noise at different locations at day and night	5,000.00	12	60,000.00
Soil	pH, Cd, Cr, Pb, Zn, Al, Cu, Ni, and Si.	25,000.00	02	50,000.00
Surface water	Temperature, pH, TDS, TSS, DO, BOD, COD, EC, Fe, Cr, Pb, Cd, Zn, Al, Cu, Ni, Sulphate, Nitrate, and Phosphate.	30,000.00	04	1,20,000.00
Drinking water	Temperature, pH, TDS, As, Hardness, Cr, Pb, Alkalinity, Fe, Cd, Sulphate, Zn, Al, Phosphate, Cu, Ni, Nitrate, TC, and FC.	35,000.00	04	1,40,000.00
Wastewater	pH, BOD5 at 20°C, COD Total Nitrogen, Total Phosphorus, Oil and Grease, TSS, TC	30,000.00	08	2,40,000.00
Total Cost				7,90,000.00

Chapter 9

9 ALTERNATIVE ANALYSIS

9.1 Alternative Analysis

Assessments of alternatives involve evaluating different options related to project concept, design and site selection. This helps in finalizing the best option that is techno-commercially viable having minimum impact on the local environmental and social conditions.

Analyses of alternatives were considered for the following aspects of the Power Plant Project-

- ✓ No build scenario
- ✓ Site Location Alternatives
- ✓ Technology Alternatives

9.2 The 'No Build' Scenario

From a purely physical environmental point of view, the 'do-nothing' is preferable to any project implementation, since it would avoid creation of any of the adverse impact associated with the project. However, the potential socio-economic benefits to the nation would be foregone. A comparison between "With Build Scenario" and "No Build Scenario" has been presented in the table below.

Table 9.1: Comparison of "With Build Scenario" and "No Build Scenario" options

Description	"With Build Scenario"	"No Build Scenario"
Establishment of 100 MW ac Solar Power Plant	Generation of additional 100 MW electricity, which will be added to National Grid.	No additional power generation capacity
Transmission of Electricity to the PGCB substation from 100 MW ac Solar Power Plant	Provides a stable and reliable flow of electricity for fulfilling power demand	No additional power generation capacity
Economic Development	More opportunities for the Char Bhabanipur, Hemayetpur, Pabna Sadar Upazila as a result of reliable power supply	Minimal due to lack of reliable power supply
Electricity Coverage	A new portion of factories and homestead will become under the electricity coverage.	No coverage development.
Potential impacts to ecologically sensitive areas	No protected areas or national parks around the plant area and along the transmission route. Associated potential impacts can be readily mitigated by adherence to applicable design standards and specifications, compliance to relevant regulations, and implementation of best	None.

Description	"With Build Scenario"	"No Build Scenario"
	practice engineering processes and procedures.	
Potential impacts to terrestrial flora and fauna	Green belt will be set up around the Solar Power Plant area and transmission towers will be set at a moderate height which may not affect the regular movement of fauna, as the area is not considered under any endangered zone.	None
Fugitive Greenhouse Gas (GHG) Emissions	No chance of GHG emissions from the Power Plant and Transmission Line.	No GHG contribution.
Disruption to local residents along the transmission line route	Impacts or disruption to daily activities will be minimal (i.e., temporary, and short duration during construction/installation). Any disruption can be mitigated by proper construction planning and scheduling of activities.	None.
Employment	Job opportunities will be created during and after project implementation.	None

Demand of electricity is increasing rapidly due to enhanced economic activities in the country. This proposed 100 MW ac Solar Power Plant at Bhabanipur, Hemayetpur, Pabna Sadar will add electricity to the national grid that will improve the present electricity generation significantly and will help the government achieve its goals in the power sector and as well as trigger the national economic development. Not only that, industrial development will be induced after the implementation of the proposed power plant. Additionally, it will create Employment opportunity to the local people and improve transportation system in the project area, which will ultimately play an important role in poverty reduction and develop social safety condition.

The No Action Alternative would have no negative impacts on the existing environmental and social resources but the positive socio-economic and beneficial commercial impacts would also not be realized as well. There would be no additional megawatts added to the national system, and the accompanying benefits of enhanced electricity production would not be achieved.

As future economic growth crucially depends on the long-term availability of electricity; however, choosing the "No Action" option will not bring these huge changes and other benefits to the power sector. After considering the above issues, it can be concluded that the 'No Project Scenario' alternative is unacceptable, and the potential socio-economic benefits of implementation of such project far outweigh the adverse impacts, all of which can be controlled and minimize to an allowable level.

9.3 Consideration of Alternatives

9.3.1 Site Alternative

The proposed solar power plant project requires such a vacant land where no interruption will be found between the Sun and PV modules, so that electricity can be produced efficiently. In this context, Char lands of Bangladesh is the most favorable places for setting up Solar Power Plants. Moreover, there is a good equipment, machineries, and fuel transportation route to the project site via road way. Due to the rural setup and using environment friendly technology, the project won't hamper the environmental condition much. It is over 50km from the nearest protected area. In addition to that, the proponent was able to acquire 229 acres of land and the rest of the land is under acquisition process.

9.3.2 Technology alternative

a. Hydroelectricity:

Hydroelectricity is produced by harnessing the gravitational force of flowing water. Compared to fossil fuel-powered energy plants, hydroelectric power plants emit fewer greenhouse gases. But the construction of hydroelectric power plants and dams requires huge investment and may have high environmental cost. Moreover, the country is having relatively limited potential for hydroelectricity.

b. Geothermal Plant:

The three main types of geothermal plants include dry steam power stations, flash steam power stations and binary cycle power stations, all of which use steam turbines to produce electricity. Geothermal power plants are environmentally friendly and emit lower levels of harmful gases compared with coal-fired power plants. But unfortunately, no active suitable geothermal site has been found.

c. HFO Fired Plant:

Heavy fuel oil (HFO) is a petroleum distillate, or hydrocarbon fuel, that is produced from crude oil, from which lighter hydrocarbon products like diesel and gasoline are also extracted. HFO is a cost-effective, reliable fuel that is used in power generators. Power plants that make use of hydrocarbon fuels, such as HFO, can operate solely on the energy that they create; during the electricity creation and supply process, they can remain entirely off the grid. Though HFO fired power plants have high negative environmental impacts.

d. Coal-Fired Plant:

If Coal is used as the fuel in this power plant, it will be cost effective because coal is quite cheap but it will pollute the atmosphere due to the production of a large amount of smoke. Besides, coal handling and ash disposal is quite difficult and requires large area. Coal is environmentally less friendly as it gives high emission of carbon dioxide and leads to acid rain because of high Sulphur content.

e. Gas fired Plant:

A gas-fired power plants burns natural gas to generate electricity. Although natural gas is a fossil fuel, the emissions produced from its combustion are much lower than those from coal or oil. Gas based combined-cycle power plant using both gas and steam turbines, they produce higher amounts of electricity from a single fuel source compared to a traditional power plant. They capture heat from the gas turbine to increase power production and are also found to release low amounts of harmful gases into the atmosphere.

f. Solar Power Plant

The environment is harmed by pollution that occurs during the production of electricity or other forms of energy. In contrast to that, the source of solar energy does not provide such a challenge. It is encouraging for the ecosystem and the environment because demand for alternative energy sources has decreased since the development of solar energy and its greater use. Solar power systems do not require much maintenance. Just needs to be cleaned twice every month. Inverters are also a part of the system, to be replaced in five to 10 years, that is, very little is spent on maintenance and repair work in addition to the initial cost. Solar power is more secure than conventional power sources, whether it is for use or maintenance and repair. Solar energy is actually a source of renewable energy. Solar energy is a never-ending energy source. In addition to that solar power does not involve any emission from the plant.

Comparing all the available technology, it can be concluded that, solar power is the most suitable, sustainable and environment friendly option.

Chapter 10

10 EMERGENCY RESPONSE AND DISASTER MANAGEMENT PLAN

10.1 Emergency Response

The purpose of having an Emergency Response Plan (ERP) is to:

- Guide personnel in determining the appropriate response to emergencies
- Notify the appropriate Company Emergency Response Team personnel and regulatory/ Govt. agencies
- Manage public and media relations
- Minimize the effects that disruptive events can have on company operations by reducing recovery times and costs
- Respond to immediate requirements to safeguard the subtending environment and community

Generally, the initial response is guided by three priorities Ranked in importance these priorities are:

1. People
2. Property
3. Environment

Emergency Response Procedures will identify who does what and when in the event of an emergency. Responsibility for who is in charge and their coordination of emergency actions shall be identified. Nature of Emergency & Hazardous Situations may be of any or all of the following categories:

I. Emergency

- Fire,
- Electric shock,
- Inverter Battery Explosion,
- Solar Panel Damage,
- Medical emergency.

II. Natural Disasters

- Flood,
- Earthquake/ cyclone,
- Storm/ typhoon/ tornados.

III. External Factors

- Food poisoning/water poisoning
- Sabotage, and
- War

10.1.1 Six Steps in Emergency Response

Step-1

a) Determine the potential hazards associated with the incident, substance or circumstances and take appropriate action identify the type and qualities of dangerous goods involved and any known associated hazards.
b) Determine potential hazards stemming from local conditions such as inclement weather water bodies etc. and ensure that the initial response team is aware of these conditions.

Step-2

Determine the source/ cause of the event resulting to the emergency and prevent further losses.

Step-3

Conduct an assessment of the incident site for any further information on hazards or remedies.

Step-4

Initiate redress procedures.

Step-5

Report the incidence; its nature, impact, applied redress procedures and any further assistance required etc. to the appropriate company, government and/or land owner.

Step-6

Take appropriate steps with respect to hazards to wildlife, other resources and addressing public and media concerns and issues, as applicable. Response priorities are to protect human lives, property and the environment.

10.2 Reporting Incidents and Accidents

All accidents and incidents shall be investigated to determine what caused the problem and what action is required to prevent a recurrence. employees required to perform investigations shall be trained in accident investigation techniques. The incident/accident investigation should be a fact-finding exercise rather than faultfinding. The investigations will focus on collection of evidence to find out the “root cause” of the incident. The recommendations of the investigation report are implemented in phases.

10.3 Approaches to Emergency Response

For this project, emergency response systems should be in place to deal with natural calamities, fires and injuries. There should be trained personnel, specific contingency plans and incidence specific equipment packages in place to cope with these types of emergencies. In case of an emergency incident occur, immediate action must be taken to mitigate the impacts.

In order to minimize the possibility of injury to the responders and others, it is important that emergency responders follow a specific sequence of actions as stepped out in the preceding paragraphs.

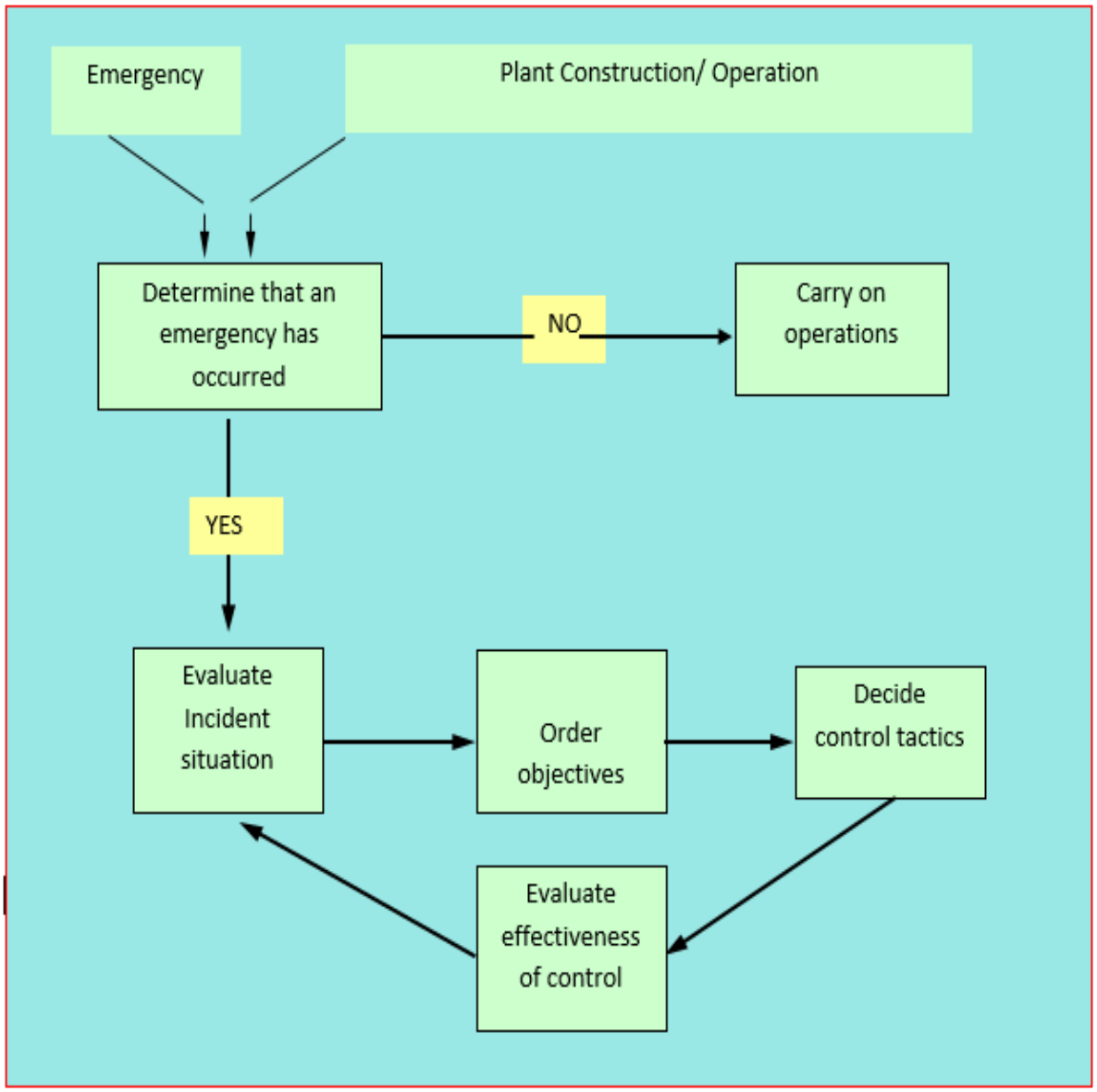


Figure 10.1: Illustrates an Example System Approach to Plant Construction & Operations

10.4 Emergency Response Plan

An Emergency Response Plan (ERP) is to provide a systematic approach to the protection of employees, assets and the environment from impact of serious incidents. A well-constructed ERP will prevent a minor incident from becoming a disaster, save lives, prevent injuries and minimize damage to property and the environment. The goals of the ERP are to:

- Provide for clear lines of authority, responsibilities and communication during incident and crisis events;
- Provide a means by which trained people and resources are available to those managing the incident or crisis event;
- Possible emergency events that have been identified for this Project are; immediate medical evacuation due to personnel injury, traffic accidents (road), leakage of hazardous chemicals, fire, earthquake, flooding, civil disturbance/riot, terrorist events/threats and gas leak/explosion.

The EHS Team and HR Coordinator will handle the emergency. During any kind of emergency situation all the personnel related to DSEPL will follow the communication matrix given below:

Table 10.1: Communication Matrix during Emergency

Incident	1st Receiver	2nd Receiver	3rd Receiver (if needed)	4th Receiver (if needed)
Traffic Accidents	EHS Manager/ Assistant EHS Manager	Report to Plant Manager Inform to Medical/First Aid Team, Rescue Officer and HR Coordinator (as per requirement)	Plant Manager will report to Project Management	-
Spill/leak of Hazardous Materials in Land and Water	EHS Manager/ Assistant EHS Manager	Report to Plant Manager Inform to Rescue Officer, Firefighting team and HR Coordinator (as per requirement)	Plant Manager will report to Project Management	-
Terrorist Events/Threats	EHS Manager/ Assistant EHS Manager	Report to Plant Manager Inform HR Coordinator	Plant Manager will report to Project Management	Rapid Action Battalion (RAB)
Earthquake	EHS Manager/ Assistant EHS Manager	Report to Plant Manager Inform to Fire Fighting Team, Medical/First Aid Team, Rescue Officer, and HR Coordinator (as per requirement)	Plant Manager will report to Project Management	Fire Service & Civil Defence
Flooding	EHS Manager/ Assistant EHS Manager	Report to Plant Manager Inform to Fire Fighting Team, Medical/First Aid Team, Rescue Officer, and HR Coordinator (as per requirement)	Plant Manager will report to Project Management	Fire Service & Civil Defence
Fire Hazard	EHS Manager/ Assistant EHS Manager	Report to Plant Manager Inform to Fire Fighting Team, Medical/First Aid Team, Rescue Officer and HR Coordinator (as per requirement)	Plant Manager will report to Project Management	Fire Service & Civil Defence
Bomb Threat	EHS Manager/ Assistant EHS Manager	Report to Plant Manager Inform HR Coordinator	Plant Manager will report to Project Management	Bomb Disposal Unit via Police and Rapid Action Battalion (RAB)
Kidnap/ Extortion	EHS Manager/ Assistant EHS Manager	Report to Plant Manager Inform HR Coordinator	Plant Manager will report to Project Management	Bangladesh Police and Rapid Action Battalion (RAB)

The emergency response plan for this project is described in the following sections.

10.4.1 Emergency Prevention

Project risks are prevented through implementation of risk mitigation measures to address events such as, flooding, traffic accidents, structural failure and other minor structural issues. The potential risks and measures to reduce each type of risk are given in the **Table 10.2** below.

Table 10.2: Risk and Preventative Mitigation Measures

Risk	Preventative Mitigation Measure
Traffic Accidents (Road)	• Traffic Control devices (road signs and markings, speed signs, stop signs, speed bumps and safety barriers); • Escort the big vehicles by motorbike for avoiding unnecessary congestion and easier movement of them.
Spill/leak of Hazardous Materials in Land and Water	• All hazardous materials will be kept in a tank which has facility of secondary containment; • The hazardous waste will be stored on hard standing floor and roofing with a secondary containment facility; • Regular inspections of machinery, equipment, pipe work, storage areas are needed to ensure that poor maintenance is not responsible for a spillage occurring; • PV modules should be checked at a regular interval (once monthly) to avoid leaching;
Fire	• Keep good conditioned fire hoses and Fire Extinguishers readily available; • Arrangement of firefighting equipment's should be available with training to the all the staffs; • Adoption of fire safety measures for each of the equipment's and machinery subject to fire hazard; • Prevent the loose electrical connections and multiple connections from one source; • Safe handling and storage of flammable chemicals and fuels; • Regular inspection of the fire extinguishing system should be made to see if they are functioning properly or not. Any defect should be reported to the manger and should be replaced immediately.
Terrorist Events/Threats	• There should be strict security check at the key points of the power plant area • CCTV cameras should be installed at all the crucial points and 24-hour monitoring facilities should be implemented • Regular contact and updates from National intelligence agencies regarding threats • Project authority should maintain regular contact and liaison with Bangladesh Army and Police personnel so that they quickly respond to terrorist emergency events; • Regular contact and updates from National intelligence agencies regarding threats.

10.4.2 Emergency Preparedness

Preparedness includes emergencies from fire related disasters and the necessary steps required to prepare for such emergencies. For this, it is required to design, manufacture, deliver to the site, install, and test and commission the fire-fighting and fire detection equipment to protect the steam & gas turbine, generating units and all associated equipment. The following **Table 10.3** includes the list of preparedness measures to be included:

Table 10.3: Risk and Preparedness Measures

Risk	Preparedness Measures
Traffic Accidents (Road)	• Identify the amount of loss due to the accident; • Identify the cause of accident to minimize same type of incidents further; • Provide compensation to the injured personnel; • Make drivers aware of traffic rules and signage.
Spill/leak of Hazardous Materials in Land and Water	• In case of any spillage, it should be immediately acted up on. To combat spillage equipment i.e. safety goggles, gloves, PPE, disposal bags, containers, suction pump, boom skimmer etc. should be available at the site; • Damaged PV modules should be temporarily stored in the hazardous waste storage area and the proponent will contact with licensed waste treatment agencies to collect and treat the panels as well as hazardous solid waste in compliance with national regulations.
Fire	• An automatic Carbon Dioxide (CO_2) gas fire protection system should be provided in all machinery enclosures. The Protection System should consist of a fire detector and an automated fire extinguishing mechanism once fire/smoke is detected. • High risk areas should be marked as “fire protection zones” and should have a separate fire protection system independent of others. • Emergency firefighting system should be ensured in the project site; • Firefighting equipment should be available at strategic locations i.e., hazardous storage area, transformers, sub-station area, kitchen, dining area within the power plant area according to **Table 10.4**; • Fire exit passages should always be easily accessible and usable and free of any kind of obstructions.
Terrorist Events/Threats	• Bangladesh Army and Police personnel will be appropriately resourced and trained to quickly respond to terrorist emergency events.

Checklists and forms for emergency situation are provided in Annexure 17.

10.4.2.1 Fire Hazard & Fire Evacuation Plan

❖ **Fire Hazard**

Fire hazards such as electrical hazards, combustible dusts, sparks, voltage up/down are common in electrical interconnection facility. Although fires are not a daily occurrence, they usually will cause severe property damage and business interruption. Sometimes the fire protection equipment systems have not received attention since they were installed. If these systems are needed, however, they are counted upon to perform reliably and protect vital plant equipment from fire. Fire protection systems are a combination of mechanical and electrical components and, like power generation equipment, need regular attention. There will be 12 fire hydrants which will be connected to the reservoir pond, near to the main control building of the project.

❖ **Fire Evacuation Plan**

In this case, the proponent needs to consider how you will arrange the evacuation of the premises in the light of your risk assessment and the other fire precautions they have or intend to put in place. Affected personnel should follow the communication matrix mentioned in **Table 10.1** and act accordingly. Possible fire evacuation plan can be as follows:

- Simultaneous Evacuation
- Vertical Phased Evacuation
- Staff Alarm Evacuation
- Defend in Place

The table below is a list of fire equipment that should be in the premises of the project site for the management of fire safety:

1. Fire extinguisher	8. Equipment box	15. Gas mask
2. Fire extinguisher (CO2)	9. Stature	16. Gum boot
3. Fire extinguisher (Foam)	10. Lock cutter	17. Hand gloves
4. Hose box	11. Fire bitter	18. Fire blanket
5. Hydrant point	12. Fire hook	19. Sand/Water bucket
6. Fire alarm bell	13. Shovel	20. Sand/Water stand
7. Fire alarm switch	14. Helmet	

Figure 10.2: Various Fire Fighting Equipment

Table 10.4 shows the types of fire extinguishers which are suggested to be provided in specific locations of the project site, so that fire can be prevented as soon as possible.

Table 10.4: Types of Fire Extinguishers and their Uses

Type	Solid combustibles (such as wood, paper & textiles)	Flammable liquids (such as petrol, diesel & paraffin)	Flammable gases (such as methane, propane & hydrogen)	Flammable metals (such as magnesium, aluminum & lithium)	Electricals (such as computers & electric heaters)	Cooking oil (such as deep fat fryers & chip pans)
Water	✓	✗	✗	✗	Only if di-electrically tested	✗
Water Mist	✓	✓	✓	✗	✓	✓
AFFF Foam	✓	✓	✗	✗	Only if di-electrically tested	✗
ABC Powder	✓	✓	✓	✗	✓	✗
Carbon Dioxide (CO2)	✗	✓	✗	✗	✓	✗
Wet Chemical	Sometimes	✗	✗	✗	✗	✓

10.4.3 E&S Orientation and Training Plan

All employees and contractors shall attend E&S orientation. The EHS Manager, Assistant EHS Manager supported by sthe Supervisor/ Safety Officer, will be responsible for the development of an E&S training plan. The Assistant EHS Manager are responsible for ensuring that the appropriate employees receive training required under the plan. The company's HR Co-ordinator will be responsible for ensuring that all employees receive introductory training on the EHS Management System.

10.4.3.1 E&S Training Procedure

- A critical first step in developing a training program is to assess employee training needs. The EHS Manager and Assistant EHS Manager will review past training and the nature of the employee's work. Based on this review, specific training requirements for each employee or type of employee will be documented.
- The Assistant EHS Manager will document the ESMP Training Program.
- The training plan will be implemented by the EHS Manager, Assistant EHS Manager in conjunction with the Supervisor/ Safety Officer. Upon completion of training by employees, the area and functional managers shall make the Plant Manager aware of the training completed.
- The EHS Manager will document the training completed form and Training Log and review the detail documentation on the Training Program prepared by Assistant EHS Manager.
- Training effectiveness will be evaluated to ensure that the changes made to significant risks, objectives, targets or operational controls are working effectively. Improvements to the training plan will be made accordingly by EHS Manager and Assistant EHS Manager.

10.4.3.2 E&S Training Plan

The training plan shall be updated whenever changes are made to the significant risks, objectives, targets, or operational controls. E&S training shall be made available on a continual basis to ensure that new employees are made aware of the ESMP.

Table 10.5: Proposed E&S Training Plan

Training Subject	Target Personnel	Duration	Instructor/Trainer
Construction Phase			
Health & Safety: Use of PPE	All construction staff	Four Trainings (quarterly)	EHS Manager, Asst. EHS Manager & Supervisor
Health & Safety: Safe way to work & hazard awareness	All construction staff	Two Trainings (quarterly)	EHS Manager& Asst. EHS Manager
Handling, use & disposal of hazardous material	Construction workers with authorized access to hazardous material storage areas and who uses	Two trainings (quarterly)	Supervisor & Asst. EHS Manager

Training Subject	Target Personnel	Duration	Instructor/Trainer
	hazardous material during their works.		
Waste Management	All staff (construction and camp staff)	Two Trainings (monthly)	Supervisor & Asst. EHS Manager
Defensive and Evasive training- Efficient & safe driving practices, including road & vehicle restrictions	Drivers	Two Trainings (monthly)	Security Supervisor & Security-in-Charge
Pollution prevention: Best practice (Actions to be taken in the event of major or minor pollution)	All construction staff	Two Trainings (monthly)	EHS Manager, Asst. EHS Manager & Supervisor
Health & Safety: Lifting and rigging	Crane operator and all riggers	Two Trainings (monthly)	Supervisor & Asst. EHS Manager
Operation Phase			
Health & Safety: Use of PPE	Identified required staff	Two Trainings (bi-annually)	EHS Manager& Asst. EHS Manager
Health & Safety: Safe way to work & hazard awareness	All staff	One Trainings (annually)	EHS Manager& Asst. EHS Manager
Health & Safety: Safe use of plant & equipment	Operators of plant & equipment	One Trainings (bi-annually)	EHS Manager& Asst. EHS Manager
Handling, use & disposal of hazardous material	Workers with authorized access to hazardous material storage areas and who uses hazardous material during their works.	One training (bi-annually)	Supervisor & Asst. EHS Manager
Waste Management	All staff (plant site and dormitory staff)	One Trainings (bi-annually)	Supervisor & Asst. EHS Manager
Defensive and Evasive training- Efficient & safe driving practices, including road & vehicle restrictions	Drivers	One Trainings (bi-annually)	Security Supervisor & Security-in-Charge
Pollution prevention: Best practice (Actions to be taken in the event of major or minor pollution)	All staff	Two Trainings (annually)	EHS Manager, Asst. EHS Manager & Supervisor
Health & Safety: Sub-Station Control Room	Designated workers	Two Trainings (annually)	EHS Manager& Asst. EHS Manager
Health and Safety: PV Panel Cleaning	Designated cleaners	Two Training (annually)	Supervisor & Asst. EHS Manager
Both Phase			
Emergency procedures and evacuation	All staff	One Training (monthly)	EHS Manager, Asst. EHS Manager and Fire Service & Civil Defense

Training Subject	Target Personnel	Duration	Instructor/Trainer
Fire Fighting Mock Drill	All staff	One Training (monthly)	EHS Manager, Asst. EHS Manager and Fire Service & Civil Defense
Earthquake Mock Drill	All staff	Four Trainings (yearly)	EHS Manager, S Asst. EHS Manager and Fire Service & Civil Defense
Heavy Flood/Typhoon Response	All staff	Four Trainings (yearly)	EHS Manager, Asst. EHS Manager and Fire Service & Civil Defense
Emergency response and management – Detailed	Rescue Team, Fire-Fighting Team and Medical Team	One Trainings (monthly)	EHS Manager and Fire Service & Civil Defense
Site Security	Security Guards	Two Training (monthly)	Security Supervisor & Security In Charge
Housekeeping, Dining & Washroom Areas - Basic	All staff	One Training (monthly)	EHS Manager& Asst. EHS Manager
Housekeeping, Kitchen, Dining & Washroom Areas - Detailed	Designated cleaners, cook and staff	One Training (monthly)	EHS Manager& Asst. EHS Manager
Culturally sensitive awareness rising on HIV/AIDS and sexually transmitted diseases. Awareness raising on Gender Based Violence (GBV) and vector-borne diseases	All staff	One Training (monthly)	EHS Manager, Supervisor and Medical Team
Cultural sensitivities of the local population	On induction of all non-local staff	One Training (monthly)	Supervisor

In case of an emergency fire breakout, the Plant Manager should be notified immediately who will delineate the information and responsibilities to other staff member. An emergency contact list should be prepared by the EHS manager consisting of Hospitals, Police, Ambulance services and other relevant contact details.

10.4.4 Emergency Recovery

After the emergency situation had passed, the EHS manager assess and categorize the damage and would provide for compensations for the injured; provide provisions for temporary services; reinstate normal environmental and working standards; initiating investigation process for the cause of disaster; evaluating response procedure and providing a recommendation to mitigate future emergencies.

10.4.5 Emergency Evacuation Plan

The EHS Manager will follow the plan for evacuation in the event of an emergency. DSEPL has prepared their evacuation plan which is given in Annexure 36. The layout plan has been preparedshowing all the possible emergency fire exits and the location of the evacuation zone. An emergency contact list

should also be prepared consisting of Hospitals, Police, Ambulance services and other relevant contact details.

List of supportive resources exclusively maintained for emergency response activities are listed in **Table 10.6**.

Table 10.6: Supportive resources exclusively maintained for emergency response activities

SI No.	Particulars	Qty.	SI No.	Particulars	Qty.
1	Leather glove 16”	50	12	Artificial resuscitators	50
2	PVC Glove 16”	50	13	Helmets	50
3	Rubber Glove 16”	50	14	Rain coats	50
4	Shock proof glove 16”	50	15	Gum boots	50
5	FIRE Suite 36” 42”	50	16	Stretchers	50
6	Leather apron	50	17	Blankets	50
7	Plain glass goggles	50	18	Torch light with cells	50
8	Goggle for gas welding & cutting	50	19	Self-contained breathing apparatus (SCBA) Sets	50
9	Welding Shield	50	20	Gas mask	50
10	Spark resistant tools	50	21	Barricade tapes	50
11	Safety Belt	50			

The cost of Institutional capacity building for emergency response plan is given in **Table 10.7**.

Table 10.7: Cost of Institutional Capacity Building

SI No.	Item	Qty.	Price (BDT)
1	Fire hydrants	12	24,00,000.00
2	Fire Extinguishers	50	1,00,000.00
3	Portable foam suppression system	20	3,00,000.00
4	Supportive resources mentioned in **Table 10.6**	1 set	20,00,000.00
5	Emergency siren system	10	9,000.00
6	Smoke alarm	15	15,000.00
9	Hand held Wireless Communicator	15	70,000.00
10	Intercom system within the power plant	10	5,00,000.00
11	First Aid, Emergency medicine & Medical services	-	1,00,000.00
16	Emergency flash lights for Blackouts	50	5,00,000.00
	Total		59,94,000.00

10.5 Disaster Management Plan

Disaster Management is a planned and systematic approach to minimize damage to life, property and environment. It involves the systematic observation and analysis of measures relating to disaster prevention, mitigation, preparedness, emergency response, rehabilitation and reconstruction. It is imperative to display necessary documentation for ease in accessing information by EHS Manager. Some of these documents include:

- ✓ Emergency contacts;
- ✓ Emergency response procedures for fires.

The EHS Team and HR Coordinator will handle any disaster at site. During any kind of disaster all the personnel related to DSEPL will follow the communication matrix given in Table 10.1

Disaster could be of two types i.e., natural disaster (e.g., earthquake, flood, cyclone etc.) and man-made disaster (e.g., fire, terrorist attack / sabotage, bomb threat, kidnap / extortion etc.). Management plan for both types are discussed below:

10.5.1 Earthquake

Bangladesh National Building Code widely known as BNBC Code, is the ultimate code that is followed in Bangladesh to build safe houses and buildings. Earthquakes and wind effect of different building systems are incorporated in this code. Moreover, this code is almost similar to ACI code which is recognized as one of the most practiced building codes of the world. Socio-economic factors have also been taken into consideration while preparing this code. This code is very helpful to the related professionals like architects and town planners as it considers the conditions specific to Bangladesh. This code should be followed in designing the power plant structures. The below mentioned plan should be implemented during the construction and operation of this proposed plant.

- ✓ In case of earth quake, all the personnel inside the project are instructed to shut down their operations and come to open yard and assemble at the assembly points;
- ✓ If required, transportation will be arranged for sending the people to safer places;
- ✓ Affected personnel should follow the communication matrix mentioned in **Table 10.1** and act accordingly.
- ✓ Rescue operation will be carried out by rescue officers and security personnel for any possible casualties and the same are given first aid treatment and will be sent to the nearest hospitals in case of requirement.

10.5.2 Flooding (Heavy rains)

When floods are caused due to heavy rains, those who will work in the project area should move to safer places and should stay in safe place until the water recedes. Actions to be taken:

- ✓ Monitor conditions and escape routes;
- ✓ Shut off electrical power and utilities if flooding is imminent;
- ✓ Affected personnel should follow the communication matrix mentioned in **Table 10.1** and act accordingly.
- ✓ Call fire services, if needed.

10.5.3 Disaster Response Plan

A Disaster Response Plan (DRP) is to provide a systematic approach to the protection of employees, assets and the environment from impact of serious incidents. A well-constructed DRP will prevent a minor incident from becoming a disaster, save lives, prevent injuries and minimize damage to property and the environment. The goals of the DRP are to:

- Provide for clear lines of authority and communication during incident and crisis events;
- Provide a means by which trained people and resources are available to those managing the incident or crisis event;
- Possible disaster events that have been identified for this Project are; flooding and seismic activities.

The EHS Team and HR Coordinator will handle the emergency situation. During any kind of emergency situation all the personnel related to DSEPL will follow the communication matrix given below:

Table 10.8: Communication Matrix during Disaster

Incident	1st Receiver	2nd Receiver	3rd Receiver (if needed)	4th Receiver (if needed)
Flooding	EHS Manager/ Assistant EHS Manager	Report to Plant Manager, Inform to Medical/First Aid Team, Recue Officer and HR Coordinator	Plant Manager will report to Project Management	Ministry of Disaster Management and Relief, GoB
Earthquake	EHS Manager/ Assistant EHS Manager	Report to Plant Manager, Inform to Fire Fighting Team, Medical/First Aid Team, Firefighting team, Rescue Officer and HR Coordinator (as per requirement)	Plant Manager will report to Project Management	Fire Service & Civil Defence
Typhoon	EHS Manager/ Assistant EHS Manager	Report to Plant Manager, Inform to Medical/First Aid Team, Recue Officer and HR Coordinator	Plant Manager will report to Project Management	Ministry of Disaster Management and Relief, GoB

The emergency response plan for this project is described in the following sections.

10.5.3.1 Disaster Prevention

Project risks are prevented through implementation of risk mitigation measures to address events such as, flooding and earthquake. The potential risks and measures to reduce each type of risk are given in the **Table 10.9** below.

Table 10.9: Risk and Preventative Mitigation Measures

Risk	Preventative Mitigation Measure
Flooding	• Design and construct the power plant according to the Flood Study report; • Regular checking the flood forecasting news; • Regular checking and maintenance of Dyke;
Seismic Activity	• Proper training should be provided to workers and staffs to save themselves during any earthquake; • Emergency firefighting system should be ensured in the project site; • Rescue Team should be formed to help the injured employees or who get concealed and they will also take the injured employees in a safe place; • The project site should have adequate first aid provisions;

10.5.3.2 Disaster Preparedness

The following **Table 10.10** includes the list of preparedness measures to be included:

Table 10.10: Risk and Preparedness Measures

Risk	Preparedness Measures
Flooding	• Design and construct the power plant according to the Flood Study report; • Regular checking the flood forecasting news; • Regular checking and maintenance of culverts and drains; • Installation and checking of pumps for discharging water from site when the outside flood water level is higher than the inner flood water level.
Seismic Activity	• Proper evacuation plan should be prepared by the Project company; • Emergency transport vehicle should be available at site to transport workers after earthquake; • Emergency drills should be conducted for workers

Chapter 11

11 STAKEHOLDER CONSULTATION

11.1 Stakeholder Consultation

Stakeholder consultation forms an important part of the IEE study. The main objective of the consultation process is to apprise the local inhabitants about the proposed project and to seek their opinions regarding the possible impacts and discuss their mitigation measures of the project. It was recognized that their opinions would be more useful as they are accustomed to construction and operation of a number of power plant units in the locality in last few years.

Community input (both of knowledge and values) on socioeconomic and environmental issues can greatly enhance the quality of decision-making. Stakeholder consultation was therefore conducted in the project area not only to satisfy the legal requirements of the IEE process in Bangladesh but also to improve and enhance the social and environmental design of the project.

11.2 Objectives of Stakeholders Consultation

Through the public consultation process, the project proponent hopes to:

- Promote better understanding of the project, its objective, and its likely impact;
- Identify and address concerns of all interested and affected parties of project area;
- Provide a means to identify and resolve issues before plans are finalized and development commences, thus avoiding public anger and resentment and potentially costly delays;
- Encourage transparency and inculcate trust among various stakeholders to promote cooperation and partnership with the communities and local leadership.
- Gather comments and opinions from the affected communities on the impact mitigation and environmental and social management plans.

11.3 Consultation Process

- ✓ Primary stakeholders were consulted during informal and formal meetings;
- ✓ The consultation process was carried out in the Bangla language. During these meetings a simple, non-technical, description of the project was given, with an overview of the project's likely human and environmental impact. This was followed by an open discussion allowing participants to voice their concerns and opinions. In addition to providing communities with information on the proposed project, their feedback was documented during the primary stakeholder consultation;
- ✓ The issues and suggestions raised were recorded in field notes for analysis and interpretation;
- ✓ By reaching out to a wider segment of the population and using various communication tools—such as participatory needs assessment, community consultation meetings, focused group discussions, in-depth interviews, and participatory rural appraisal—IEE involved the community in active decision-making;

- ✓ This process will continue even during construction and operation phase of the project to create consensus among stakeholders on specific environmental and social issues raised in the context of proposed project;
- ✓ Secondary stakeholder consultations were more formal as they involved government representatives and local welfare organizations consulted during face-to-face meetings and through telephonic conversations. They were briefed on the IEE process, the project design, and the potential negative and positive impact of the project on the area's environment and communities.

It was important not to raise community expectations unnecessarily or unrealistically during the stakeholder consultation meetings in order to avoid undue conflict with local leaders or local administrators. The issues recorded in the consultation process were examined, validated and addressed in the IEE report.

11.4 Stakeholders Consulted & Consultation Technique

In recognition of the diversity of views within any community, it is very important to obtain a clear understanding of the different stakeholders and to analyze their capacity and willingness to be involved in some or all of the project and its planning process. It is important to be aware of how different power relations can distort participation. It is also important to examine how community skills, resources, and 'local knowledge' can be applied to improve project design and implementation. All of this can be achieved by careful use of the various tools of Stakeholder Consultation. Therefore, the following participatory technique and key stakeholders were employed during stakeholder consultation:

- Focus Group Discussion (FGD) with several groups of people i.e.; women, fisherman, farmer, laborer etc.
- Key Informant Interview (KII) with relevant Government & Non-government officials;
- Formal Public Consultation meetings with relevant Government & Non-government officials and communities in surrounding areas. Men, women and local elders attended these meeting.

11.5 Stakeholder Concerns and Recommendations

The findings of FGD and KII are given in **Table 11.1** and **Table 11.2** respectively. All these have been addressed in various sections of the IEE, and the mitigation plans have been incorporated in the ESMP. The summary of the various stakeholder consultations is given below. Participants list of Public Consultation is attached as **Annexure 18.**

Table 11.1: Summary of Focus Group Discussion (FGD)

Stakeholder Category	Key Points Discussed	Outcomes in brief	Comments/Feedback Compliance
Local Community	✓ Details regarding project activities; ✓ Environmental Protection Activity; ✓ Concern about this project; ✓ Benefit from this Project; ✓ Suggestion regarding this project; ✓ Expectation from the project.	✓ People are in favor of the project and they ask to prioritize local people and employ them during different phases of the project. ✓ They wanted the Project company to finish the land acquisition process as early as possible providing the exact amount of compensation to the affected people. Moreover, it was emphasized that the Project company to give prioritize local people to engage in the project during and after construction phase.	✓ Section 6.3.17 & 6.4.16 ✓ Section 6.2.1, 6.3.17 & 6.4.16
Local Fisherman		✓ They request the authority not to discharge any construction materials, soil, and solid waste directly into the nearest canal as it is harmful for fish; ✓ They also suggested that the authority should not dump any kind of waste at local canal's water; ✓ Fisherman has high expectation on getting employment opportunity for the younger generation as they are mostly not interested in pursuing fishing activities;	✓ Section 6.3.10 & 6.4.14 ✓ Section 6.3.5 & 6.4.4 ✓ Section 6.3.17 & 6.4.16
Local Farmers		✓ People generally grow various kinds of local vegetables at the surrounding area. For their irrigation purpose they use the water of nearest river& canal, so they want the river & canal's water free from pollution; ✓ They requested not to dump any kinds of waste and loose soil in the nearest agricultural land and crops. ✓ They also suggested the authority not to dump any oil or solid waste into the local canal & river;	✓ Section 6.3.5 & 6.4.4 ✓ Section 6.3.4, 6.3.7, 6.4.3, & 6.4.6 ✓ Section 6.3.7 & 6.4.6
Vulnerable Group (Old people, women and children)		✓ They are in favor of this project but they requested the authority take proper steps to minimize air and noise emission and manage all waste properly. ✓ They ask to prioritize local people and employ them during different phases of the project; ✓ People urge to employ local women during different phases of the project to overcome their poverty.	✓ Section 6.3.1, 6.3.2, 6.3.7, 6.3.13, 6.4.1, 6.4.2, 6.4.6 & 6.4.8. ✓ Section 6.3.17 & 6.4.16
Local workers & laborers		✓ Group of working people requested to engage the neighboring workers according to their skill during construction/operation phase of the project; ✓ They requested the authority to give them opportunity to work in this project as day Laborer; ✓ They said that the authority should take proper management plan on health & safety of the workers.	✓ Section 6.3.17 & 6.4.16 ✓ Section 6.3.17 & 6.4.16 ✓ Section 6.3.12 & 6.4.11.

Table 11.2: Summary of Key Informant Interviews (KII)

Authority	Name	Occupation	Age	Comments
Government Officials (Pabna Sadar Upazila)				
UNO Office	Tahmida Akhter	UNO	--	• This project may bring a lot of positive change in commercial & industrial sector; • The authority should use high technology so that it does not harm the elements of Environment.
Upazila Parishad[7]	Md. Mosarrof Hossain	Chairman	50	• Environmental Laws and Regulation should be strictly followed at different phases of the project; • All the emission (air, noise, water etc.) level should meet the DoE guidelines; • I hope that the project activity will not hamper the regular movement of the community people and will bring betterment to their lives.
Hemayetpur Union Parishad[8]	Md. Mizanur Rahman	Union Secretary	45	• We support this project but the authority must give high priority on Environment; • Compensation should be given properly according to the market price; • Local people should be given priority for employment.
Govt. Officials, Pabna				
Department of Fisheries	Md. Abul Kalam Azad	District Fisheries Officer	52	• Solid and liquid waste should not be discharged into river or nearest khal without proper treatment; • Authority should closely monitor so that any kinds of hazardous materials do not mix with water.

[7] Upazila Parishad is one of the administrative units of Bangladesh, works as the sub-unit of district. There are several Union Parishads under one Upazila Parishad
[8] Union Parishad is the smallest rural administrative and local government unit in Bangladesh.

Authority	Name	Occupation	Age	Comments
Department of Agricultural Extension	Dr. Md. Jamal Uddin	Deputy Director	54	• The project proponent may use the lands under solar panel for cultivating low rising crops. • This project may contribute in improving the socio-economic condition of that char land. Due to the project intervention lots of local people will get chance to work in the project at different phases, there may be increase in local business and shops as the project activity may involve sourcing of different materials and services from local suppliers. As a result, the economic condition of that area will improve.
Department of Environment (DOE)	Md. Nazmul Hossain	Assistant Director	30	• Must maintain all the environmental laws and code as per the DoE guideline; • Should use high technology so that it does not harm environment; • Should prepare a project specific environmental management plan;
Bangladesh Water Development Board (BWDB)	Md. Abdul Mazed	Sub-Assistant Engineer	47	• Proper mitigation and management plan should be adopted so that aquatic ecosystem is not disturbed; • Care must be taken to ensure that any leakage of oil or other waste does not happen.

Local Community

Local Farmers and Fishermen

Labors and Workers

Local women

Local women and children

Vulnerable group

Figure 11.1: Focus Group Discussion

District Fisheries Officer's Office

Department of Agricultural Extension

DoE, Pabna District Office

BWDB

Government Officials, Pabna

UNO Office

Hemayetpur Union Office

Upazila Parishad Office

Government Officials, Pabna Sadar Upazila

Figure 11.2: Photographs of Public Consultation at different Government Offices

11.6 First Formal Public Consultation Meeting

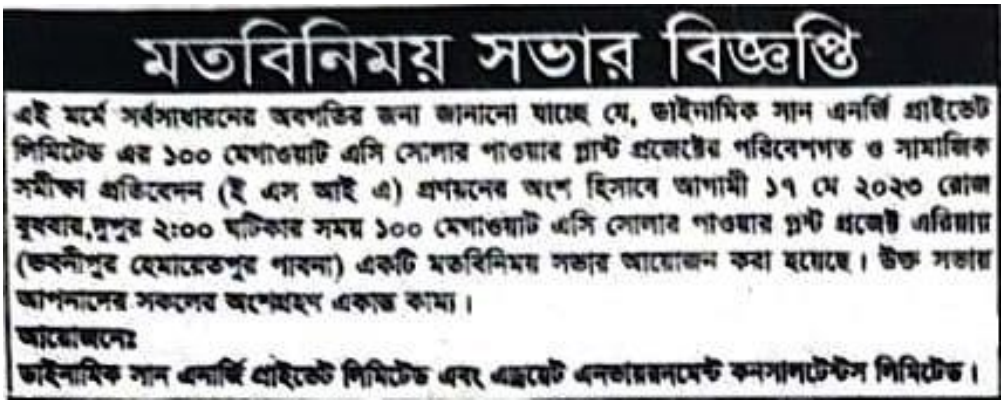
A Formal Public consultation was carried out on 17th May, 2023 with a vision to engage with the community a lot better than the informal ones. The meeting was held on the Project site, Bhabanipur, Hemayetpur Union, Pabna Sadar Upazila. The meeting started at 1:45 p.m.

Dr. Nasir Uddin Khan, Environmental Consultant of AECL explained the environmental issues regarding this project. He discussed with the participants about the proposed Project interventions and importance of electricity in our day to day life. Mamun-Ar-Rashid, Social and Resettlement Consultant of AECL explained the land acquisition process and resettlement plan to the local people. The

consultation meetings were intended to capture the main views of the participants from the surrounding areas. The information about public consultation meeting was published in The Daily Asia Bani and The Muslim Times newspaper shown in Figure below.

Table 11.3: Project attendees of Formal Public Consultation

Representing Organization	Name and Designation
DSEPL	Md. Robiul Islam (Company Secretary)
AECL	Dr. Nasir Uddin Khan (Environmental Consultant, Team Leader); Mamun-Ar-Rashid (Social and Resettlement Consultant); Shanjana Haider (Environmental Consultant); Md Golam Rasul (Consultant); Shahriar Ebn Bashar (Consultant); Sabrina Islam Labonno (Consultant); Raktim Banik (Consultant)



মতবিনিময় সভার বিজ্ঞপ্তি

এই মর্মে সর্বসাধারনের অবগতির জন্য জানানো যাচ্ছে যে, ডাইনামিক সান এনার্জি প্রাইভেট লিমিটেড এর ১০০ মেগাওয়াট এসি সোলার পাওয়ার প্লান্ট প্রজেক্টের পরিবেশগত ও সামাজিক সমীক্ষা প্রতিবেদন (ই এস আই এ) প্রণয়নের অংশ হিসাবে আগামী ১৭ মে ২০২৩ রোজ বুধবার,দুপুর ২:০০ ঘটিকার সময় ১০০ মেগাওয়াট এসি সোলার পাওয়ার প্লান্ট প্রজেক্ট এরিয়ায় (ভবনীপুর হেমায়েতপুর পাবনা) একটি মতবিনিময় সভার আয়োজন করা হয়েছে। উক্ত সভায় আপনাদের সকলের অংশগ্রহণ একান্ত কাম্য।

আয়োজনেঃ

ডাইনামিক সান এনার্জি প্রাইভেট লিমিটেড এবং এড্রয়েট এনভায়রনমেন্ট কনসালটেন্টস লিমিটেড।

The Daily Asia Bani

NOTICE FOR PUBLIC CONSULTATION MEETING

A Public Consultation Meeting will be held as a part of Environmental & Social Impact Assessment (ESIA) study for the proposed 100 MW ac Solar Power Plant Project on 17 May 2023, Wednesday at 2:00 pm. Your kind participation in the meeting will be highly appreciated.

Organized by:

Dynamic Sun Energy Private Limited & Adroit Environment Consultants Ltd.

The Muslim Times

Figure 11.3: Circular in the Newspaper

Findings of the public consultations are given in **Table 11.4**. The photographs are shown in **Figure 11.4**. List of Participants in Public consultation meeting and meeting minutes are given in **Annexure 18** and **Annexure 19** respectively.

Table 11.4: Summary of First Public Consultation Meeting

Key Points Discussed	Outcomes in brief	Feedback addressed in IEE
Alhaj Mosarof Hossain (Upazila Chairman, Pabna Sadar Upazila) mentioned: • the consultant should conduct detail study on the impact and consequence of this project especially on environmental and socio-economic condition. • He also requested to give priority to local people in providing jobs at the plant	• The consultant team replied that they have already undertaken relevant necessary studies for this project. • Company Secretary appreciated his advice and assure that they may consider local people as the first priority on the basis of their ability to work.	• Chapter 5, Table 5.1. • Section 3.8.4, 6.3.17 and 6.4.16
Inspector, DoE, Pabna: • He mentioned to follow the Bangladesh Environment Conservation Rules, 2023 and all the relevant guidelines during construction and operation stages.	• The consultant team replied that they have already suggested the Project company to perform all their duties according to relevant law and legislations. Besides that, they are thoroughly monitoring all the activities. • The Company Secretary informed that DSEPL is currently following DoE guidelines along with ADB SPS. They will continue following for the betterment of the environment.	• Chapter 2, Table 2.1, Section 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 4.10.1, 4.10.2, 4.11, 4.12, 4.14.3, 6.1, 6.2, 6.3, and 7.2, Table 7.1, Section 7.4, 7.5, 7.6, 7.7, 8.2, 8.3, 8.4, 10.5.
Md. Jahangir Alam (Hemayetpur Union Parishad Chairman) requested: • The Project company should compensate all the land and crops owner according to the price set by GoB.	• Company Secretary thanked him for sharing his thoughts. He assured that already a good number of people have received their compensation and rest are on the process. All the deals will be completed according to ARIMA, 2017 and Electricity Rules, 2020.	• Section 6.2.1 and Annexure 6 (Land Acquisition Information of Power Plant and Tower Footing areas)

Key Points Discussed	Outcomes in brief	Feedback addressed in IEE
Md. Abdullah Mondal, (Local Representative) mentioned: • After the starting of this project they got a new kacha road, if the company developed the road connection from Bhabanipur to Pabna Sadar, their children can get chance to educate themselves more.	• Company Secretary said due to the betterment of the project we need a well-paved road. We are discussing this matter with local authority. Hope to work coordinating with them to have a developed road for all.	• Section 3.7.4 and 7.11

Figure 11.4: Photographs of Public Consultation

11.7 Second Formal Public Consultation Meeting

Second Formal Public Consultation Meeting was conducted on August 17, 2023 at the project site. This consultation was mainly with the direct impact communities and relevant stakeholders where the identified impacts and the ESMPs were presented, highlighting how the concerns of the communities and stakeholders from previous consultations were addressed in the IEE and ESMP. The meeting started at 11:30 a.m.

Shanjana Haider, Environmental Consultant of AECL discussed about the current status and detail of the project, identified impacts and the environmental & socio-economic management plans (local employment opportunities, resettlement issues, overall economic development) that will be undertaken by the proponent during construction and operation phase according to their concern shared during the last public consultation meeting. The information about public consultation meeting was published in The Daily Asia Bani and The Muslim Times newspaper shown in Figure below.

Table 11.5: Project attendees of Formal Public Consultation

Representing Organization	Name and Designation
DSEPL	Md. Robiul Islam (Company Secretary)
AECL	Shanjana Haider (Environmental Consultant); Burhan Uddin (Social and Resettlement Consultant); Md Golam Rasul (Consultant); Shahriar Ebn Bashar (Consultant); Sabrina Islam Labonno (Consultant); Md. Mosaddaqur Rahman (Consultant)

মতবিনিময় সভার বিজ্ঞপ্তি

এই মর্মে সর্বসাধারণের অবগতির জন্য জানানো যাচ্ছে যে, ডাইনামিক সান এনার্জি প্রাইভেট লিমিটেড এর ১০০ মেগাওয়াট এসি সোলার পাওয়ার প্লান্ট প্রজেক্টের পরিবেশগত ও সামাজিক সমীক্ষা প্রতিবেদন (ই এস আই এ) প্রণয়নের অংশ হিসাবে আগামী ১৭ আগস্ট,২০২৩ রোজ বৃহস্পতি বার, সকাল ১১.৩০ ঘটিকায় সময় ১০০ মেগাওয়াট এসি সোলার পাওয়ার প্লান্ট প্রজেক্ট এরিয়ায় (ভবানীপুর হেমায়েতপুর, পাবনা) ২য় মতবিনিময় সভার আয়োজন করা হয়েছে। উক্ত সভায় আপনাদের সকলের অংশগ্রহণ একান্ত কাম্য।

আয়োজনে ঃ

ডাইনামিক সান এনার্জি প্রাইভেট লিমিটেড এবং এম্ব্রয়েট এনভায়রনমেন্ট কনসালটেন্টস লিমিটেড

The Daily Asia Bani

NOTICE FOR 2nd PUBLIC CONSULTATION MEETING

A Public Consultation Meeting will be held as a part of Environmental & Social Impact Assessment (ESIA) studyfor the proposed 100MW ac Solar Power Plant Project on 17 August 2023, Thursday at 11:30 am.Your kind participation in the meeting will be highly appreciated.
Organized by:
Dynamic Sun Energy Private Limited & Adroit Environment Consultants Ltd.

The Muslim Times

Figure 11.5: Circular in the Newspaper

Findings of the public consultations are given in **Table 11.6**. The photographs are shown in **Figure 11.6**. List of Participants in Public consultation meeting and meeting minutes are given in **Annexure 18** and **Annexure 19** respectively.

Table 11.6: Summary of Second Public Consultation Meeting

Key Points Discussed	Outcomes in brief	Feedback addressed in IEE
Md. Nazmul Hossain (Assistant Director, DoE, Pabna District Office) mentioned: • DSEPL has followed the latest DoE Rules and Regulations in the implementation of the project • He highlighted the benefits of solar power plant as it didn't use any raw materials which have negative impacts on environment like coal or gas power plants and this type of power plant.	• The consultant team appreciated his compliments. • Company Secretary appreciated his advice and assure that they will take actions to mitigate any negative impacts on local environment.	• Chapter 2, Table 2.1, Section 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 4.10.1, 4.10.2, 4.11, 4.12, 4.14.3, 6.1, 6.2, 6.3, and 7.2, Table 7.1, Section 7.4, 7.5, 7.6, 7.7, 8.2, 8.3, 8.4, 10.5. • Section 9.3.2
Md. Musharraf Hussain (Assistant Director, BWDB, Pabna District):	• The consultant team replied that they have already suggested the Project	• Section 6.3.5, 6.3.6, 6.3.10, 6.3.13, 6.4.4,

Key Points Discussed	Outcomes in brief	Feedback addressed in IEE
• He ensured that this project have no negative impact on surface and ground water. • He also requested the local people to support this project as it will improve the socio-economic condition of Pabna Upazila	company to perform all their duties according to relevant law and legislations so that ground water will remain uncontaminated. • The Company Secretary thanked him and informed that DSEPL is currently following DoE guidelines along with ADB SPS. They will continue following for the betterment of the environment.	6.4.5, 6.4.8, and 6.4.14 • Section 6.3.17, 6.3.18, 6.4.16 and 6.4.17
Amena Khatun (Housewife, Bhabanipur): • She requested that other interested women should also be given suitable job opportunities so that they can also earn money for their family and can improve their living standard. • She requested the project company to arrange some trainings which are related to project activities so that their children can work here too after they complete their education.	• Company Secretary thanked her for sharing her thoughts. He informed that already a good number of women have been appointed here and they are willing to appoint more people as per requirement of the project. He also described their CSR policy.	• Section 3.8.4, 6.3.17, and 6.4.16 • Section 7.11
Atahur Member (Local Representatives, Char Bhabanipur): • He thanked DSEPL as due to this project road connectivity has improved in their area. • He also mentioned that this project has enhanced the socio-economic condition in their area as the project authority recruit local people in project activity.	• Company Secretary said due to the betterment of the project we need a well-paved road. We are discussing this matter with local authority. Hope to work coordinating with them to have a developed road for all.	• Section 3.7.4 • Section 6.3.17, 6.3.18 6.4.16 and 6.4.17.

Key Points Discussed	Outcomes in brief	Feedback addressed in IEE
Saiful Islam (Businessman, Bhabanipur): • He requested the project company to buy construction materials, daily necessities from local people to improve their economic condition. • He requested project authority for construct a mosque within the project area for local people religious activity.	• Company Secretary said that they are already procuring construction materials and daily necessities from local dealers, which are available here. In some cases, they need to communicate foreign dealers too. He also ensured that they have a plan to construct a mosque within the project area.	• Section 6.3.18 and 6.4.17 • Section 3.4.1






Figure 11.6: Photographs of Second Formal Public Consultation Meeting

11.8 Stakeholder Engagement Plan

The stakeholders must be engaged for smooth continuation of the Project in all the phases of the project i.e., pre-construction, construction and operation stages. EHS manager will conduct meeting in every six months with stakeholders who are directly and indirectly impacted and relevant with the project related activities. Issues of affected people, land related issues, community health and safety measures and any other issues related to land will be discussed in the meeting. EHS Manager should explain the procedure regarding Grievance Redress Mechanism (GRM), so that stakeholders can access the GRM and get solution. Besides that, EHS Manager will disclose the relevant project information and securing their opinions to overcome the adverse situation for project implementation. Assistant EHS Manager will note down all the queries, issues and problems of the stakeholders and report to project management. Project management should take necessary steps to sought out the matters. The stakeholders should be engaged at every step of the project development in an integrated way.

In the early stages of the development of the project, the initial identification of stakeholders was conducted, and these stakeholders were further grouped into government, non-government organizations, civil society group, businesses, institutions, indigenous people, and local communities and individuals. Analysing the stakeholders identity, roles, interest, and influence on the project we can further categorize the stakeholders into the following groups:

Table 11.7: Stakeholder Groups

Stakeholder Category	Brief Description
Direct Stakeholder	These are the stakeholders identified as the most vulnerable to the possible impacts and changes to be brought by the project.
Indirect Stakeholder	These are stakeholders that may be indirectly affected by the project wherein consequences although indirect, may still be felt due to changes and impacts brought by the project.
Other Relevant Stakeholders	These are stakeholders that may have interest in the project and influence its development and operations.

During each stakeholder consultation meeting, stakeholders should be aware of the ongoing progress/condition of the project. Any kind of constraints, incidents, accidents and GRM should be informed to the stakeholders. The concerns and overviews of stakeholders should be evaluated during the meeting and shared with top management of the proponent to make necessary steps to solve any issue that may arise adversely in near future. Stakeholders should be aware of their rights and privileges according to national and international regulatory guidelines. Effectiveness of GRM, possibility of job placement, community health issues, performed and future CSR activities should be discussed in the meeting. Stakeholders should consider the project as one of their own things to explore the opportunities they might get. This section includes the summary of these guidelines with statement that SEP will be developed as part of the operations ESMP.

11.9 Disclosure

The draft IEE report will be available for the public review Dynamic Sun Energy Private Limited website. Once the final version is ready, it will replace the draft version on the Dynamic Sun Energy Private

Limited website. The executive summary will be translated into Bangla and will be made available to the public.

Chapter 12

12 GRIEVANCE REDRESS MECHANISM AND DISCLOSURE

12.1 Grievance Redress Mechanism

Public participation, consultation and information disclosure undertaken as part of the local IEE process have discussed and addressed major community environmental concerns. Continued public participation and consultation has been emphasized as a key component of successful project implementation. As a result of this public participation during the initial stages of the project, major issues of grievance are not expected. During the construction and operational phase of the project, the complaints that may be anticipated are mostly related to dust, noise & vibration of the engines, unexpected accidents and some other social and environmental issues. To settle such issues effectively, an effective and transparent channel for lodging complaints and grievances will be established. The grievance redress mechanism should be scaled to the risks and adverse impacts of the project. It should address affected people's concerns and complaints promptly, using an understandable process. It should also be readily accessible to all sections of the community at no cost and without retribution.

The Grievance Mechanism will be implemented during both the construction and operational period of the project to ensure that all complaints from local communities are dealt with appropriately, with corrective actions being implemented, and the complainant being informed of the outcome. The GRM should accept complaints from Project affected people and anonymous source.

The mechanism will be accessible to diverse members of the community, including more vulnerable groups such as women and youth. Multiple means of using this mechanism, including face-to-face meetings, written complaints, telephone conversations should be available. Confidentiality and privacy for complainants should be honored where this is seen as necessary or important.

A grievance redress mechanism and procedures is setup to provide opportunity for project affected persons (PAPs) to settle their complaints and grievances amicably. The established grievances redress procedures and mechanism ensures that project affected persons are provided with the appropriate resolution and that all administrative measures are in line with the law. It also allows project affected persons not to lose time and resources from going through lengthy administrative and legal procedures. Grievances are first preferred to be settled amicably.

100 MW ac Solar Power Plant has already set-up a grievance redress committee that addresses any complaints during the construction period of the project but the team formation needs some enhancement

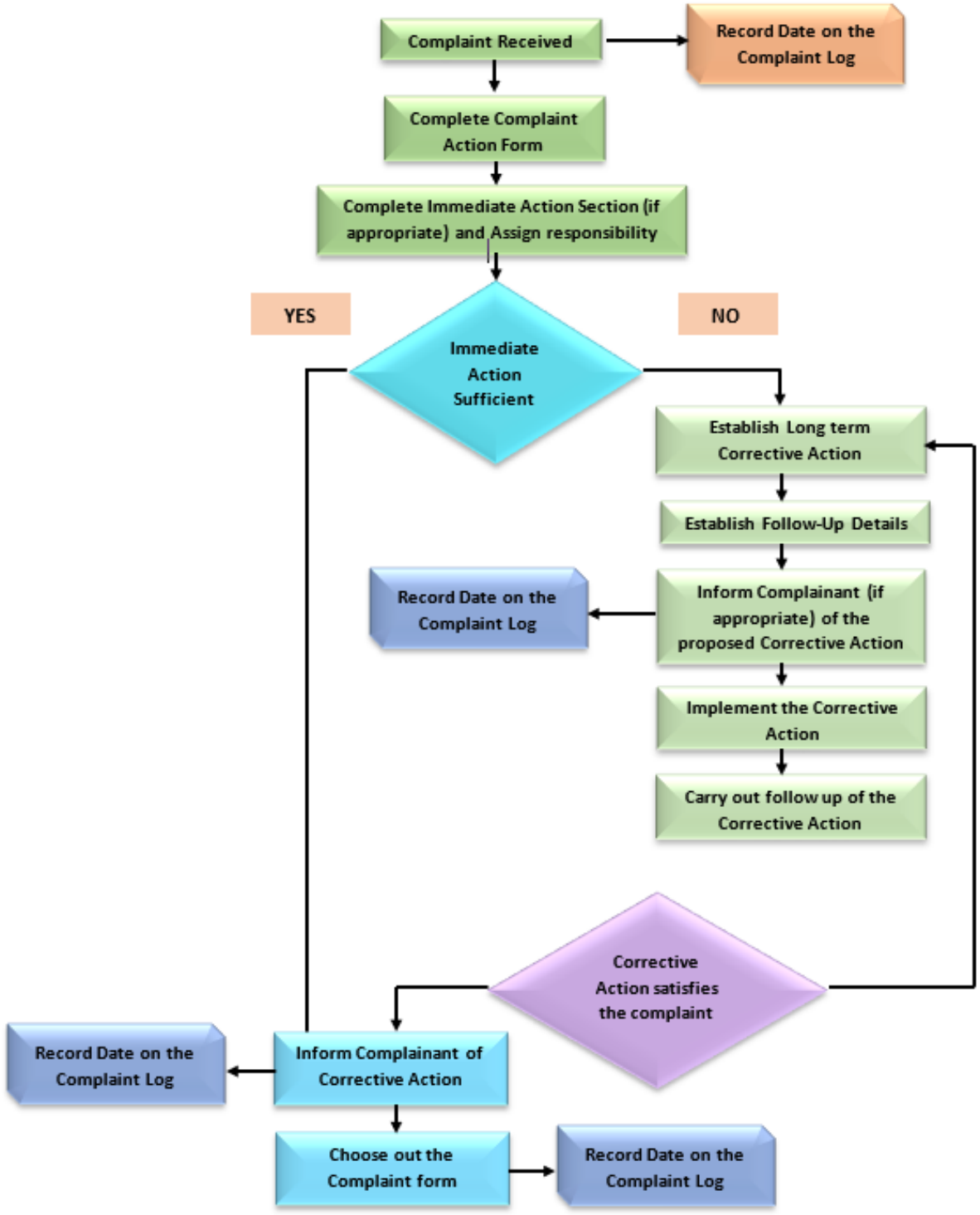


Figure 12.1: Flowchart of Complaints/Grievance procedure

The company has formulated a Grievance mechanism to reduce/redress grievance related to environmental and OHS issues, community issues, land acquisition related issues at various level for effective & smooth operation of the project during both construction and operation phases and for both TL and main power plant site. To mitigate/redress the grievance the company has been working in three step layers to solve the complaints and concerns more effectively and efficiently within sort period which is as below:

1. PAPs Representative Committee:

Name	Position	Contact No.
Mr. Md. Atahar Mondol	Local Representative	+880-1718-964871
Mr. Md. Shahid Bissas	Local Representative	+880-1745-521461
Mr. Md. Bondar Ali Haji	Local Representative	+880-1711-301866

2. Project Management Committee:

Name	Position	Contact No.
Mr. Md Jahurul Islam	DGM (HR & Admin)	+880-1324-724855
Mr. Md Omar Faruk	AGM (Operation)	+880-1725-538929
Mr. Md. Aktaruzzaman	AGM	+880-1324-437720

3. Executive Committee:

Name	Position	Contact No.
Mr. AHM Abdur Rahman	Director (Operation & Administration)	+880-1755-524278
Mr. Md. Robiul Islam	GM & Company Secretary	+880-1713-236107
Mr. Md. Shamim Hossain	Head of Audit	+880-1777-709448

Framework of Grievance

Procedure of Grievance Redressal & its Mitigation:

1. PAPs should be encouraged to raise their issue in written or oral to PAPs Representative Committee informally in the first instance;
2. Upon getting the query from PAPs, the PAPs Representative Committee attend the issue and will conduct the necessary investigations whether the issue related with the project activity and measure the depth of the issue;
3. Then the committee give a date and sit together with the aggrieved PAP to resolve;
4. Generally, any issue raised by PAPs, it should be resolve within 7 days from the date of coznigence of the committee;
5. If the matter is not resolved, the PAPs Representative Committee submit a letter to Project Management Committee in detail and outline what steps they would like to be taken to redress the issue with their investigation report;

6. Project Management Committee will conduct the necessary investigations then a grievance hearing will be held and mitigate the issue within next 7 days.
7. If they fail to mitigate, they forward it to the Executive Committee of the company with their investigation report;
8. Executive Committee will take the decision regarding on the complaints or concern issues within 14 days;
9. PAPs have the right to appeal against the Grievance Management decision. In some cases, if the PAPs and Company decide that it would be advantageous to enlist a third party in the dispute resolution process, such mediation to help the parties arrive to a mutually agreeable solution. The grievance process may be temporarily halted in such cases.

For any kind of grievance any members of the PAPs representative committee should be contacted. During operations, the GRM will be open for Operations and Maintenance related complaints and that this will be contained in the main project GRM. The RP will be available in English on adb.org for access to the affected people.

DSEPL should recruit one dedicated officer as Community Relations Officer (CRO) to maintain a Complaints Database, which will contain all the information on complaints or grievances received from the communities or other stakeholders and manage record keeping. This would include: the type of complaint, location, time, actions to address these complaints, and final outcome. CRO will undertake engagement with PAHs to determine if there are any grievances or issues that require resolution.

The GRM in place is being used by the community to raise complaints. But no complaint has been raised by the community till now. Right now, the Site supervisors manage GRM at site. Till now only one complaint was raised and it was related to an office staff who was not listening to his superiors, the staff was alerted about that and now he is following the rules. The complaint is resolved now. No grievance has escalated to legal claims till date. The GRM is gender responsive. Community people and workers are aware of the GRM. The TOR of GRM has been added in Annexure 20.

As a general policy, project proponent will work proactively towards preventing grievances through implementation of impact mitigation and community liaison activities that anticipate and address potential issues before they become grievances. Minor issues will be solved by the contractor in consultation with the aggrieved party and the local Union parishad representatives (local authority representative).
In case a dispute is not resolved by arbitrational tribunal, then if any of the Party disagrees, the aggrieved party has the right to appeal to the ordinary courts of law. However, the preferred option of dispute settlement ought to be the option of settling the dispute amicably because recourse to courts may take a very long-time even year before a final decision is made and therefore, should not be the preferred option for both parties concerned

A grievance form is presented below and hard copies of both English and Bangla will be made available at the project office.

Table 12.1: Sample Grievance Reporting Form

Contact Details	Name:	
	Address:	
	Telephone Number/ Cell Phone Number:	
	Email:	
How would you prefer to be contacted? (please tick box)	☐ By Phone ☐ By Email	
Details of your Grievance (Please describe the problems, how it happened, when, where, and how many times, as relevant)		
What is your suggested resolution for the grievance?		
Signature:		**Date:**

Chapter 13

13 CONCLUSION AND RECOMMENDATIONS

13.1 Conclusions

Dynamic Sun Private Ltd. is going to set up the 100 MW ac Solar Power which will generate and supply electricity to Bangladesh Power Development Board ("BPDB") for a period of 20 years on an off-take basis. The proposed project is located at Bhabanipur and Ratanpur Mauza, Hemayetpur Union, Pabna Sadar Upazila at Pabna District. The proposed power plant will use renewable energy which reduces greenhouse gas emissions by providing carbon-free electricity generation, contributing to cleaner air and a healthier planet. The abundance and renewable nature of solar energy ensures its availability for generations to come, promoting long-term sustainability. The integration of solar power plants into existing electricity grids enhances grid stability and resilience.

The present IEE report finds that though there are certain adverse environmental impacts associated with the project under consideration, these are manageable provided recommendations in the ESMP are followed with due diligence.

If the management plans suggested are followed properly i.e. Regular water sprinkling to minimize fugitive dust emission; Noisy construction works to be limited to daytime hours and all employees likely to be exposed to ear noise to be provide with ear protectors; Collection and segregation of wastes and safe storage should be done; Supply good quality drinking water and adequate standard toilet facilities must be available at the construction site to the workers; The quality of drinking water should be checked periodically; Septic tank of adequate capacity should be installed at site; Access to workplace must be restricted for community people to provide higher degree of safety and people working in the site workers must wear appropriate PPEs; Standard wage, wage deductions, hours of work, overtime arrangements, overtime compensation, leave for illness, maternity, vacation or holiday should also be maintained by the contractor; Child labor and forced labor should strictly be avoided; Speed limit and proper sign board should be provided along the connecting roads to the project site etc. then it is expected to mitigate the negative impacts due to the construction of this proposed power plant. In addition to that, handling, installation of PV modules should be undertaken carefully by experienced workers. Suggested EMP Implementation Unit for construction phase should be implemented properly for the smooth operation of the construction phase and ensure environmental safeguard.

During operation phase the proposed project will not create much environmental negative impact. There will be no air or liquid emission from the project operation. Only the sewage and solid waste should be handled according to the mitigation measure suggested to avoid the negative impact. Collection and segregation of wastes and safe storage should be done. STP of adequate capacity should be installed at the project site. Supply good quality drinking water and adequate standard toilet facilities must be available at the project

area. Solid and hazardous materials will have to be stored at site at designated area and disposed at a regular interval in municipal solid waste disposal area while others which has demand in market will be sold in to the authorized dealer. All PV panels should be checked at a regular interval for leaching and electrical leakage. Damaged or old panels should be temporarily stored in the hazardous waste and give them to licensed waste treatment agencies to treat the panels as well as hazardous solid waste storage area and sold them to secondary dealer. There won't be any significant impact from the transmission line during operation phase. Suggested EMP Implementation Unit for operation phase should be implemented to ensure environmental safeguard.

The benefits of solar power plants, extend beyond environmental considerations. They encompass economic growth, job creation, energy security, and a cleaner, healthier future for all. Bhabanipur and Ratanpur Mauza are two remote places of Pabna Sadar Upazila with undeveloped roads and socio-economic facilities. After the implementation of the project, it will create employment opportunity to the local people and improve transportation system in the project area, which will ultimately play an important role in poverty reduction and develop social safety condition.

It is expected that the project will be an ideal for the nation. The project operator will use modern technology and follow all necessary measures to make it successful. Minimum impacts shall be produced on the surrounding environment on the condition that the mentioned mitigation measures are taken. The project site is reasonably selected and the project construction is feasible from the perspective of environmental protection.

Having reviewed all the potential environmental impacts and if followed by our proposed mitigation measures, the project is expected to proceed without having unacceptable environment.

13.2 Recommendations

- A greenbelt area should be developed along the project boundary. However, plantation of trees shall be provided by planting trees of local species around the power plant boundary.
- Internal environmental management in the company shall be reinforced to make sure that the environmental protection actions are implemented, the facilities are in normal operation and assistances are provided to enable the local environmental protection authorities to carry out the monitoring activities;
- Solid and Hazardous waste management is an important issue in this project. Some raw materials have secondary demand can be sold but other wastes must be disposed properly;
- All activities (pre-construction, construction and operation stage) should be implemented according to ESMP and regular monitoring of the project activities as mentioned in the environment monitoring plan during different phases of the project should be done;
- Public consultation/stakeholder consultation should be conducted regularly in every stage of the project to know the problems of local people and stakeholders related to the project activities.

However, no development can be expected without any adverse impact on the environment. The beneficial impacts on the nation as well as human beings would only be meaningful and sustainable development would only be possible if adverse impacts are minimized through strict maintenance and control measures as mentioned for this project. All this would need vigilant care and money and the Project company should take these into consideration.

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Annexure

Annexure - 1

Site Clearance Certificate

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
পরিবেশ অধিদপ্তর
পাবনা জেলা কার্যালয়
সাং-নুরপুর বাইপাস, পাবনা সদর, পাবনা
www.doe.gov.bd

অবস্থানগত ছাড়পত্র

ছাড়পত্র নং: ২৩-১০০৮৭৫

পরিবেশগত ব্যবস্থাপনা নিশ্চিতকরণ সাপেক্ষে সংযুক্ত শর্তে নিম্নবর্ণিত প্রতিষ্ঠান/প্রকল্পের অনুকূলে অবস্থানগত ছাড়পত্র প্রদান করা হলো :

প্রতিষ্ঠান/প্রকল্পের নাম	:	ডাইনামীক সান এনার্জি প্রাইভেট লিমিটেড
উদ্যোক্তার নাম	:	অলক কুমার দাস, পরিচালক
সনাক্তকরণ নং	:	১৩৮৮৯০
প্রতিষ্ঠান/প্রকল্পের কার্যক্রম	:	সোলার পাওয়ার প্লান্ট (১০০ মেগা ওয়াট)
প্রতিষ্ঠান/প্রকল্পের শ্রেণী	:	Orange
প্রতিষ্ঠান/প্রকল্পের ঠিকানা	:	ভবানীপুর, হিমাইতপুর, পাবনা সদর, পাবনা
প্রদানের তারিখ	:	১৯ জুন ২০২৩
মেয়াদ উত্তীর্ণের তারিখ	:	১৮ জুন ২০২৪

এ ছাড়পত্র সনদের সাথে পৃথকভাবে সংযুক্ত প্রদত্ত শর্তাবলী যথাযথভাবে প্রতিপালন করতে হবে, অন্যথায় ছাড়পত্র বাতিল/ক্ষতিপূরণ আদায়সহ যে কোন আইনানুগ ব্যবস্থা গ্রহণ করা হবে।

বিঃদ্রঃ এটি একটি সিস্টেম জেনারেটেড ছাড়পত্র এবং এতে কোনোরূপ স্বাক্ষরের প্রয়োজন নেই।

অবস্থানগত ছাড়পত্র জন্য প্রযোজ্য শর্তাবলী:

১ . এ ছাড়পত্র ১৭,৭৬৫৭২ বর্গমিটার জায়গায় সৌর বিদ্যুৎ উৎপাদন (১০০ মেগা ওয়াট) কার্যক্রম পরিচালনার জন্য কারখানার ভূমি উন্নয়ন, অবকাঠামো ও

যন্ত্রপাতি স্থাপন কার্যক্রম পরিচালনা করার ক্ষেত্রে প্রযোজ্য হবে।

২ . আইইই প্রতিবেদনে উল্লিখিত সকল মিটিগেশন মেজার্স যথাযথভাবে বাস্তবায়নপূর্বক সার্বক্ষণিক কার্যকরী রাখতে হবে।

৩ . অগ্নি নির্বাপনকল্পে কারখানায় যথোপযুক্ত ব্যবস্থাদি গড়ে তুলতে হবে। ফায়ার সার্ভিস কর্তৃক আলোচ্য কারখানার অনুকূলে সকল ধরনের নির্দেশনা বাস্তবায়ন করতে হবে।

৪ . বাংলাদেশ পরিবেশ সংরক্ষণ আইন ১৯৯৫ (সংশোধিত ২০১০) এবং পরিবেশ সংরক্ষণ বিধিমালা,২০২৩ এর সকল ধারা ও বিধি প্রতিপালন করতে হবে।

৫ . কঠিন বর্জ্য ব্যবস্থাপনা বিধিমালা, ২০২১ অনুসারে কারখানা সৃষ্ট কঠিন বর্জ্য পরিবেশসম্মতভাবে ব্যবস্থাপনা ও অপসারণ করার জন্য প্রয়োজনীয় ব্যবস্থা গ্রহণ করতে হবে। কারখানার স্থাপনা নির্মাণের জন্য ব্যবহৃত সকল নির্মাণ সামগ্রী ঢেকে রাখার ব্যবস্থা গ্রহণ করতে হবে এবং কারখানার নির্মাণ সামগ্রী পরিবহণকারী সকল যানবাহনকে যথাযথভাবে ঢেকে মালামাল পরিবহণ করতে হবে এবং এই সকল যানবাহনের চাকার মাধ্যমে যাতে কোন ধরনের কাদা বা ময়লা কারখানার বাইরে ছড়িয়ে না পরে সেই বিষয়েও প্রয়োজনীয় ব্যবস্থা গ্রহণ করতে হবে।

৬ . কারখানার ভূমি উন্নয়ন, অবকাঠামো ও যন্ত্রপাতি স্থাপন কর্মকান্ড পরিচালনা করার সময় শব্দ, তরল ও বায়বীয় বর্জ্য নিঃসরণ/নির্গমন মাত্রা যথাক্রমে শব্দ দূষণ (নিয়ন্ত্রণ) বিধিমালা-২০০৬, পরিবেশ সংরক্ষণ বিধিমালা, ২০২৩ এবং বায়ু দূষণ (নিয়ন্ত্রণ) বিধিমালা ২০২২-এ বর্ণিত মানমাত্রার মধ্যে রাখতে হবে।

৭ . কারখানার ভূমি উন্নয়ন, অবকাঠামো ও যন্ত্রপাতি স্থাপন কর্মকান্ড পরিচালনা করার মাধ্যমে মাটি, পানি ও বায়ু দূষণ করা যাবে না। একইসাথে কারখানা পরিচালনার সময় যাতে কারখানার কোন কর্মকান্ড দ্বারা মাটি, পানি ও বায়ু দূষণ না হয় সেই জন্যে প্রয়োজনীয় ব্যবস্থা গ্রহণ করতে হবে।

৮ . কারখানার ভূমি উন্নয়ন, অবকাঠামো ও যন্ত্রপাতি স্থাপন কর্মকান্ড পরিচালনার সময় মানব স্বাস্থ্যের জন্য ক্ষতিকর কোন উপাদান ব্যবহার করা যাবে না। কারখানার ভূমি উন্নয়ন, অবকাঠামো ও যন্ত্রপাতি স্থাপন কর্মকান্ড দ্বারা সৃষ্ট ধূলোবলি নিয়ন্ত্রণে দিনে কমপক্ষে দুইবার পানি ছিটানোর ব্যবস্থা গ্রহণ করতে হবে।

৯ . কারখানায় উপযুক্ত স্থানে বৃক্ষ রোপনের জন্য প্রয়োজনীয় ব্যবস্থা গ্রহণ করতে হবে।

১০ . কারখানাটিতে এনার্জি সেভিং LED বাল্ব ব্যবহার করতে হবে। একইসাথে কারখানাতে ব্যবহৃত পানি সাশ্রয়ের জন্য পানি সাশ্রয়ী প্রযুক্তির ব্যবহার করার জন্য প্রয়োজনীয় ব্যবস্থা গ্রহণ করতে হবে।

১১ . কর্মরত শ্রমিকদের জন্য Personal Protection Equipment যেমন ডাস্ট মাস্ক, গ্লাভস, ইয়ার প্লাগ ইত্যাদি ব্যবহার নিশ্চিত করতে হবে।

১২ . প্রতিষ্ঠানটির অবকাঠামোর পরিবর্তন/পরিবর্ধন কিংবা উৎপাদন প্রক্রিয়ার পরিবর্তন/বৃদ্ধির ক্ষেত্রে পরিবেশ অধিদপ্তরের অনুমতি গ্রহণ করতে হবে।

১৩ . এ ছাড়পত্র দ্বারা নির্মাণ কাজ ও যন্ত্রপাতি স্থাপনের জন্য বিদ্যুৎ সংযোগ পাওয়া যাবে কিন্তু গ্যাস সংযোগের ক্ষেত্রে প্রযোজ্য হবে না।

১৪ . এ ছাড়পত্র ভূমির মালিকানা স্বত্ব নির্ধারণ করে না।

১৫ . অবকাঠামো নির্মাণ ও অন্যান্য কার্যক্রম সমাপ্ত করে পরিবেশগত ছাড়পত্র গ্রহণের জন্য পুনরায় আবেদন দাখিল করতে হবে।

১৬ . পরিবেশগত ছাড়পত্র গ্রহণ ব্যতিরেকে কারখানাটি পরীক্ষামূলক/বাণিজ্যিক উৎপাদনে যেতে পারবে না।

১৭ . এ পর্যায়ে প্রাপ্ত ও পরিবেশিত তথ্যের ভিত্তিতে এ ছাড়পত্র প্রদান করা হলো। পরবর্তীতে কোনো তথ্য অসম্পূর্ণ, ত্রুটিপূর্ণ বা অসত্য কিংবা গোপন করা হয়েছে মর্মে প্রমাণিত হলে এ ছাড়পত্র বাতিল বলে গণ্য হবে। এছাড়া কারখানার বিরুদ্ধে কোন ধরনের অভিযোগ পাওয়া গেলে এবং তদন্তে অভিযোগের সত্যতা পাওয়া গেলে এ ছাড়পত্র বাতিল করা হবে।

১৮ . ছাড়পত্রের মূলকপি/নবায়নপত্র প্রতিষ্ঠনে সংরক্ষণ করতে হবে। পরিবেশ অধিদপ্তরের এনফোর্সমেন্ট টীম বা কোন কর্মকর্তা পরিদর্শনে গেলে তাদেরকে ছাড়পত্র প্রদর্শন ও কারখানার কার্যক্রম পরিদর্শনে সর্বাত্মক সহযোগিতা করতে হবে।

১৯ . এই ছাড়পত্র জারির তারিখ হতে পরবর্তী ১ (এক) বছরের জন্য বহাল থাকবে এবং মেয়াদ শেষ হবার অন্ততঃ ৩০ (ত্রিশ) দিন পূর্বে নবায়নের জন্য আবেদন করতে হবে।

২০ . বাংলাদেশ পরিবেশ সংরক্ষণ আইন, ১৯৯৫ এবং তদধীন প্রণীত বিধিমালা এ প্রদত্ত ক্ষমতাবলে উপরিল্লিখিত শর্তসমূহ Enforce করা হবে।

Annexure - 2

Layout Plan of the Project site

Proposed Route AP-01
Angle- 57°46'55"RT
Distance = 481.76m
X = 732563.816
Y = 2651847.665
Mouza :Khas Char Bagunda

ISHWARDI GRID 132KV

New TT-01
Angle- 26°40'09"RT
Distance = 49.51m
X = 719509.0000
Y = 2652074.9919
Mouza :Bhabanipur

New AP-01
Angle- 52°59'06"RT
Distance = 489.74m
X = 719068.9104
Y = 2652289.8667
Mouza :Bhabanipur

Existing Ground Level (EGL)	= 12.455m	(0.00m)
Switch Yard Gr. Floor Top	= 16.00m	(+3.545m) (11'-8")
Main Substation Gr. Floor Top	= 17.00m	(+4.545m) (14'-11")
Block Substation Gr. Floor Top	= 16.00m	(+3.545m) (11'-8")
Internal Road Level	= 12.65m	(+0.150m) (00'-6")
Boundary Road Top Level	= 14.00m	(+1.545m) (5'-1")
PV Panel Lower Part Height	= 15.485m	(+3.030m) (9'-11")
PV Panel Upper Part Height	= 16.50m	(+4.045m) (13'-3")
PV SPC Pile Top Height	= 15.855m	(+3.40m) (11'-2")
PV Inv. SPC Pile Top Height	= 16.355m	(+3.90m) (12'-9")

1.	Total Table	= 4728 Nos.
2.	Total Inverter	= 744 Nos (@200kw)
3.	Total Table Pile	= 47280 Nos.
4.	Total Inverter Pile	= 744 Nos.
5.	Panel tilt Angle	= 18°
6.	Face	= South
7.	Pitch to Pitch	= 6.513m
8.	Block Sub-Station	= 31 Nos.
9.	Total DC Capacity	= 150 MW
10.	Total AC Capacity (Inv. Cap)	= 148 MW
11.	Power Factor	= 0.9
12.	PV Panel Row to Row	= 1100m
13.	PV Panel Colm. to Colm.	= 2150m

Total land as per digital survey =377 Acre
31 Nos. Block (150 MW DC/148 MW AC/P.F=0.9)
Evacuation 100MW AC (132 KV)

PV Panel Area	= 258.304 Acre
River Embankment With Boundary Road Area	= 26.35 Acre
Internal Road Area	= 10.5 Acre
Service Road, (Shadow Clearance, Cable Trench, Drain, Street Light)	= 22.5 Acre
Main Control Room Area	= 2.294 Acre
Switch Yard Area 132KV	= 3.064 Acre
Block Sub-station for 31 Nos.	= 8.63 Acre
Office Area Building	= 2.14 Acre
Safe Distance Maintain from River	= 15 Acre
Agrovoltaic / Green Zone Pocket Area	= 24.183 Acre
Total Required Project Land Area	= 372.597 Acre
Play Ground, officers Club & Mosque Etc	= 4.403 Acre
Total Land	= 377.00 Acre

132 KV TL
Damage Brick Field
Fencing Line
SP Area
Banana Garden
GUCHHA GRAM
21.5 km
LABOUR SHED
SOLID WASTE DUMPING YARD
OFFICE
LGED Road
Project Access Road
STP
SEPTIC TANK
Main Substation Height EL =17.00m (+4.545m)
MAIN ENTRANCE
MAIN CONTROL ROOM
PLATFORM EL. +14.00 M.(PWD)
Stack Yard (1 Lac sft.)
LPS
ELEVATED ROAD/DIKE
RAIN WATER HARVEST TANK
GRAVEYARD
MOSQUE
PARK
OFFICERS CLUB
ROUND SHADE
SWIMMING POOL
PLAY GROUND
HELIPAD
Ramp
EAST
PADMA RIVER
PADMA RIVER

TYPE-B
ROAD
25
82'-0"
29
ROAD
SUBSTATION BUILDING AREA = 0.028 Acre (1219 sft)
SUBSTATION BOUNDARY AREA = 0.250 Acre (10890 sft)
TOTAL = 0.278 Acre (12109 sft)

N
North Pole 90° N
Bangladesh Latitude : 24° N longitude :89.25° E
Latitude
Equator / (0°)
W
E
Prime meridian
Longitude
Latitude
90° S
South Pole
S

REV	DATE	DESCRIPTION	DRAWN	CHECKED	APPROVED
0	28.09.2022	PRELIMINARY	SUEBPHONG	WANAGORN	POOSIT .3489

PROJECT :
100MW (AC) SOLAR PARK,
BHABANIPUR, HEMAYETPUR,PABNA, BANGLADESH.

OWNER :
DYNAMIC SUN ENERGY PRIVATE LIMITED

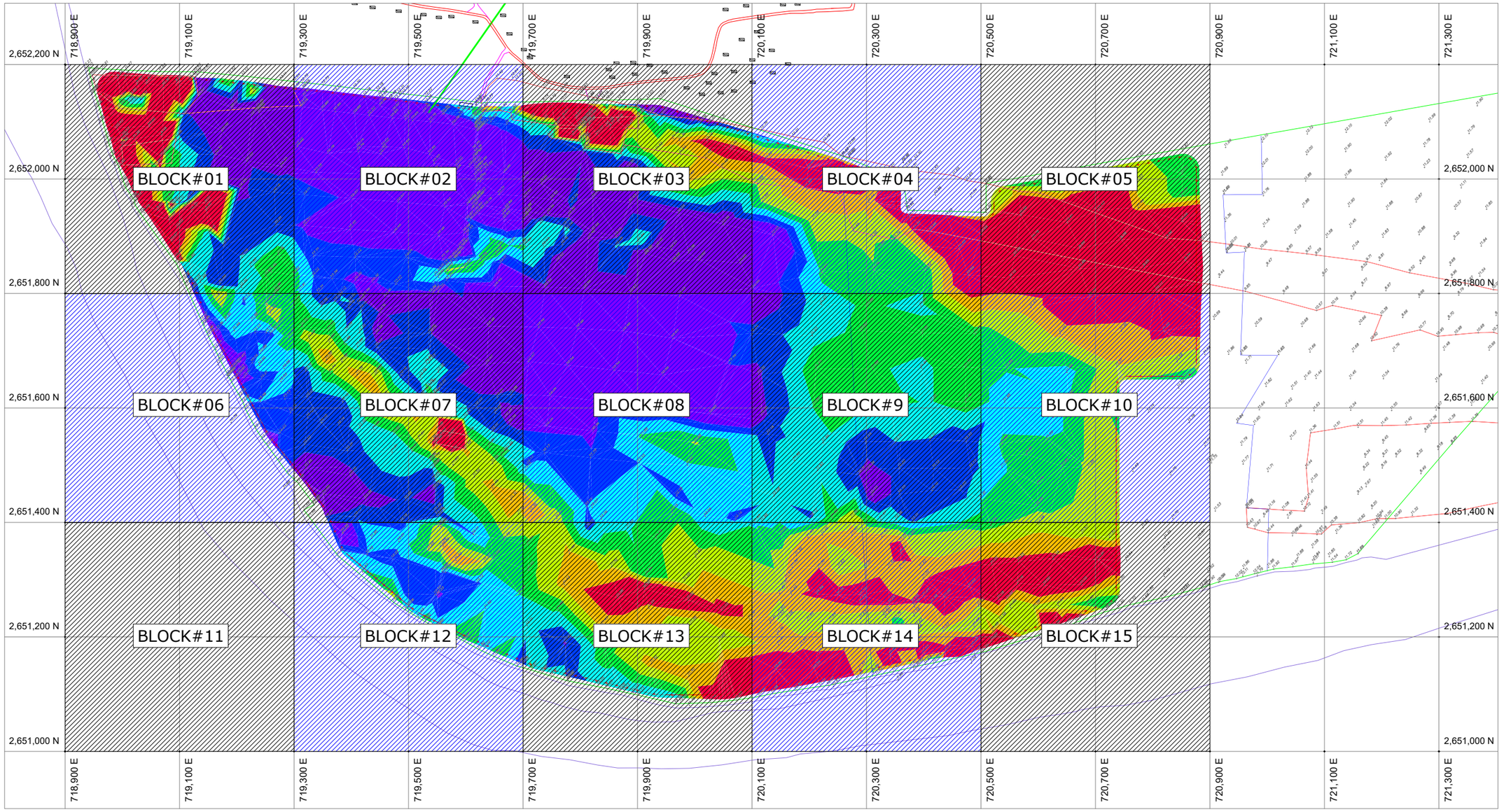
EP CONTRACTOR :
PETERSON INNOTEC CO., LTD.
ROOM 2103, 2104 , NO.2 BUILDING , ART & TECHNOLOGY SPACE . No.63, HAIER ROAD, QINGDAO P.R.CHINA
TEL: 0086 532 80999562, 80999563 , 80999561 FAX: 0086 532 80999560 P.C. : 266061

EP CONTRACTOR'S DESIGNER :
Infratech Energy Co., Ltd.
1032/217 Pahonyothin 18/1 RD. Jatujak District, Bangkok 10900,Thailand
www.infratechenergy.com

DRAWING TITLE : FINAL LAYOUT PLAN
PROJECT DOCUMENT NO :
DRAWING NO : PL- 1
SCALE : 1 : 100
PAPER : A1 (m.)
SHEET : 1 / 1

Annexure - 3

Site Elevation Map



LEGEND

- COORDINATE LINE REFERENCE
- PROJECT BOUNDARY/FENCE
- BOUNDARY LINE
- GROUND LEVEL (X.XXX)

Elevation Table			
Number	Min. Depth (m.)	Max. Depth (m.)	Color
1	7.487	11.300	
2	11.300	11.500	
3	11.500	11.700	
4	11.700	11.900	
5	11.900	12.100	
6	12.100	12.300	
7	12.300	13.162	

REV	DATE	DESCRIPTION	DRAWN	CHECKED	APPROVED
0	Aug / 23 / 2022	PRELIMINARY	SUEBPHONG	WANAGORN	POOSIT สถิ.3489

PROJECT :
100MW (AC) SOLAR PARK,
BHABANIPUR, PABNA.

OWNER :
DYNAMIC SUN ENERGY
PRIVATE LIMITED

CONTRACTOR :

EPC :

DESIGN :
Infratech Energy Co., Ltd.
1032/217 Pahonyothin
18/1 RD. Jatujak District,
Bangkok 10900,Thailand
www.infratechenergy.com

DRAWING TITLE :
KEY PLAN FOR PRE-DEVELOPMENT

PROJECT DOCUMENT NO :

DRAWING NO :
2D - 1

SCALE : 1 : 7,500
PAPER : A3 (m.)
SHEET : 1 / 16

Annexure - 4

Flood Study & Mitigation Report

FINAL

REPORT ON

FLOOD STUDY AND MITIGATION

100 MWac Bhabanipur, Pabna SOLAR PV POWER PLANT PROJECT, BANGLADESH

Submitted to

DYNAMIC SUN ENERGY PRIVATE LIMITED

August 26, 2022

บริษัท อินฟราเทค เอ็นเนอร์ยี่ จำกัด
Infratech Energy Co.,Ltd.
1032/217 Phaholyothin 18/1 Rd. Jomphon, Jatujak Bangkok. 10900
Tel. 02-272-2474-5 Fax. 02 272-2475 www.infratechenergy.com

DOCUMENT ISSUE RECORD

PROJECT : Dynamic Sun 100 MW solar farm

LOCATION : Pabna, Bangladesh

PROJECT# : 26/08/2022

	Name	Date	Signature
Author	Prasop S. (Bsc. 2nd class honor)	2022-08-25	
Document Check	Sawarot S.(Bsc. 2nd class honor, Msc.)	2022-08-25	
Authorisation	Poosit S.(Msc.)	2022-08-26	

บริษัท อินฟราเทค เอ็นเนอร์ยี่ จำกัด
Infratech Energy Co.,Ltd.

EXECUTIVE SUMMARY

A flood study for a Dynamic Sun 100 MW solar farm has been carried out and results of the study are concluded below.

The average ground level for this site is EL.12.0 m. PWD

1.Overtopping of Padma River for 25,50 and 100 years ARI considering the effect of climate change and future land development;

Maximum water elevation for 100 year ARI from flood study is EL.15.04 m. PWD

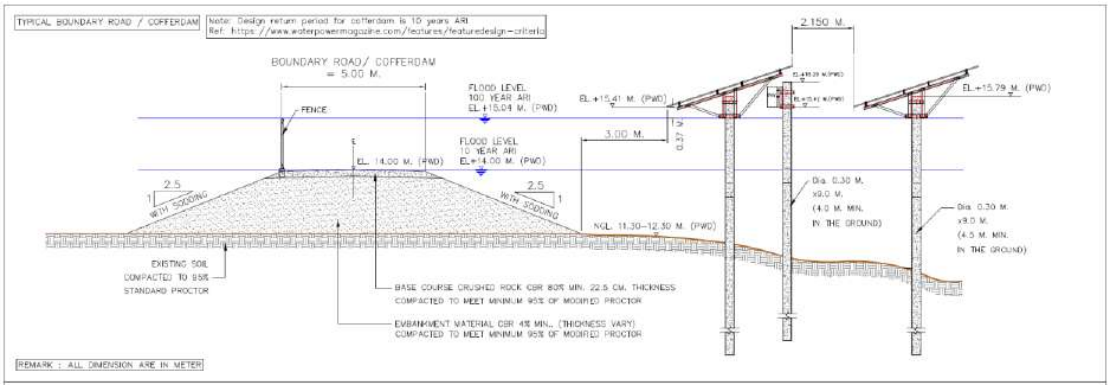
Animation of 2D flood at project site from overtopping of Padma river can be downloaded from;
https://drive.google.com/file/d/1rtWuib_cbto9j7zo2aWuUEUV1SIcI4RY/view?usp=sharing

2. Flood from local rain for 100 years ARI considering the effect of climate change and future land development;

Maximum water elevation for 100 year ARI from flood study is EL.12.03 m. PWD

Animation of 2D flood at project site from local rain can be downloaded from;
https://drive.google.com/file/d/18WatyPGdE5d5eFQq02_-YFhVxtOo7XaY/view?usp=sharing

3. The flood mitigation for this project is suggested by elevate the PV module above the flood level as below.



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1.0 INTRODUCTION AND BACKGROUND OF THE PROJECT

Infratech Energy Co., Ltd. has been engaged by Dynamic Sun Energy Pvt Ltd to conduct the flood study for the construction of a 100 MWac solar PV power plant project located within the Bhabanipur, Pabna, Bangladesh.

The site location is at latitude 23.963421°, longitude 89.163830°

The project site is shown in Plate 1-1.

Plate 1-1: Project location

The site is approximately 144 km West of the capital Dhaka and takes 5 hours to reach by car.

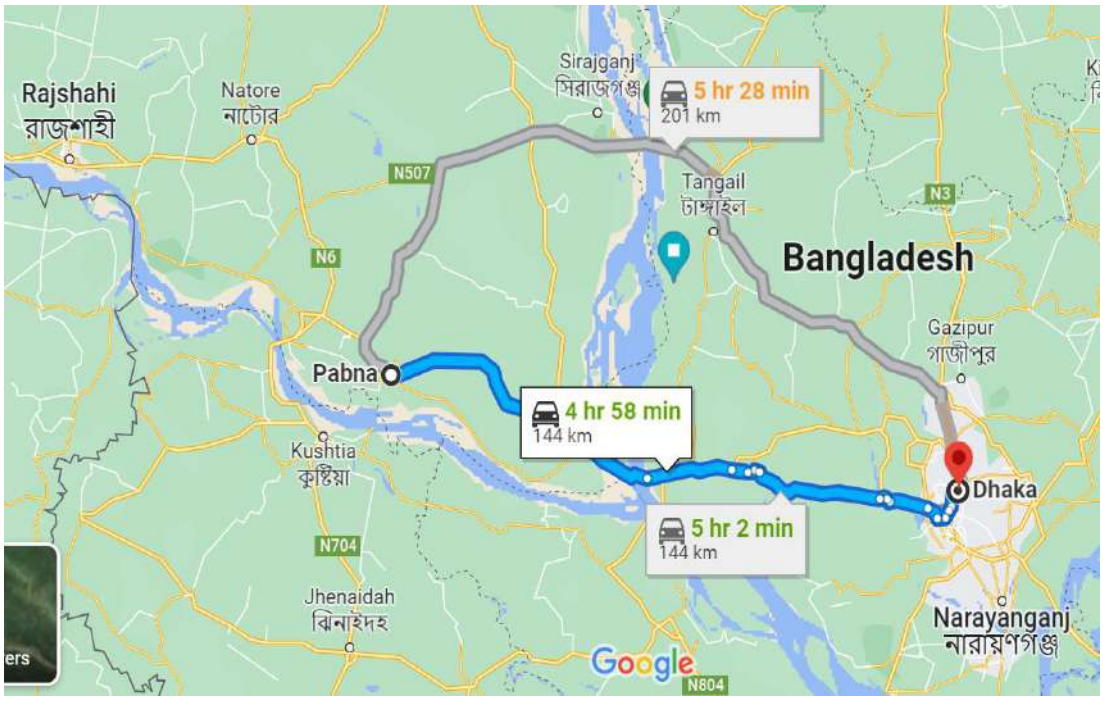


Plate 1-2: Site Vicinity

2.0 OBJECTIVE AND SCOPE OF WORK

The assessment methodology was designed to address potential flood risk from rainfall between 25,50 and 100 years of Appearance Recurrence Interval (ARI) to make the proposed SPPP area flood-free.

The main objectives of the hydrological study of the proposed SPPP are to:

- Flood analysis and calculation of highest flood level due to flood risk from river and high-intensity short-duration rainfall for designing the solar power plant.
- Flood and inundation mitigation

Scope of work shall include.

2.1 Collection of relevant information for the subject property and surrounding area. This included site area maps and identification of land use.

2.2 Collection of hydrological data;
2.2.1 Water level in the nearby river, rainfall, and hydrographic network from BWDB
2.2.2 Available information on the existing natural drainage system in the area.
2.2.3 Some brief overview of historic flood events in the area.
2.2.4. collecting data on existing site discharge and drainage points

2.3 A visit of the site, including a visual survey of the entire drainage area as identified from the maps and data collected. Discussions with the farmers and local population to understand the historical flood levels in the area;

2.4 A review of readily available records and documents on the hydrology of the area, to assist in determining surface water drainage patterns for the subject property and adjacent areas;

2.5 Estimation of design parameters, including storm intensity based on the rainfall data collected for this area. In absence of site-specific information, standard engineering assumptions and factors of safety are applied to available information on this issue;

2.6 Estimation of the peak water level and overtopping of the nearby river for the return period of 20,50 and 100 years including the effect of climate change by local practice in Bangladesh.

2.7 Flood Risk Analysis of the site, including the flood levels likely to be reached for various scenarios and the impact of these flood levels at the site.

2.8 Erosion study of the project site and ;

2.8 Recommendations for flood mitigation.

3.0 SITE INFORMATION

3.1 Site conditions

The proposed SPPP area is flat terrain with undulations.

The project area is predominantly used for agricultural purposes by local inhabitants for banana farms.

The site is situated in the Ganga-Padma River basin.

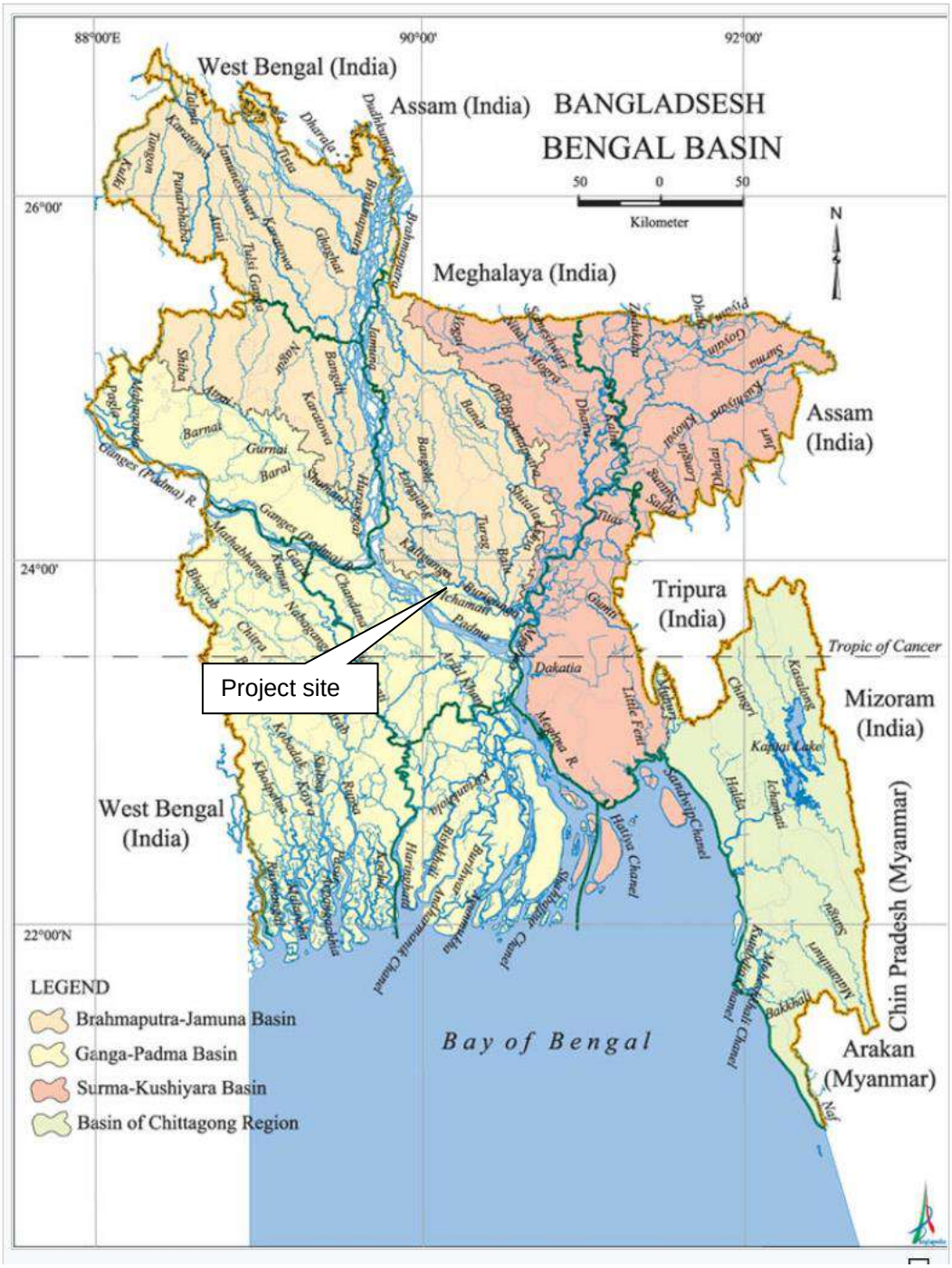


Plate 3-1: River Basin in Bangladesh

Project site is located on the left bank of the Padma River.

Plate 3-2: Nearby River (Padma River)

The Padma or Podda is a major river in Bangladesh. It is the main distributary of the Ganges, flowing generally southeast for 120 kilometers (75 mi) to its confluence with the Meghna River near the Bay of Bengal.

During August, the period of peak flow, the discharge of the river system reaches over 2,500,000 m3 / sec. in the year 1998.

3.2 Rainfall

The mean annual rainfall during monsoon is between 2000-2500 mm./year

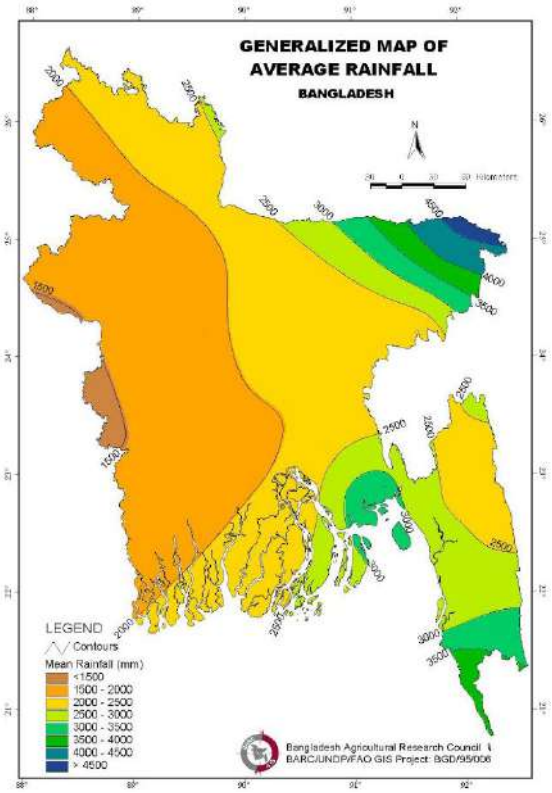


Plate 3-3: Average Rainfall

3.3 Climate

The proposed project area is located in a typical monsoon climate for three main reasons such as.

- Summer: The summer starts in February and ends in May. The summer season is very hot. The temperature varies from 25 degrees centigrade (during nighttime) to 42 degrees Celsius (during daytime). The wind speed during this season is high and usually blows from east to west and south to north direction.
-
- Monsoon: The summer starts in June and ends in September. The monsoon season is also very hot. The temperature varies from 25 - 38 degrees centigrade. During this period about 80% of rainfall occurs. Rest 20% occurs during the rest of the year. The annual rainfall for the Mymensingh rainfall station is 2800mm (Figure 2.4). The wind speed during this season is not so high and usually blows from east to west and south to north direction.

- Winter: The summer starts in October and ends in January. The winter season is cold. The temperature varies from 10 degrees centigrade (during nighttime) and 25 degrees centigrade (during daytime). The wind speed during this season is not high and usually blows from north to east and west to east direction.

3.4 Site elevation

The average site elevation from the topographic map of the project site is EL.12.0 m. PWD (see ***Figure 1.)***

A picture of the site and nearby branch of the Padma River is shown below.

Plate 3-4: Site Pictures

3.5 Discharge points of the project

The internal flow and discharge point of the project from 3D modeling is shown below.

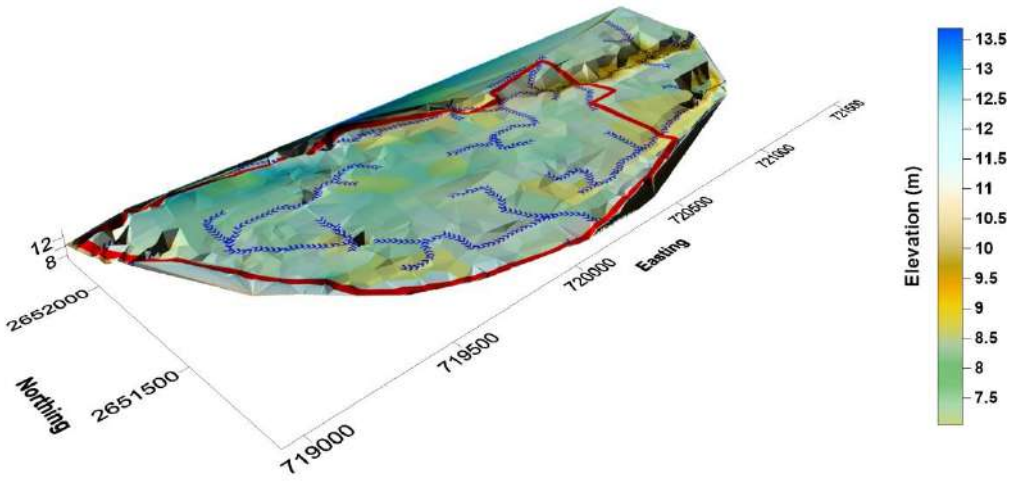


Plate 3-5: Internal flow and discharge point from DEM (Topographic survey)

3.6 Peak floods in the past

Peak flood in the past from the overtopping of the Padma main river has been observed.
The flood duration is between 2-3 months.
The water level in the year 1988 from the local resource is EL.14.87 m.(unconfirmed)

Data from the river gauge at Harding bridge in 1988 shows the water level is EL.15.19 (See ***Figure 2***)

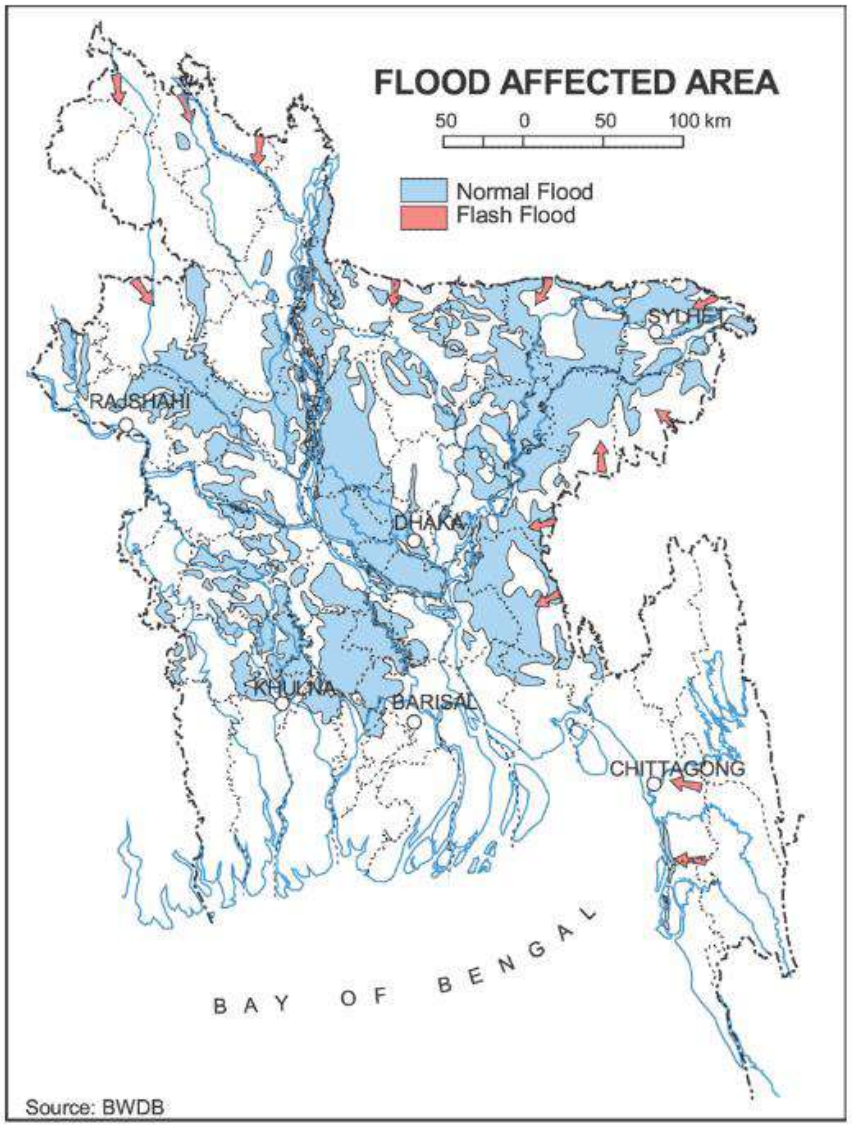
As the project site is on the downstream side, we expect the flood level on-site in the year 2008 to be lower than EL.15.19

4.0 TYPE OF FLOOD AND CAUSE OF FLOOD IN BANGLADESH

Bangladesh generally experiences four types of floods: flash floods, riverine floods, rainfall-induced floods, and storm surge floods, nevertheless, vulnerability to these four types varies according to different regions in the country.

4.1 Flash floods.

A flash flood is characterized by a very sharp rise of the water of rivers and subsequence over bank spillage with high velocity. It is also marked by a relatively rapid recession of water from the floodplains. A flash flood is characterized by a very sharp rise of the water of rivers and subsequence over bank spillage with high velocity. It is also marked by a relatively rapid recession of water from the floodplains.
The extent of flash floods is in the northern and eastern parts of Bangladesh.



Map Showing The **Normal And Flash Flood Affected Areas** Throughout Bangladesh

Plate 4-1: Flash flood in Bangladesh

In Bangladesh, a flash flood occurs after a heavy downpour in the neighboring hills and mountains. These floods often maul the standing crops at the ripening stage and cause severe damage to physical infrastructures along riverbanks.

4.2 Riverine floods (Long term flood)

Riverine floods from the major rivers generally rise and fall slowly over 10 to 20 days or more. Spilling by the major rivers and their tributaries and distributaries can cause extensive damage to lives and properties. Most of the flood plains in Bangladesh are subject to riverine floods during monsoon including this project.

4.3 rainfall-induced floods

Rainfall-induced floods are caused by high intense local precipitation of long duration in monsoon. In Bangladesh, mainly embanked areas are characterized by this flood. However, in each monsoon, rainfall-induced localized floods are observed in a number of locations in Dhaka city, the capital of the country from insufficient drainage network capacity.

4.4 Storm surge floods

Storm surge floods occur in the coastal areas of Bangladesh which consists of large estuaries, extensive tidal flats, and low-lying islands.

5.0 METHODOLOGY

From the site vicinity in chapter 3, flash floods and storm surges flood are not expected for this project.

5.1 Flood analysis from riverine

In Bangladesh prediction of water level is the main interest of flood management.

Annual maximum water levels of the hydrological gauge station at the nearest river will be used to analyze to derive the Highest Flood Level (HFL) of different return periods (20,25,50 and 100 years).

There are three different methods for the computation of HFL for different return periods. They are.

- Gumbel's Method.
- Log Pearsons Type - 3; and
- Normal Log.

The computations for high flood level (HFL) have been done by using Gumble's Method which is most commonly practiced in Bangladesh.

The computation shall include.

5.1.1 Impact of climate change and future land use to be also considered for the flood analysis for return periods 20,25,50 and 100 years.

5.1.2. Effect of the soil and groundwater on the flood

All information on the river water level at the nearest station and possible from the connected river (if available) will be collected together with information on river station at different locations in the same river are to be collected and compare for the same degree of change.

Once the HFL of the nearest river is known, the extension of flood to the project site will be accomplished with the aid of computer software Geo-HEC RAS and civil 3D in conjunction with site topographic survey and DEM.

5.2 rainfall-induced floods

High intense local precipitation of long duration in monsoon can cause short-term floods within the project site from insufficient discharge capacity.

The scope of the study shall include a collection of historical rainfall, the effect of climate change, and effect of future land use, and information of surrounded artificial rivers for the planning of internal drainage design and flood mitigation.

Information on rainfall data is to be verified for accuracy before use.

Rainfall data from at least three nearby stations are to be statistical analysis to check data homogeneity and consistency (double mass curve and probability distribution).

The future rainfall forecast will be for the return period of 20,25,50 and 100 years ARI.

The study shall include the effect of soil and groundwater in the site area on rainfall induced floods.

Flood mitigation and conceptual design of internal drainage will be included in the study.

6.0 FLOOD ANALYSIS

6.1 Flood analysis from riverine

Data records of the minimum and maximum water level together with discharge from river gauges at Harding bridge station from the year 1972 to 2021 are used for the estimation of water level in Padma River for 100 years ARI with the effect of climate change by the Gumbel method and Log Pearson Type III method

As the distance from Harding bridge to the project site is approximately 21.84 km., it is necessary to find a correlation between the water level at Harding bridge to the nearest river gauge to the project site.

The river gauge at Talbaria station (14.3 km. downstream) is used for calibration of water level and river profile slope.

Assume the slope of the river bed between Talbaria station and to project site (distance 6.84 km) is the same as the river bed from Harding bridge to Talbaria,

Details analysis in ***Annex A*** is concluded below.

Plate 6-1: River gauge station at Harding bridge and Talbaria station

Gumbel	Hardinge Bridge station to Talbaria station	14300	m	14.3	km
	Slope	0.000035	m/m		
	Tr	WL(Max)_Hardinge Bridge	(Slope x L)	WL(Max)_Talbaria	
	WL 2YR	13.869	0.501	13.368	
	WL 5YR	14.380	0.501	13.880	
	WL 10YR	14.719	0.501	14.219	
	WL 25YR	15.147	0.501	14.647	
	WL 50YR	15.465	0.501	14.964	
	WL 100YR	15.780	0.501	15.280	

Plate 6-2: Correlation between water level at Harding bridge station and Talbaria station by the Gumbel method.

Gumbel	Talbaria station to Project site	6840	m	6.84	km
	Slope	0.000035	m/m		
	Tr	WL(Max)_Talbaria	(Slope x L)	WL(Max)_Site	
	WL 2YR	13.368	0.239	13.129	
	WL 5YR	13.880	0.239	13.640	
	WL 10YR	14.219	0.239	13.979	
	WL 25YR	14.647	0.239	14.407	
	WL 50YR	14.964	0.239	14.725	
	WL 100YR	15.280	0.239	15.040	

Plate 6-3: Correlation between water level at Talbaria station and water level in front of the project site by the Gumbel method.

Log Pearson Type III	Hardinge Bridge station to Talbaria station	14300	m	14.3	km
	Slope	0.000035	m/m		
	Tr	WL(Max)_Hardinge Bridge	(Slope x L)	WL(Max)_Talbaria	
	WL 2YR	13.942	0.501	13.441	
	WL 5YR	14.389	0.501	13.889	
	WL 10YR	14.628	0.501	14.128	
	WL 25YR	14.887	0.501	14.387	
	WL 50YR	15.056	0.501	14.556	
	WL 100YR	15.210	0.501	14.709	

Plate 6-4: Correlation between water level at Harding bridge station and Talbaria station by the Log Pearson Type III method

Log Pearson Type III	Talbaria station to Project site	6840	m	6.84	km
	Slope	0.000035	m/m		
	Tr	WL(Max)_Talbaria	(Slope x L)	WL(Max)_Site	
	WL 2YR	13.441	0.239	13.202	
	WL 5YR	13.889	0.239	13.649	
	WL 10YR	14.128	0.239	13.888	
	WL 25YR	14.387	0.239	14.147	
	WL 50YR	14.556	0.239	14.317	
	WL 100YR	14.709	0.239	14.470	

Plate 6-5: Correlation between water level at Talbaria station and water level in front of the project site by the Log Pearson Type III method

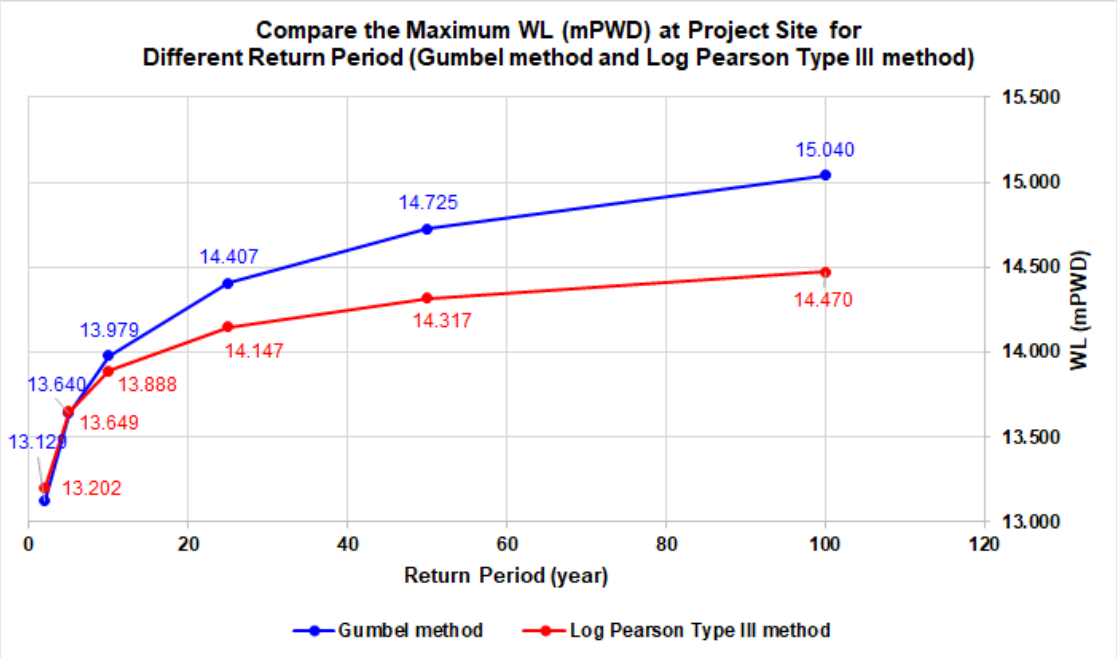


Plate 6-6: Compare the Maximum WL (mPWD) at Project Site for Different Return Period (Gumbel method and Log Pearson Type III method)

From the calculation analysis of maximum water level by Gumbel method and Log Pearson type III. The maximum water level calculated by Gumbel method is higher than Log Pearson type III, so selected by Gumbel method

The results of the maximum water level calculated by Gumbel method is shown in ***Plate 6-7*** below;

Tr	Maximum WL (mPWD) at Project Site (Gumbel Distribution)
2	13.129
5	13.640
10	13.979
25	14.407
50	14.725
100	15.040

Plate 6-7: Maximum water level at the project site by the Gumbel method

Water level for 100 years ARI with the effect of climate change by the Gumbel method is calculated to EL.15.04 m. PWD.

From the average site elevation at EL.12.0 m. PWD, average flood depth is 3.0 m. (see ***Figure 3***)

To explore the extended flood from the overtopping of Padma main river to the project side, the computer software Geo-HecRas is used for flood simulation. (see ***Annex B***).
Animation of 2D flood at project site from overtopping of Padma river can be downloaded from;

https://drive.google.com/file/d/1rtWuib_cbto9j7zo2aWuUEUV1SIcI4RY/view?usp=sharing

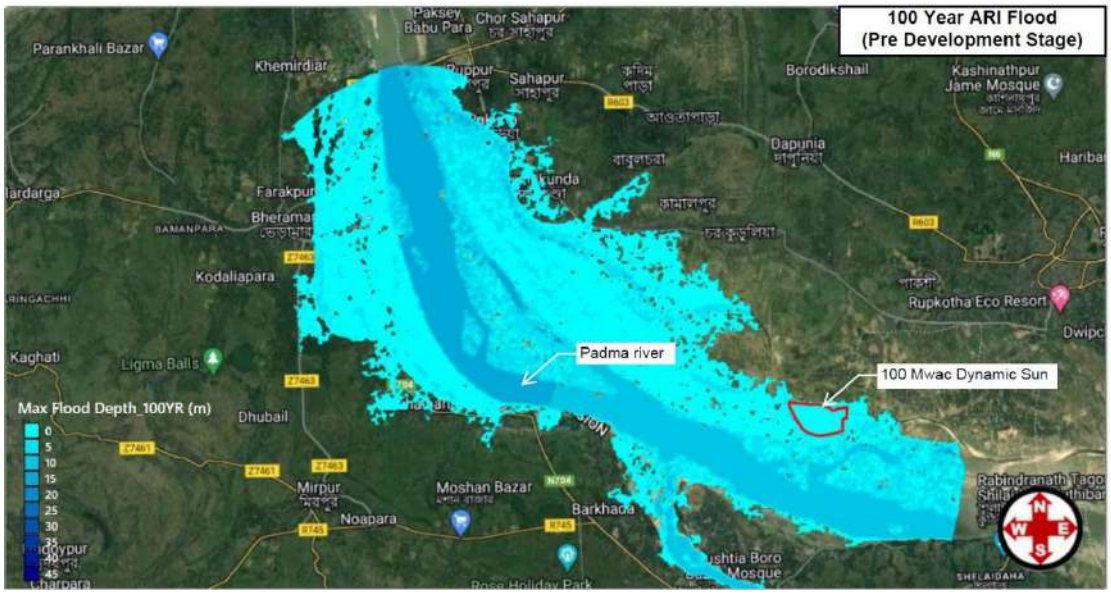


Plate 6-8: Extended flood from overtopping of Padma River

Flood depth on-site from 100 years ARI with the effect of climate change is shown in ***Figure 3***

6.2 Rainfall-induced flood

Rainfall data from 3 rainfall stations covering the project site (see ***Figure 4***) from Open Weather(https://home.openweathermap.org/) are used for the study of the rainfall-induced flood.

For the pre-development stage, the rainfall-induced flood may occur in the low ground areas which can be mitigated by backfilling low spot areas.
In other areas, water from rainfall will flow to the discharge point as shown in plate 3-5.

Maximum inundation extents under 100-year ARI local rainfall event for the site location, the computer software Geo-HecRas is used for flood simulation. (see ***Annex C***).

The ponding up of rainwater within the site is up to EL.**12.03** for 100 years ARI.

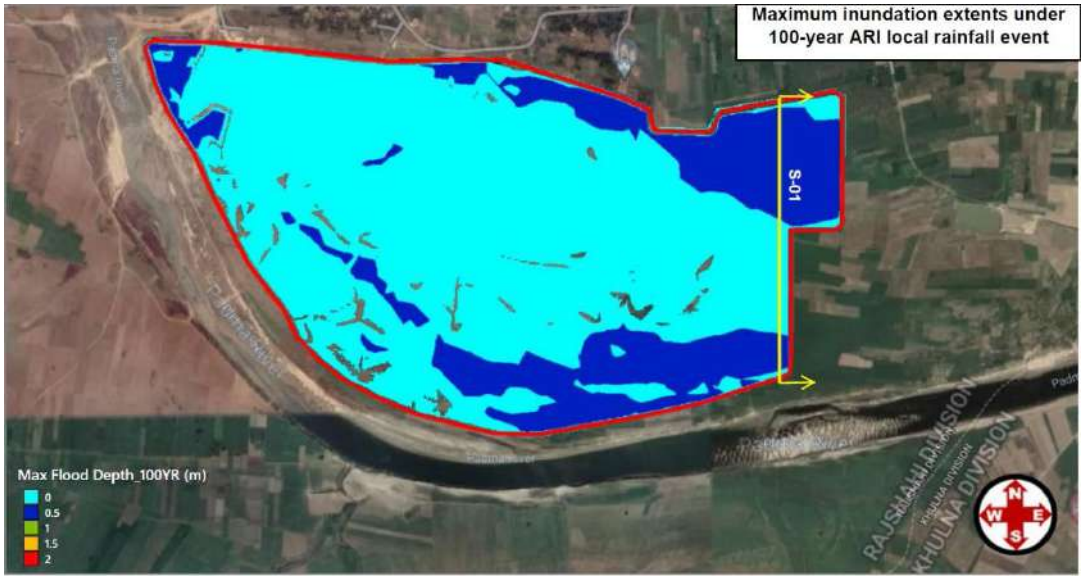


Plate 6-9: Maximum inundation flood depth extents under 100-year ARI local rainfall event within the site

Maximum water level at Cross section S-01 is shown in ***Plate 6-10*** below;

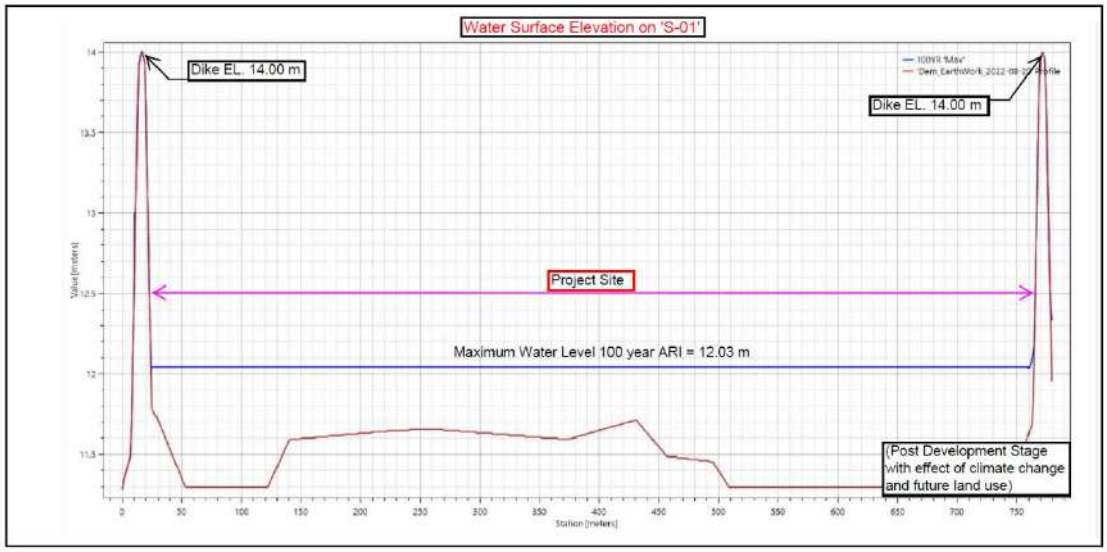


Plate 6-10: Flood depth 100 years ARI from local rain (Post Development Stage with effect of climate change and future land use)

Animation of 2D flood at project site can be downloaded from;

https://drive.google.com/file/d/18WatyPGdE5d5eFQq02_-YFhVxtOo7XaY/view?usp=sharing

The flow rate at the project site from local rain is shown in ***Annex D***.

The amount of flow rate is used for internal drainage design in the post-development stage.

7.0 FLOOD MITIGATION

The flood mitigation for this project is suggested below.

- Flood dike height to 100-year ARI with freeboard 0.50 m. to protect PV module from flooding. (Dry site)

  OR

- Elevate PV module height to 100-year ARI with freeboard 0.50 m. and allow flooding within site.

7.1 Flood dike (Earth dike) height to 100-year ARI with freeboard 0.5 m.

As the existing soil is sandy soil with high water conductivity and requires a minimum side slope of 1:2(V: H) for an earth dike, we do not suggest an earth dike for flood protection for the following reasons.

7.1.1 Elevation of flood dike at EL.15.54 m. PWD required a large amount of soil to form a dike.

7.1.2 Footprint (toe of dike) will interfere with PV module area and reduce the usable area for PV arrays.

7.1.3 For a long period of flooding (2-3 months), a large volume of seepage water passing through the dike body and foundation will require water pumps to dry the site.

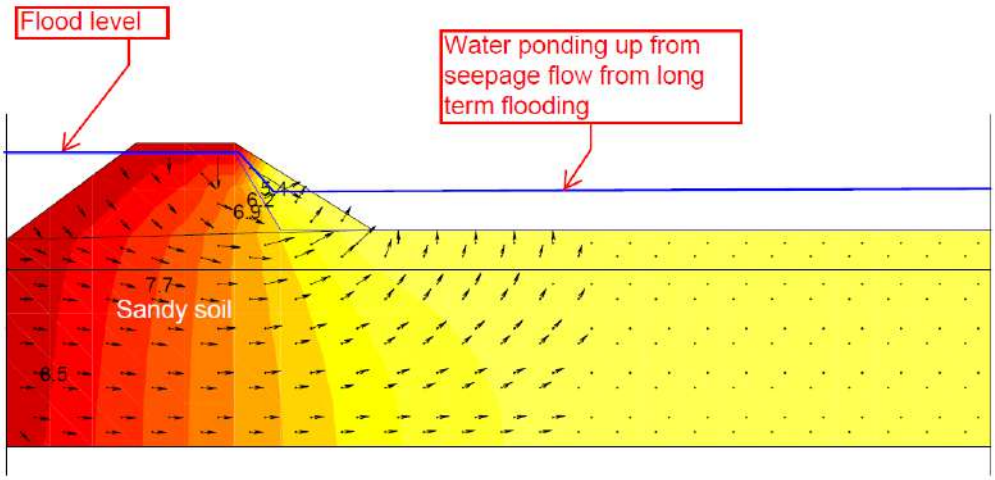


Plate 7-1: Seepage flow through earth dike

7.2 Elevate PV module height.

This option is preferred for a solar farm in a flood plain area for the following reasons.

7.2.1 Cost and timesaving of earthwork construction.

7.2.2 Gain more usable are for PV module arrays.

7.2.3 No water pump is required.

A typical drawing for this type of flood protection is shown below.

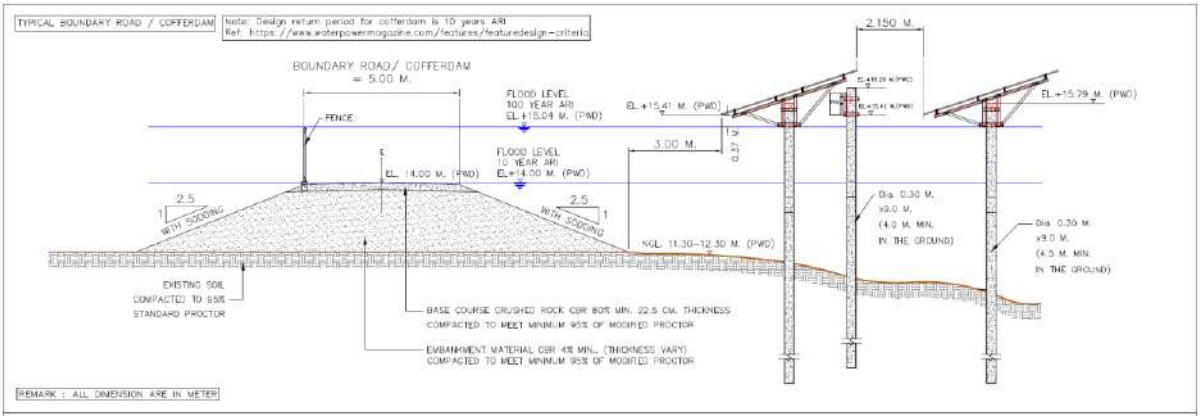


Plate 7-2: Typical flood protection by elevated PV module

The boundary road can be used for flood protection(cofferdam) from the overtopping of the Padma river during plant construction.

The elevation of the boundary road is suggested to meet the flood level at 10-year ARI for cofferdam design (EL.14.00 m.) ,*Ref:https://www.waterpowermagazine.com/features/featuredesign-criteria*

The ponding up of rainwater from local rain within the site (see ***Annex C***) is shown below.

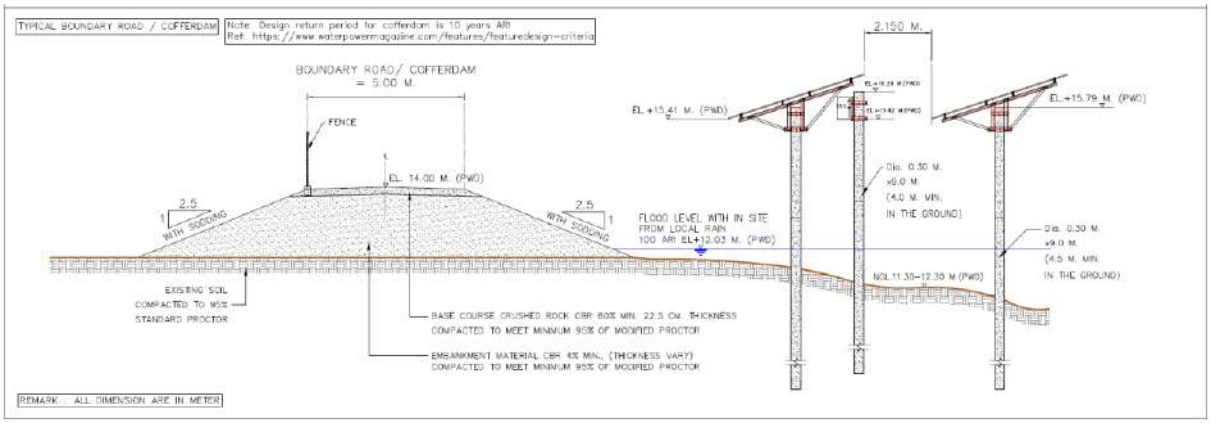


Plate 7-3: Flood level within site from internal rain (100 years ARI)

8.0 EROSION OF PROJECT SITE

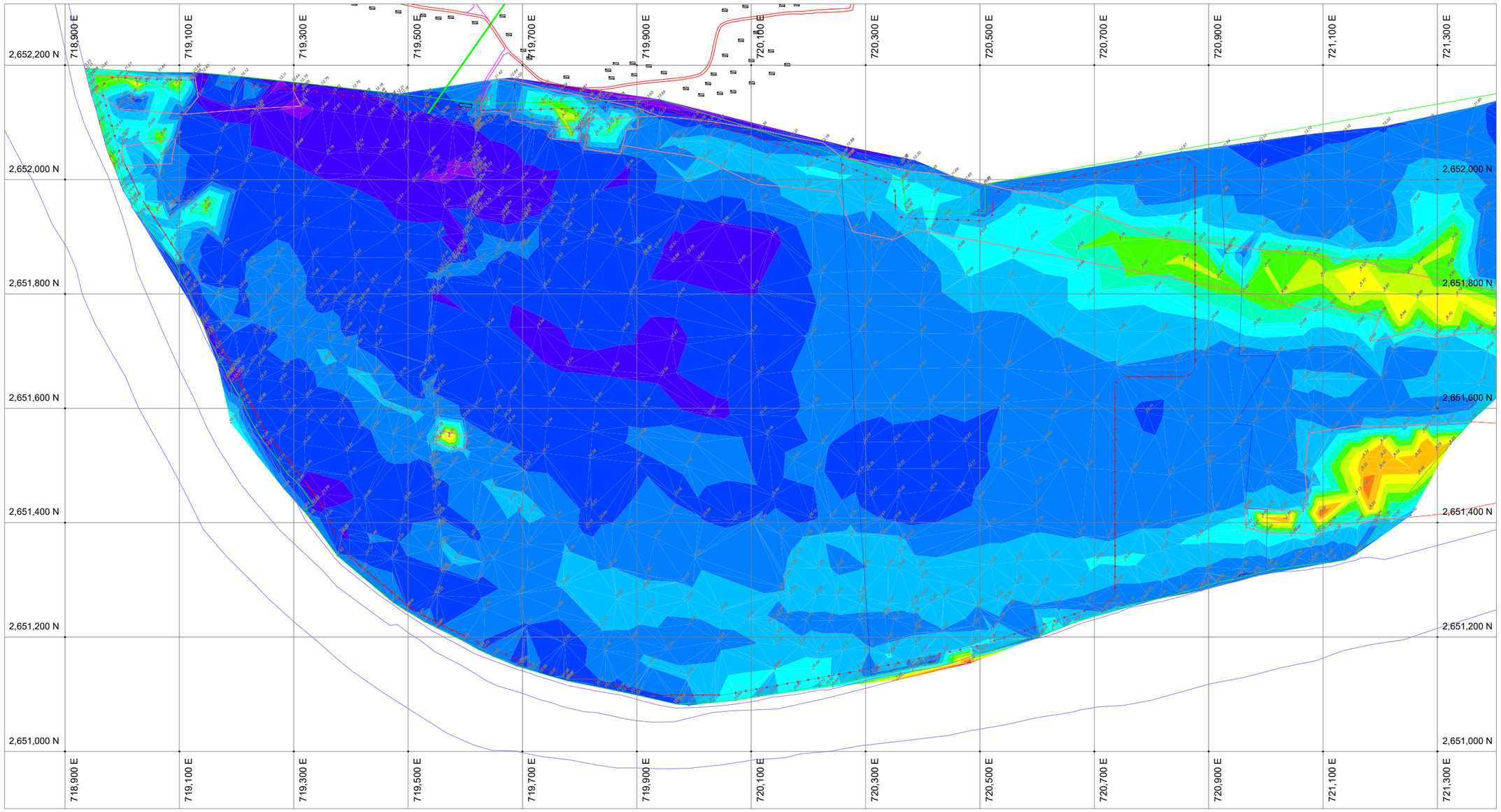
Gradient of the Padma River is less than 1:1000 (see plate 6-2 and 6-3), flow velocity is mild.

From the site visit, no erosion on the river bank in front of the project site has been observed from the flat slope bear river bank in front of the project site.
Erosion control is not required.

Plate 8-1: Flat slope of riverbank in front of project site (No bank erosion)

Figure 1

Topographic map



LEGEND

- COORDINATE LINE REFERENCE
- PROJECT BOUNDARY/FENCE
- BOUNDARY LINE
- ⊗ X.XXX GROUND LEVEL

Elevation Table

Number	Min. Depth (m.)	Max. Depth (m.)	Color
1	7.039	7.500	
2	7.500	8.000	
3	8.000	8.500	
4	8.500	9.000	
5	9.000	9.500	
6	9.500	10.000	
7	10.000	10.500	
8	10.500	11.000	
9	11.000	11.500	
10	11.500	12.000	
11	12.000	12.500	
12	12.500	13.000	
13	13.000	13.693	

REV	DATE	DESCRIPTION	DRAWN	CHECKED	APPROVED
0	Aug / 25 / 2022	PRELIMINARY	SUEBPHONG	WANAGORN	POOSIT ตีย.3489

PROJECT : 100MW (AC) SOLAR PARK, BHABANIPUR, PABNA.

OWNER : DYNAMIC SUN ENERGY PRIVATE LIMITED

CONTRACTOR :

EPC :

DESIGN : Infratech Energy Co., Ltd.
1032/217 Pahonyothin
18/1 RD. Jatujak District,
Bangkok 10900,Thailand
www.infratechenergy.com

DRAWING TITLE : KEY PLAN FOR TOPOGRAPHIC SURVEY

PROJECT DOCUMENT NO :

DRAWING NO : TP-1

SCALE : 1 : 7,500

PAPER : A3 (m.)

SHEET : 1 / 1

Figure 2

Data from the river gauge at Harding bridge station

39,Padma/ Ganges at 90 Hardinge Bridge station

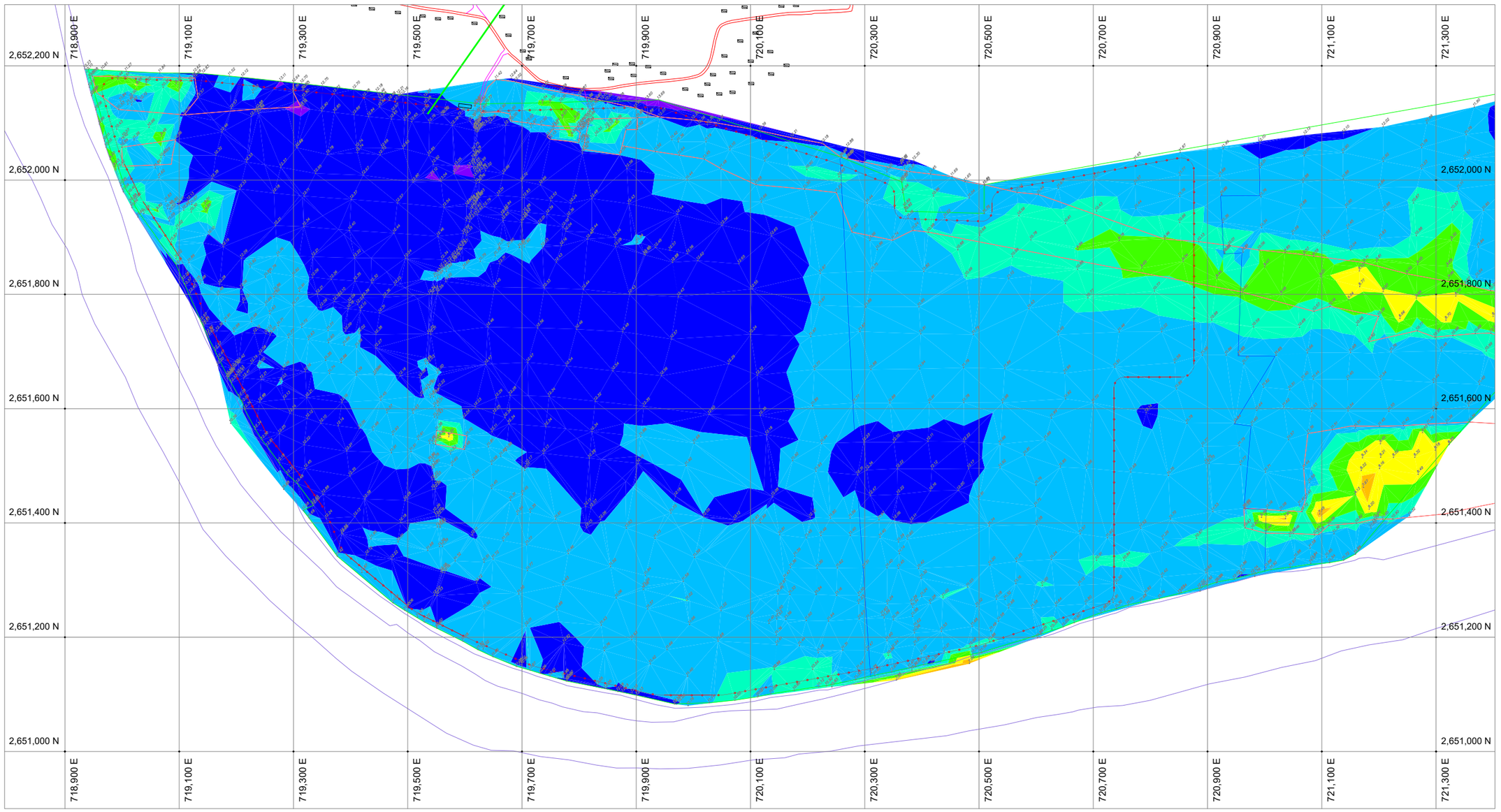
Recorded Maximum Discharge In Cusecs					Recorded Minimum Discharge In Cusecs					Remarks
Year	Discharge In Cusecs	Water Level M.W.L		Date & Year	Year	Discharge In Cusecs	Water Level M.W.L		Date & Year	
		(M)	(Ft)				(M)	(Ft)		
1	2	3	4	5	6	7	8	9	10	11
1972	1205352	13.26	43.49	6/9/1972	1972	73202	6.78	22.24	26/04/72	
1973	1585324	13.87	45.51	1/8/1973	1973	73825	6.52	21.39	2/5/1973	
1974	966772	12.74	41.80	26/09/1974	1974	67174	6.75	22.15	21/03/74	
1975	1752437	14.08	46.20	1/8/1975	1975	49865	6.17	20.23	5/5/1975	
1976	1814085	14.25	46.75	20/09/1976	1976	22888	5.03	16.5	29/03/1976	
1977	1734722	14.05	46.08	22/08/1977	1977	28159	6.23	20.43	21/03/1977	
1978	2027121	14.60	47.90	24/08/1978	1978	42844	6.19	20.30	25/03/1978	
1979	1288530	13.60	44.62	1/8/1979	1979	40223	6.23	20.45	6/4/1979	
1980	2050262	14.84	48.70	20/08/1980	1980	30567	6.22	20.4	5/5/1980	
1981	1899813	14.01	45.98	6/8/1981	1981	31141	6.13	20.12	8/4/1981	
1982	2129287	14.60	47.90	8/9/1982	1982	41197	5.86	19.23	29/03/1982	
1983	2042261	14.69	48.18	20/09/1983	1983	24733	5.38	17.65	8/4/1983	
1984	1992069	14.48	47.52	17/09/1984	1984	31354	6.07	19.91	4/4/1984	
1985	1691925	13.98	45.88	23/10/1985	1985	24345	5.68	18.63	6/4/1985	
1986	1799424	14.11	46.29	7/8/1986	1986	40134	5.99	19.65	6/4/1986	
1987	2685118	14.80	48.57	19/09/1987	1987	30517	5.86	19.23	19/03/1987	
1988	2484918	14.87	48.77	2/9/1988	1988	31413	6.26	20.54	2/4/1988	
1989	1116147	13.19	43.27	8/9/1989	1989	15478	5.49	18.01	27/3/1989	
1990	1761470	13.95	45.77	20/08/1990	1990	19739	5.00	16.41	14/02/1990	
1991	1944222	14.62	47.98	14/09/1991	1991	18633	5.06	16.60	1/4/1991	
1992	1474385	13.67	44.86	21/09/1992	1992	13521	4.76	15.63	28/09/1992	
1993	1579445	13.74	45.09	22/09/1993	**1993**	**9218**	**4.24**	**13.91**	**30/03/1993**	
1994	1615018	14.22	46.64	19/08/1994	1994	14338	4.90	16.09	21/04/1994	
1995	1718239	13.76	45.13	18/08/1995	1995	12825	4.65	15.26	26/04/1995	
1996	1924221	14.50	47.56	4/9/1996	1996	14696	4.69	15.39	18/04/1996	
1997	1409644	13.73	45.05	8/9/1997	1997	6457	5.19	17.04	27/03/1997	
1998	**2581199**	**15.19**	**49.84**	**10/9/1998**	1998	36631	5.21	17.09	29/03/1998	

Harding's bridge : D.2 = 14.25

Recorded Maximum Discharge In Cusecs					Recorded Minimum Discharge In Cusecs					Remarks
Year	Discharge In Cusecs	Water Level M.W.L		Date & Year	Year	Discharge In Cusecs	Water Level M.W.L		Date & Year	
		(M)	(Ft)				(M)	(Ft)		
	2	3	4	5	6	7	8	9	10	11
1999	2158530	12.93	42.41	29/09/1999	1999	27749	5.06	16.60	20/04/1999	
2000	2130219	14.19	46.57	24/09/2000	2000	33712	5.33	17.50	25/08/2000	
2001	1886078	13.90	45.60	31/08/2001	2001	20522	4.71	15.44	21/04/2001	
2002	1447224	13.23	43.42	26/08/2002	2002	32267	5.28	17.31	31/03/2002	
2003	2114493	14.28	46.85	20/09/2003	2003	31737	5.55	18.21	20/04/2003	
2004	1331569	13.61	44.65	26/07/2004	2004	31670	5.71	18.73	29/03/2004	
2005	1540427	13.76	45.14	31/08/2005	2005	23379	5.31	17.42	30/03/2005	Bhobaneswar, Pabna
2006	1315625	13.34	43.77	1/9/2006	2006	20049	4.86	15.94	20/04/2006	
2007	1914650	14.00	45.93	6/8/2007	2007	40415	5.73	18.80	28/03/2007	D.2 = 13.25 m (PWD)
2008	1785593	13.83	45.37	3/9/2008	2008	18353	5.36	17.59	21/04/2008	
2009	1363177	13.36	43.83	27/08/2009	2009	20490	5.64	18.5	22/04/2009	
2010	1422320	13.69	44.91	7/9/2010	2010	13849	4.73	15.52	2/4/2010	
2011	1719289	13.78	45.21	2/10/2011	2011	27050	5.30	17.39	20/04/2011	
2012	1563568	13.56	44.49	27/09/2012	2012	34197	5.15	16.90	28/03/2012	
2013	1914952	14.13	46.36	8/9/2013	2013	32894	5.38	17.65	16/04/2013	
2014	1533069	13.31	43.67	23/08/2014	2014	48923	5.41	17.75	14/5/2014	
2015	1648455	13.75	45.11	28/08/2015	2015	47103	4.92	16.14	12/3/2015	
2016	1982374	14.16	46.46	27/08/2016	2016	15394	4.26	13.98	28/03/2016	
2017	1731646	13.845	45.42	21/08/2017	2017	26012	4.76	15.62	29/03/2017	
2018	1429509	13.450	44.13	10/9/2018	2018	33004	4.46	14.63	17/04/2018	
2019	1992601	14.330	47.01	3/10/2019	2019	31217	4.56	14.96	3/4/2019	
2020	1600623	13.500	44.29	29/07/2020	2020	48009	5.34	17.52	4/3/2020	
2021	1991470	14.200	46.59	21/08/2021	2021	20623	4.13	13.55	9/5/2021	

Figure 3

Flood depth on-site from 100 years ARI with the effect of climate change



LEGEND	
	COORDINATE LINE REFERENCE
	PROJECT BOUNDARY/FENCE
	BOUNDARY LINE
⊗ X.XXX	GROUND LEVEL

FLOOD DEPTH Table
From Flood EL.15.04 m.

Number	Min. Depth cut/fill (m.)	Max. Depth cut/fill (m.)	Color
1	1.000	2.000	
2	2.000	3.000	
3	3.000	4.000	
4	4.000	5.000	
5	5.000	6.000	
6	6.000	7.000	
7	7.000	8.000	
8	8.000	9.000	

REV	DATE	DESCRIPTION	DRAWN	CHECKED	APPROVED
0	Aug / 25 / 2022	PRELIMINARY	SUEBPHONG	WANAGORN	POOSIT ลต.3489

PROJECT :
100MW (AC) SOLAR PARK,
BHABANIPUR, PABNA.

OWNER :
DYNAMIC SUN ENERGY
PRIVATE LIMITED

CONTRACTOR :

EPC :

DESIGN :
Infratech Energy Co., Ltd.
1032/217 Pahonyothin
18/1 RD. Jatujak District,
Bangkok 10900,Thailand
www.infratechenergy.com

DRAWING TITLE :
LAYOUT FOR FLOOD DEPTH

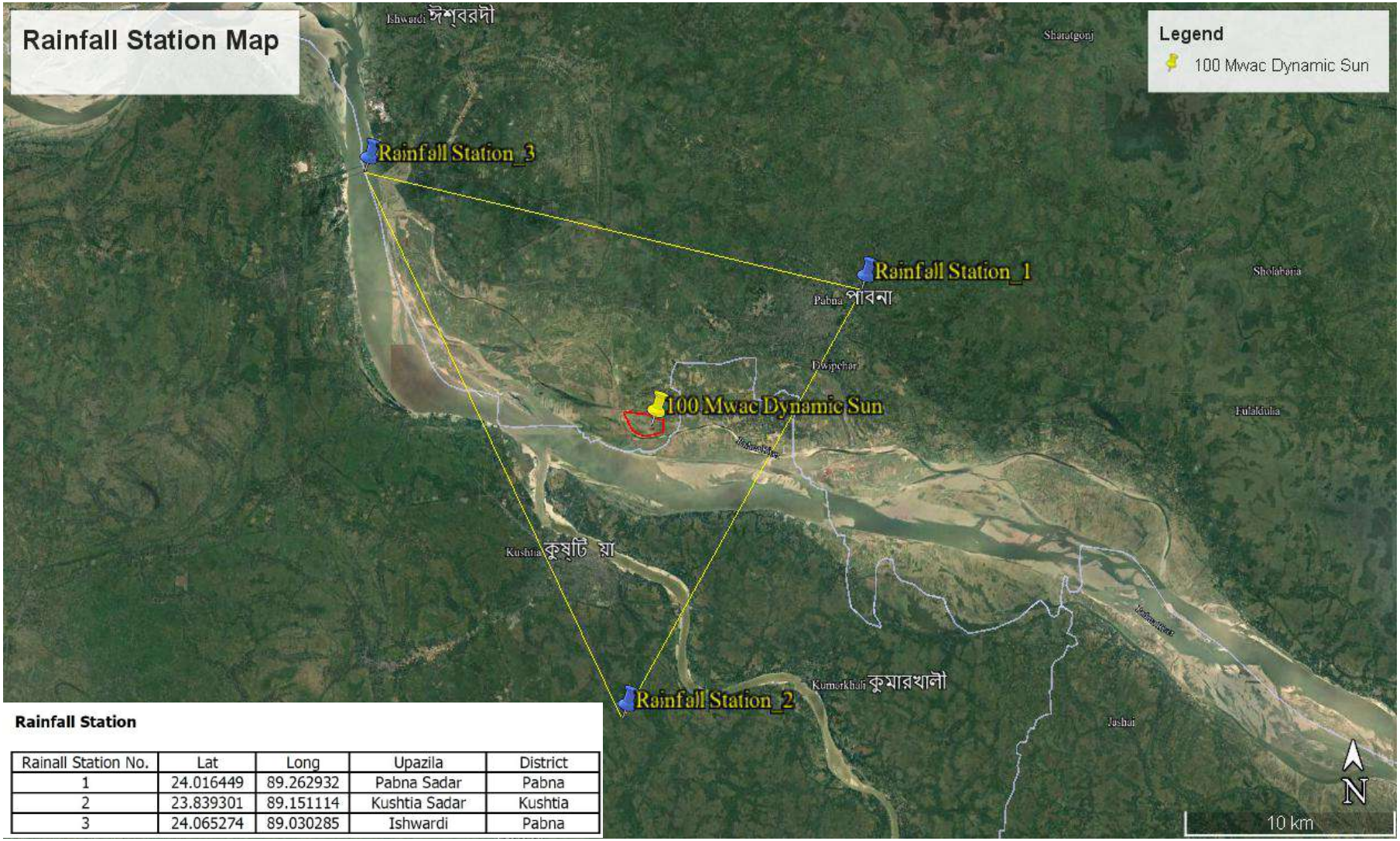
PROJECT DOCUMENT NO :

DRAWING NO :
FD-1

SCALE : 1 : 7,500
PAPER : A3 (m.)
SHEET : 1 / 1

Figure 4

Rainfall data from 3 rainfall stations covering the project site



Rainfall Station

Rainall Station No.	Lat	Long	Upazila	District
1	24.016449	89.262932	Pabna Sadar	Pabna
2	23.839301	89.151114	Kushtia Sadar	Kushtia
3	24.065274	89.030285	Ishwardi	Pabna

Station : 1 Lat : 24.016449
Duration : 2007-2021 Long: 89.262932

Year	Maximum Daily Rainfall
	mm
2007	126.90
2008	93.18
2009	96.63
2010	74.60
2011	121.09
2012	40.05
2013	61.23
2014	135.03
2015	176.40
2016	74.75
2017	78.28
2018	62.57
2019	43.90
2020	108.72
2021	74.82

Station : 2 Lat : 23.839301
Duration : 2007-2021 Long: 89.151114

Year	Maximum Daily Rainfall
	mm
2007	111.16
2008	96.59
2009	69.53
2010	52.43
2011	163.83
2012	51.61
2013	37.67
2014	74.95
2015	154.83
2016	52.98
2017	78.30
2018	53.22
2019	65.11
2020	113.46
2021	80.69

Station : 3 Lat : 24.065274
Duration : 2007-2021 Long: 89.030285

Year	Maximum Daily Rainfall
	mm
2007	104.89
2008	88.51
2009	64.58
2010	58.22
2011	152.25
2012	87.99
2013	42.86
2014	118.04
2015	189.62
2016	71.87
2017	64.68
2018	63.01
2019	116.16
2020	71.66
2021	76.44

Annex A

Flood Analysis from Padma river

Annex A-1

Flood level of Padma river by Gumbel method


Legend
100 Mwac Dynamic Sun
Damukdia
Paksey Babu Para
Hardinge Bridge Station
Ruppur রুপপুর
Tebunia
Farakpur
Pabna পাবনা
Dwipchar
Talbaria Station
100 Mwac Dynamic Sun
Mirpur মি রপুর
Barkhada
KUSHTIA DIVISION
Google Earth
Image © 2022 CNES / Airbus
Image © 2022 Maxar Technologies
N
6 km

Frequency Analysis of Maximum Annual Water Level of Hardinge Bridge station

Station : Hardinge Bridge
River: Ganges-Padma
District : Pabna
Country : Bangladesh

Year	WLmax (m)
1972	13.26
1973	13.87
1974	12.74
1975	14.08
1976	14.25
1977	14.05
1978	14.6
1979	13.6
1980	14.84
1981	14.01
1982	14.6
1983	14.69
1984	14.48
1985	13.98
1986	14.11
1987	14.8
1988	14.87
1989	13.19
1990	13.95
1991	14.62
1992	13.67
1993	13.74
1994	14.22
1995	13.76
1996	14.5
1997	13.73
1998	15.19
1999	12.93
2000	14.19
2001	13.9
2002	13.23
2003	14.28
2004	13.61
2005	13.76
2006	13.34
2007	14
2008	13.83
2009	13.36
2010	13.69
2011	13.78
2012	13.56
2013	14.13
2014	13.31
2015	13.75
2016	14.16
2017	13.845
2018	13.45
2019	14.33
2020	13.5
2021	14.2

Result of Gumbel Distribution Analysis

No.	Year	WLmax (m)	(Xi-X̄)	(Xi-X̄)^2
1	1972	13.26	-0.6907	0.4771
2	1973	13.87	-0.0807	0.0065
3	1974	12.74	-1.2107	1.4658
4	1975	14.08	0.1293	0.0167
5	1976	14.25	0.2993	0.0896
6	1977	14.05	0.0993	0.0099
7	1978	14.60	0.6493	0.4216
8	1979	13.60	-0.3507	0.1230
9	1980	14.84	0.8893	0.7909
10	1981	14.01	0.0593	0.0035
11	1982	14.60	0.6493	0.4216
12	1983	14.69	0.7393	0.5466
13	1984	14.48	0.5293	0.2802
14	1985	13.98	0.0293	0.0009
15	1986	14.11	0.1593	0.0254
16	1987	14.80	0.8493	0.7213
17	1988	14.87	0.9193	0.8451
18	1989	13.19	-0.7607	0.5787
19	1990	13.95	-0.0007	0.0000
20	1991	14.62	0.6693	0.4480
21	1992	13.67	-0.2807	0.0788
22	1993	13.74	-0.2107	0.0444
23	1994	14.22	0.2693	0.0725
24	1995	13.76	-0.1907	0.0364
25	1996	14.50	0.5493	0.3017
26	1997	13.73	-0.2207	0.0487
27	1998	15.19	1.2393	1.5359
28	1999	12.93	-1.0207	1.0418
29	2000	14.19	0.2393	0.0573
30	2001	13.90	-0.0507	0.0026
31	2002	13.23	-0.7207	0.5194
32	2003	14.28	0.3293	0.1084
33	2004	13.61	-0.3407	0.1161
34	2005	13.76	-0.1907	0.0364
35	2006	13.34	-0.6107	0.3730
36	2007	14.00	0.0493	0.0024
37	2008	13.83	-0.1207	0.0146
38	2009	13.36	-0.5907	0.3489
39	2010	13.69	-0.2607	0.0680
40	2011	13.78	-0.1707	0.0291
41	2012	13.56	-0.3907	0.1526
42	2013	14.13	0.1793	0.0321
43	2014	13.31	-0.6407	0.4105
44	2015	13.75	-0.2007	0.0403
45	2016	14.16	0.2093	0.0438
46	2017	13.85	-0.1057	0.0112
47	2018	13.45	-0.5007	0.2507
48	2019	14.33	0.3793	0.1439
49	2020	13.50	-0.4507	0.2031
50	2021	14.20	0.2493	0.0622
Sum		697.54	0.00	13.46
Average, X̄		13.9507		
Yn		0.5485		
Sn		1.1607		
Standard Deviation, Sd		0.5241		

Result of Peak Water Level Calculation using Gumbel Distribution Analysis

No.	$\bar{X}$	Sn	Yn	Sd	Tr	Yt	K	WLmax(design) m $XT = \bar{X} + K(Sd)$
1	13.9507	1.1607	0.5485	0.5241	2	0.3665	-0.1568	13.869
2	13.9507	1.1607	0.5485	0.5241	5	1.4999	0.8197	14.380
3	13.9507	1.1607	0.5485	0.5241	10	2.2504	1.4662	14.719
4	13.9507	1.1607	0.5485	0.5241	25	3.1985	2.2831	15.147
5	13.9507	1.1607	0.5485	0.5241	50	3.9019	2.8892	15.465
6	13.9507	1.1607	0.5485	0.5241	100	4.6001	3.4907	15.780

equation (1)

$$S.D. = \sqrt{\frac{\sum(x_i - \bar{x})^2}{(n-1)}}$$

where Sd = the standard deviation
n = the number of sample
Xi = the each value of the sample
$\bar{X}$ = the mean value of this sample.

$XT = \bar{X} + K(Sd)$ equation (2)

where XT = Gumbel's Distribution in reference to return period
$\bar{X}$ = the mean value
Sd = the standard deviation
K = the factor of frequency in Gumbel method

$$K = \frac{Y_T - \overline{Y_n}}{S_n}$$

equation (3)

where Y_T = the reduced variate which is calculated by using the equation (4)
the Sn and Yn value have been used from Gumbel's extreme value distribution chart that depends on the sample size.

$$Y_T = -\left[\text{Ln. Ln.}\left(\frac{T}{T-1}\right)\right]$$

equation (4)

where T = the predicted time period.

Table 1: Yn

N	0	1	2	3	4	5	6	7	8	9
10	0.4952	0.4996	0.5035	0.5070	0.5100	0.5128	0.5157	0.5181	0.5202	0.5220
20	0.5236	0.5252	0.5268	0.5283	0.5296	0.5039	0.5320	0.5332	0.5343	0.5353
30	0.5362	0.5371	0.5380	0.5388	0.5369	0.5402	0.5410	0.5418	0.5424	0.5430
40	0.5436	0.5442	0.5448	0.5453	0.5458	0.5463	0.5468	0.5473	0.5477	0.5481
50	0.5485	0.5489	0.5493	0.5497	0.5501	0.5504	0.5508	0.5511	0.5515	0.5518
60	0.5521	0.5524	0.5527	0.5530	0.5533	0.5535	0.5538	0.5540	0.5543	0.5545
70	0.5548	0.5550	0.5552	0.5555	0.5557	0.5559	0.5561	0.5563	0.5565	0.5567
80	0.5569	0.5570	0.5572	0.5574	0.5576	0.5578	0.5580	0.5581	0.5583	0.5585
90	0.5586	0.5587	0.5589	0.5591	0.5592	0.5593	0.5595	0.5596	0.5598	0.5599
100	0.5600									

Table 2: Sn

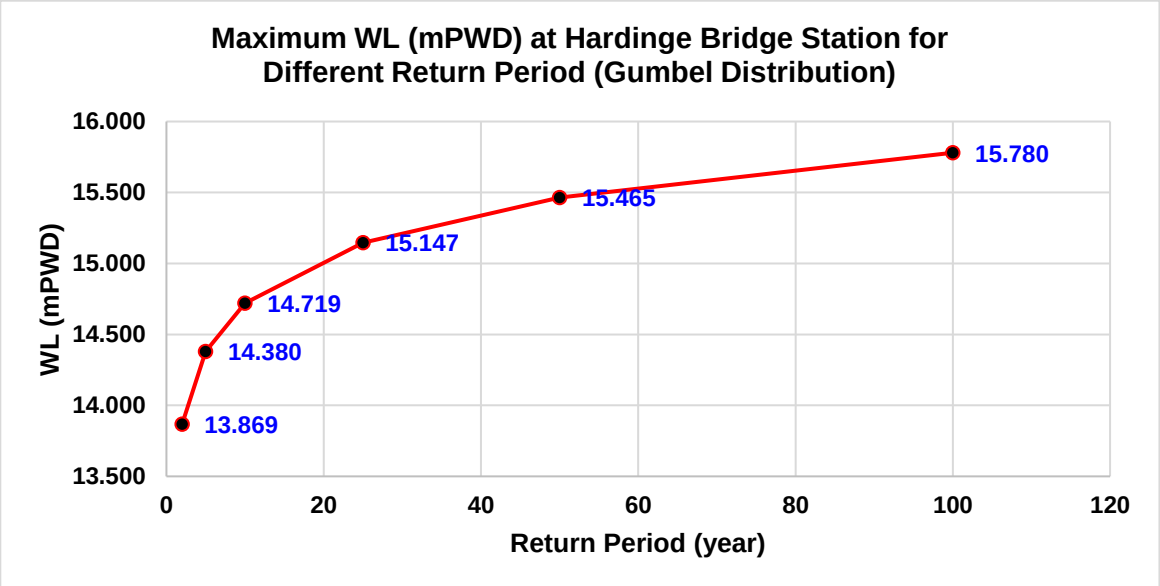
N	0	1	2	3	4	5	6	7	8	9
10	0.9496	0.9676	0.9833	0.9971	1.0095	1.0206	1.0316	1.0411	1.0493	1.0565
20	1.0628	1.0696	1.0754	1.0811	1.0864	1.9015	1.0961	1.1004	1.1047	1.1086
30	1.1124	1.1159	1.1193	1.1226	1.1255	1.1285	1.1313	1.1339	1.1363	1.1388
40	1.1413	1.1436	0.1458	1.1480	1.149	1.1519	1.1538	1.557	1.1574	1.1590
50	1.1607	1.1263	1.1638	1.1658	1.1667	1.1681	1.1696	1.1708	1.1721	1.1734
60	1.1747	1.1759	1.1770	1.1782	1.1793	1.1803	1.1814	1.1824	1.1834	1.1844
70	1.1854	1.1863	1.1873	1.1881	1.1890	1.1898	1.1906	1.1915	1.1923	1.1930
80	1.1938	1.1945	1.1953	1.1959	1.1967	1.1973	1.1980	1.1987	1.1994	1.2001
90	1.2007	1.2013	1.2020	1.2026	1.2032	1.2038	1.2044	1.2049	1.2055	1.2060
100	1.2065									

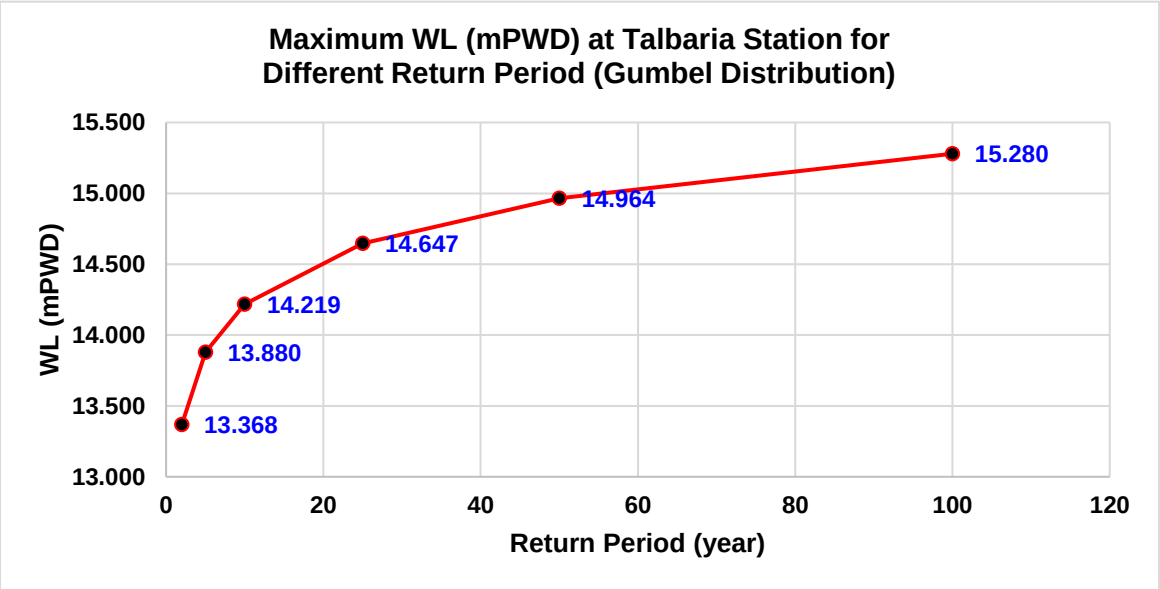
The design HWL at each ARI at the Talbaria station is calculated below.

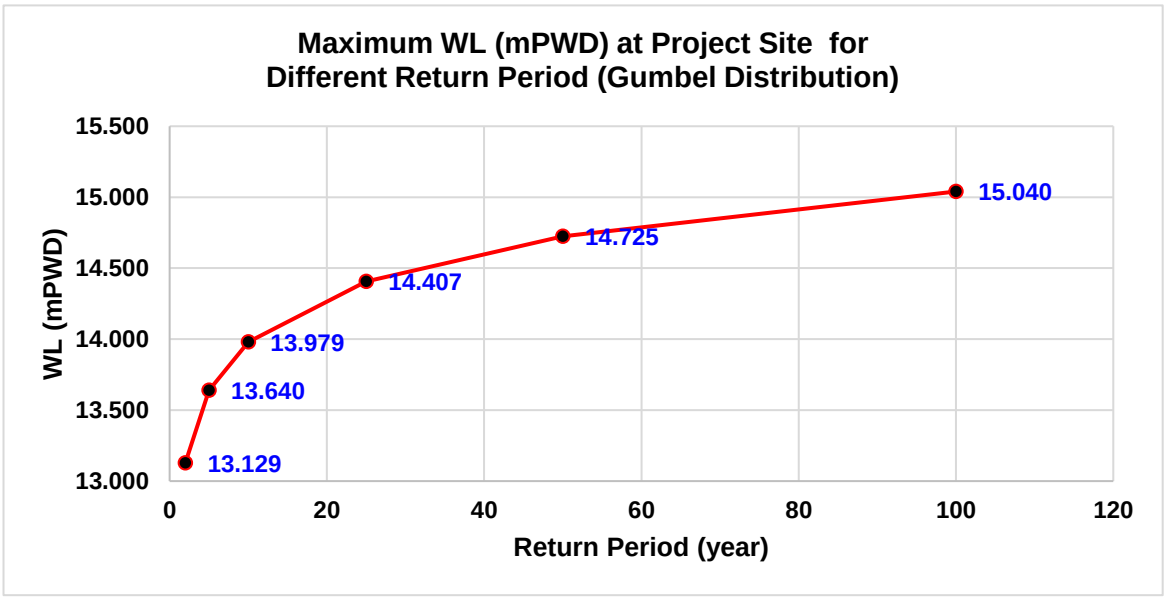
Hardinge Bridge station to Talbaria station	14300	m	14.3	km
Slope	0.000035	m/m		
Tr	WL(Max)_Hardinge Bridge	(Slope x L)	WL(Max)_Talbaria	
WL 2YR	13.869	0.501	13.368	
WL 5YR	14.380	0.501	13.880	
WL 10YR	14.719	0.501	14.219	
WL 25YR	15.147	0.501	14.647	
WL 50YR	15.465	0.501	14.964	
WL 100YR	15.780	0.501	15.280	

The design HWL at each ARI at the Project site is calculated below.

Talbaria station to Project site	6840	m	6.84	km
Slope	0.000035	m/m		
Tr	WL(Max)_Talbaria	(Slope x L)	WL(Max)_Site	
WL 2YR	13.368	0.239	13.129	
WL 5YR	13.880	0.239	13.640	
WL 10YR	14.219	0.239	13.979	
WL 25YR	14.647	0.239	14.407	
WL 50YR	14.964	0.239	14.725	
WL 100YR	15.280	0.239	15.040	




Maximum WL (mPWD) at Talbaria Station for
Different Return Period (Gumbel Distribution)
WL (mPWD)
15.500
15.000
14.500
14.000
13.500
13.000
0
20
40
60
80
100
120
Return Period (year)
15.280
14.964
14.647
14.219
13.880
13.368


Maximum WL (mPWD) at Project Site for
Different Return Period (Gumbel Distribution)
WL (mPWD)
15.500
15.000
14.500
14.000
13.500
13.000
0
20
40
60
80
100
120
Return Period (year)
15.040
14.725
14.407
13.979
13.640
13.129

Annex A-2

Flood level of Padma river by Log Pearson Type III method


Legend
100 Mwac Dynamic Sun
Damukdia
Paksey Babu Para
Hardinge Bridge Station
Ruppur রুপপুর
Tebunia
Farakpur
Pabna পাবনা
Dwipchar
Talbaria Station
100 Mwac Dynamic Sun
Mirpur মি রপুর
Barkhada
KUSHTIA DIVISION
Google Earth
Image © 2022 CNES / Airbus
Image © 2022 Maxar Technologies
N
6 km

Frequency Analysis of Maximum Annual Water Level of Hardinge Bridge station

Station : Hardinge Bridge River: Ganges-Padma
District : Pabna Country : Bangladesh

Year	WLmax (m)
1972	13.26
1973	13.87
1974	12.74
1975	14.08
1976	14.25
1977	14.05
1978	14.6
1979	13.6
1980	14.84
1981	14.01
1982	14.6
1983	14.69
1984	14.48
1985	13.98
1986	14.11
1987	14.8
1988	14.87
1989	13.19
1990	13.95
1991	14.62
1992	13.67
1993	13.74
1994	14.22
1995	13.76
1996	14.5
1997	13.73
1998	15.19
1999	12.93
2000	14.19
2001	13.9
2002	13.23
2003	14.28
2004	13.61
2005	13.76
2006	13.34
2007	14
2008	13.83
2009	13.36
2010	13.69
2011	13.78
2012	13.56
2013	14.13
2014	13.31
2015	13.75
2016	14.16
2017	13.845
2018	13.45
2019	14.33
2020	13.5
2021	14.2

Result of Log Pearson Type III Distribution Analysis

No.	Year	WLmax (m)	Log Y	Log $\bar{Y}$	Log Y-Log $\bar{Y}$	(Log Y-Log $\bar{Y}$)^2	(Log Y-Log $\bar{Y}$)^3
1	1972	13.26	1.1225	1.1443	-0.0218	0.0005	0.0000
2	1973	13.87	1.1421	1.1443	-0.0022	0.0000	0.0000
3	1974	12.74	1.1052	1.1443	-0.0391	0.0015	-0.0001
4	1975	14.08	1.1486	1.1443	0.0043	0.0000	0.0000
5	1976	14.25	1.1538	1.1443	0.0095	0.0001	0.0000
6	1977	14.05	1.1477	1.1443	0.0034	0.0000	0.0000
7	1978	14.60	1.1644	1.1443	0.0201	0.0004	0.0000
8	1979	13.60	1.1335	1.1443	-0.0108	0.0001	0.0000
9	1980	14.84	1.1714	1.1443	0.0271	0.0007	0.0000
10	1981	14.01	1.1464	1.1443	0.0021	0.0000	0.0000
11	1982	14.60	1.1644	1.1443	0.0201	0.0004	0.0000
12	1983	14.69	1.1670	1.1443	0.0227	0.0005	0.0000
13	1984	14.48	1.1608	1.1443	0.0165	0.0003	0.0000
14	1985	13.98	1.1455	1.1443	0.0012	0.0000	0.0000
15	1986	14.11	1.1495	1.1443	0.0052	0.0000	0.0000
16	1987	14.80	1.1703	1.1443	0.0260	0.0007	0.0000
17	1988	14.87	1.1723	1.1443	0.0280	0.0008	0.0000
18	1989	13.19	1.1202	1.1443	-0.0241	0.0006	0.0000
19	1990	13.95	1.1446	1.1443	0.0003	0.0000	0.0000
20	1991	14.62	1.1649	1.1443	0.0207	0.0004	0.0000
21	1992	13.67	1.1358	1.1443	-0.0085	0.0001	0.0000
22	1993	13.74	1.1380	1.1443	-0.0063	0.0000	0.0000
23	1994	14.22	1.1529	1.1443	0.0086	0.0001	0.0000
24	1995	13.76	1.1386	1.1443	-0.0057	0.0000	0.0000
25	1996	14.50	1.1614	1.1443	0.0171	0.0003	0.0000
26	1997	13.73	1.1377	1.1443	-0.0066	0.0000	0.0000
27	1998	15.19	1.1816	1.1443	0.0373	0.0014	0.0001
28	1999	12.93	1.1116	1.1443	-0.0327	0.0011	0.0000
29	2000	14.19	1.1520	1.1443	0.0077	0.0001	0.0000
30	2001	13.90	1.1430	1.1443	-0.0013	0.0000	0.0000
31	2002	13.23	1.1216	1.1443	-0.0227	0.0005	0.0000
32	2003	14.28	1.1547	1.1443	0.0104	0.0001	0.0000
33	2004	13.61	1.1339	1.1443	-0.0104	0.0001	0.0000
34	2005	13.76	1.1386	1.1443	-0.0057	0.0000	0.0000
35	2006	13.34	1.1252	1.1443	-0.0191	0.0004	0.0000
36	2007	14.00	1.1461	1.1443	0.0018	0.0000	0.0000
37	2008	13.83	1.1408	1.1443	-0.0035	0.0000	0.0000
38	2009	13.36	1.1258	1.1443	-0.0185	0.0003	0.0000
39	2010	13.69	1.1364	1.1443	-0.0079	0.0001	0.0000
40	2011	13.78	1.1392	1.1443	-0.0050	0.0000	0.0000
41	2012	13.56	1.1323	1.1443	-0.0120	0.0001	0.0000
42	2013	14.13	1.1501	1.1443	0.0058	0.0000	0.0000
43	2014	13.31	1.1242	1.1443	-0.0201	0.0004	0.0000
44	2015	13.75	1.1383	1.1443	-0.0060	0.0000	0.0000
45	2016	14.16	1.1511	1.1443	0.0068	0.0000	0.0000
46	2017	13.85	1.1413	1.1443	-0.0030	0.0000	0.0000
47	2018	13.45	1.1287	1.1443	-0.0156	0.0002	0.0000
48	2019	14.33	1.1562	1.1443	0.0120	0.0001	0.0000
49	2020	13.50	1.1303	1.1443	-0.0140	0.0002	0.0000
50	2021	14.20	1.1523	1.1443	0.0080	0.0001	0.0000
Sum			57.2148	57.2148	0.0000	0.0130	0.0000
Average, $\bar{Y}$			1.1443				
Coefficient of skew, Cw			-0.0094				
Standard Deviation, Sd			0.0163				

Result of Peak Water Level Calculation using Log Pearson Type III Distribution Analysis

No.	Tr	Log $\bar{Y}$	Sd	P %	K	$Y_T = \bar{Y} + K(Sd)$	WLmax(design) m $XT= 10^{YT}$
1	2	1.1443	0.0163	50	0.0016	1.1443	13.942
2	5	1.1443	0.0163	20	0.8424	1.1580	14.389
3	10	1.1443	0.0163	10	1.2809	1.1652	14.628
4	25	1.1443	0.0163	4	1.7477	1.1728	14.887
5	50	1.1443	0.0163	2	2.0489	1.1777	15.056
6	100	1.1443	0.0163	1	2.3191	1.1821	15.210

$$Sd = \sqrt{\frac{\sum(\text{Log } Y - \text{Log } \bar{Y})^2}{n-1}}$$ equation (1)

where Sd = standard deviation (in the log form)
n = the number of sample
Log Y= the each value of the sample (in the log form)
Log $\bar{Y}$ = the mean value of this sample (in the log form)

$$YT = \bar{Y} + K(Sd)$$ equation (2)

where YT = the predicted value of log X
$\bar{Y}$ = average of the logarithms of X
Sd = standard deviation of the logarithms.
K = the factor of frequency in Log Pearson Type III method
function of the skewness coefficient and return period and can be found using the frequency factor table.

$$XT= 10^{YT}$$ equation (3)

where XT = the computed peak water level for log-Pearson Type III.

Table 1. Frequency Factors K for Gamma and log-Pearson Type III Distributions

WEIGHTED SKEW COEFFICIENT	Recurrence Interval In Years							
	1.0101	2	5	10	25	50	100	200
	Percent Chance (>=) = 1-F							
Cw	99	50	20	10	4	2	1	0.5
3	-0.667	-0.396	0.42	1.18	2.278	3.152	4.051	4.97
2.9	-0.69	-0.39	0.44	1.195	2.277	3.134	4.013	4.904
2.8	-0.714	-0.384	0.46	1.21	2.275	3.114	3.973	4.847
2.7	-0.74	-0.376	0.479	1.224	2.272	3.093	3.932	4.783
2.6	-0.769	-0.368	0.499	1.238	2.267	3.071	3.889	4.718
2.5	-0.799	-0.36	0.518	1.25	2.262	3.048	3.845	4.652
2.4	-0.832	-0.351	0.537	1.262	2.256	3.023	3.8	4.584
2.3	-0.867	-0.341	0.555	1.274	2.248	2.997	3.753	4.515
2.2	-0.905	-0.33	0.574	1.284	2.24	2.97	3.705	4.444
2.1	-0.946	-0.319	0.592	1.294	2.23	2.942	3.656	4.372
2	-0.99	-0.307	0.609	1.302	2.219	2.912	3.605	4.298
1.9	-1.037	-0.294	0.627	1.31	2.207	2.881	3.553	4.223
1.8	-1.087	-0.282	0.643	1.318	2.193	2.848	3.499	4.147
1.7	-1.14	-0.268	0.66	1.324	2.179	2.815	3.444	4.069
1.6	-1.197	-0.254	0.675	1.329	2.163	2.78	3.388	3.99
1.5	-1.256	-0.24	0.69	1.333	2.146	2.743	3.33	3.91
1.4	-1.318	-0.225	0.705	1.337	2.128	2.706	3.271	3.828
1.3	-1.383	-0.21	0.719	1.339	2.108	2.666	3.211	3.745
1.2	-1.449	-0.195	0.732	1.34	2.087	2.626	3.149	3.661
1.1	-1.518	-0.18	0.745	1.341	2.066	2.585	3.087	3.575
1	-1.588	-0.164	0.758	1.34	2.043	2.542	3.022	3.489
0.9	-1.66	-0.148	0.769	1.339	2.018	2.498	2.957	3.401
0.8	-1.733	-0.132	0.78	1.336	1.993	2.453	2.891	3.312
0.7	-1.806	-0.116	0.79	1.333	1.967	2.407	2.824	3.223
0.6	-1.88	-0.099	0.8	1.328	1.939	2.359	2.755	3.132
0.5	-1.955	-0.083	0.808	1.323	1.91	2.311	2.686	3.041
0.4	-2.029	-0.066	0.816	1.317	1.88	2.261	2.615	2.949
0.3	-2.104	-0.05	0.824	1.309	1.849	2.211	2.544	2.856
0.2	-2.178	-0.033	0.83	1.301	1.818	2.159	2.472	2.763
0.1	-2.252	-0.017	0.836	1.292	1.785	2.107	2.4	2.67
0	-2.326	0	0.842	1.282	1.751	2.054	2.326	2.576
-0.1	-2.4	0.017	0.846	1.27	1.716	2	2.252	2.482
-0.2	-2.472	0.033	0.85	1.258	1.68	1.945	2.178	2.388
-0.3	-2.544	0.05	0.853	1.245	1.643	1.89	2.104	2.294

Table 1. Frequency Factors K for Gamma and log-Pearson Type III Distributions (Con.)

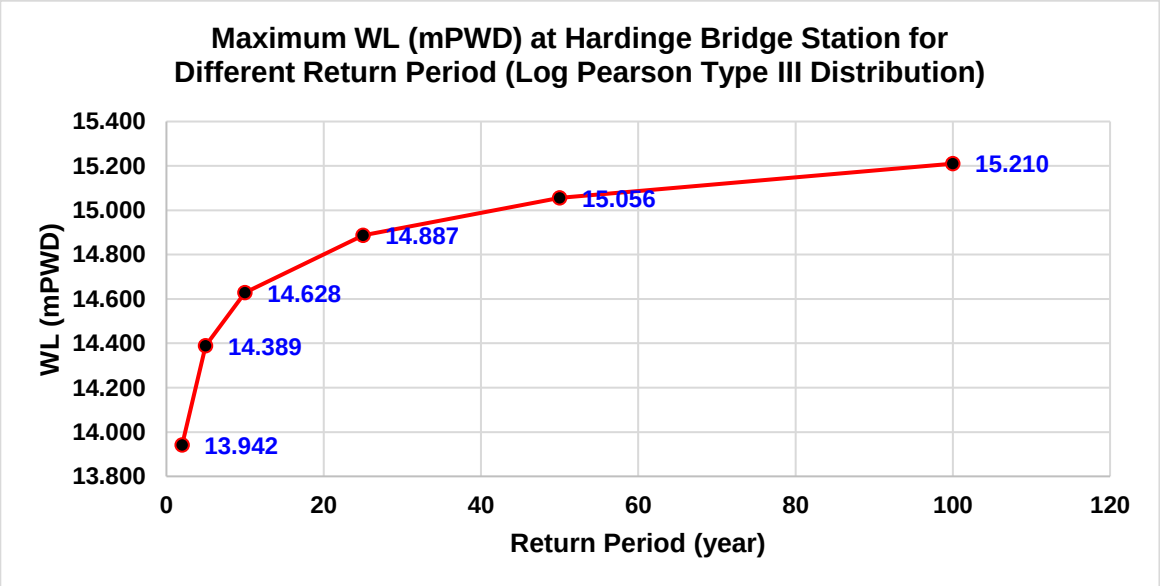
WEIGHTED SKEW COEFFICIENT Cw	Recurrence Interval In Years							
	1.0101	2	5	10	25	50	100	200
	Percent Chance (>=) = 1-F							
	99	50	20	10	4	2	1	0.5
-0.4	-2.615	0.066	0.855	1.231	1.606	1.834	2.029	2.201
-0.5	-2.686	0.083	0.856	1.216	1.567	1.777	1.955	2.108
-0.6	-2.755	0.099	0.857	1.2	1.528	1.72	1.88	2.016
-0.7	-2.824	0.116	0.857	1.183	1.488	1.663	1.806	1.926
-0.8	-2.891	0.132	0.856	1.166	1.448	1.606	1.733	1.837
-0.9	-2.957	0.148	0.854	1.147	1.407	1.549	1.66	1.749
-1	-3.022	0.164	0.852	1.128	1.366	1.492	1.588	1.664
-1.1	-3.087	0.18	0.848	1.107	1.324	1.435	1.518	1.581
-1.2	-3.149	0.195	0.844	1.086	1.282	1.379	1.449	1.501
-1.3	-3.211	0.21	0.838	1.064	1.24	1.324	1.383	1.424
-1.4	-3.271	0.225	0.832	1.041	1.198	1.27	1.318	1.351
-1.5	-3.33	0.24	0.825	1.018	1.157	1.217	1.256	1.282
-1.6	-3.88	0.254	0.817	0.994	1.116	1.166	1.197	1.216
-1.7	-3.444	0.268	0.808	0.97	1.075	1.116	1.14	1.155
-1.8	-3.499	0.282	0.799	0.945	1.035	1.069	1.087	1.097
-1.9	-3.553	0.294	0.788	0.92	0.996	1.023	1.037	1.044
-2	-3.605	0.307	0.777	0.895	0.959	0.98	0.99	0.995
-2.1	-3.656	0.319	0.765	0.869	0.923	0.939	0.946	0.949
-2.2	-3.705	0.33	0.752	0.844	0.888	0.9	0.905	0.907
-2.3	-3.753	0.341	0.739	0.819	0.855	0.864	0.867	0.869
-2.4	-3.8	0.351	0.725	0.795	0.823	0.83	0.832	0.833
-2.5	-3.845	0.36	0.711	0.711	0.793	0.798	0.799	0.8
-2.6	-3.899	0.368	0.696	0.747	0.764	0.768	0.769	0.769
-2.7	-3.932	0.376	0.681	0.724	0.738	0.74	0.74	0.741
-2.8	-3.973	0.384	0.666	0.702	0.712	0.714	0.714	0.714
-2.9	-4.013	0.39	0.651	0.681	0.683	0.689	0.69	0.69
-3	-4.051	0.396	0.636	0.66	0.666	0.666	0.667	0.667

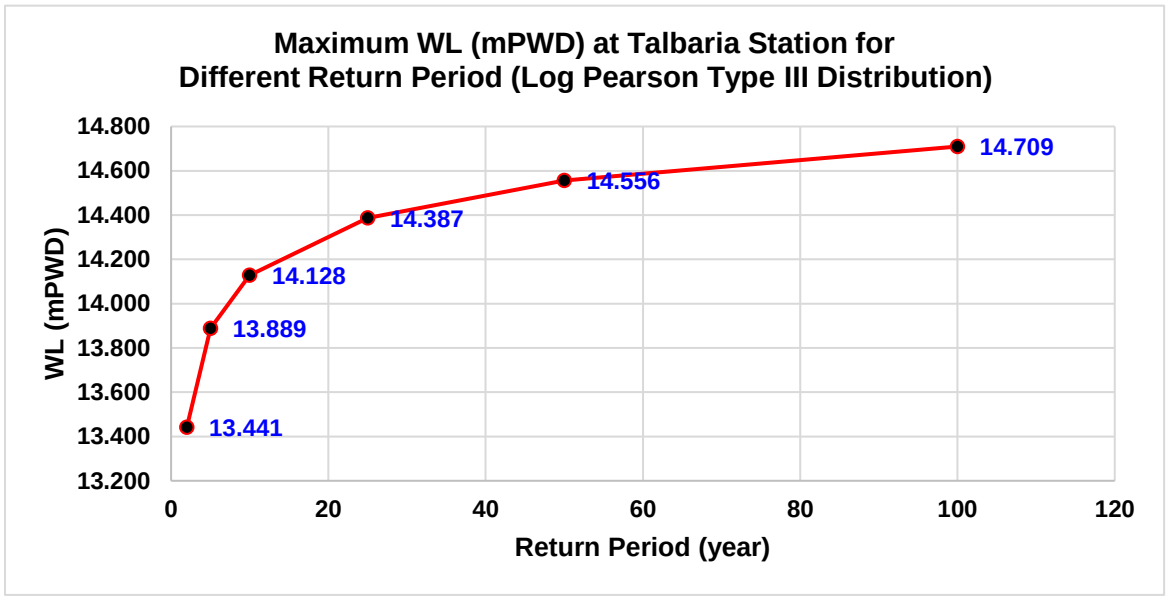
The design HWL at each ARI at the Talbaria station is calculated below.

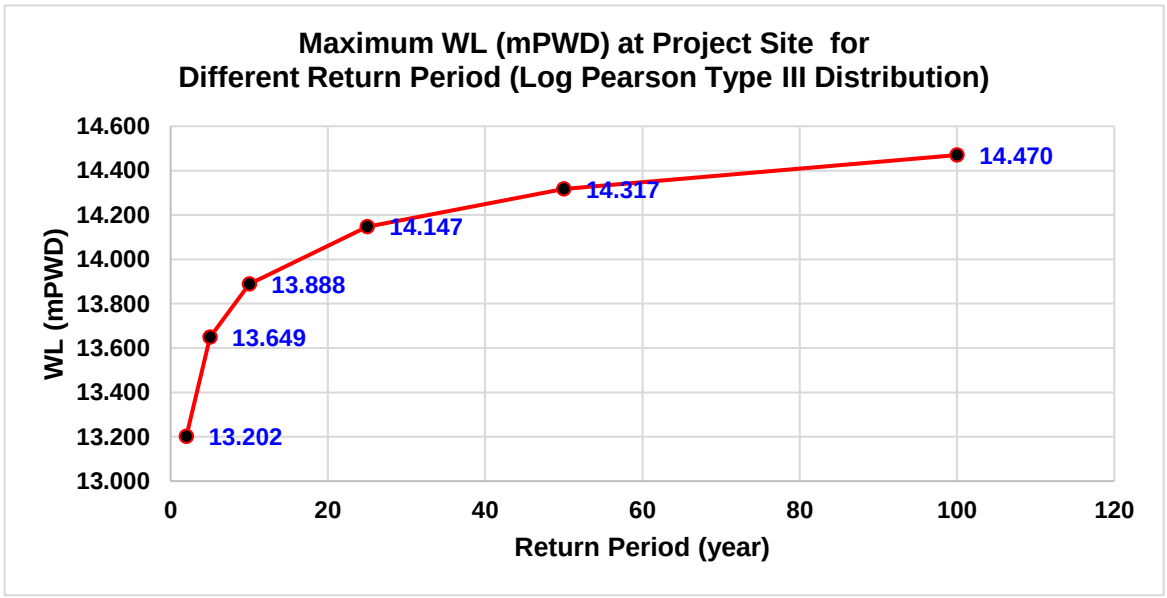
Hardinge Bridge station to Talbaria station	14300	m	14.3	km
Slope	0.000035	m/m		
Tr	WL(Max)_Hardinge Bridge	(Slope x L)	WL(Max)_Talbaria	
WL 2YR	13.942	0.501	13.441	
WL 5YR	14.389	0.501	13.889	
WL 10YR	14.628	0.501	14.128	
WL 25YR	14.887	0.501	14.387	
WL 50YR	15.056	0.501	14.556	
WL 100YR	15.210	0.501	14.709	

The design HWL at each ARI at the Project site is calculated below.

Talbaria station to Project site	6840	m	6.84	km
Slope	0.000035	m/m		
Tr	WL(Max)_Talbaria	(Slope x L)	WL(Max)_Site	
WL 2YR	13.441	0.239	13.202	
WL 5YR	13.889	0.239	13.649	
WL 10YR	14.128	0.239	13.888	
WL 25YR	14.387	0.239	14.147	
WL 50YR	14.556	0.239	14.317	
WL 100YR	14.709	0.239	14.470	




Maximum WL (mPWD) at Talbaria Station for
Different Return Period (Log Pearson Type III Distribution)
WL (mPWD)
14.800
14.600
14.400
14.200
14.000
13.800
13.600
13.400
13.200
0
20
40
60
80
100
120
Return Period (year)
14.709
14.556
14.387
14.128
13.889
13.441


Maximum WL (mPWD) at Project Site for
Different Return Period (Log Pearson Type III Distribution)
WL (mPWD)
14.600
14.400
14.200
14.000
13.800
13.600
13.400
13.200
13.000
0
20
40
60
80
100
120
Return Period (year)
14.470
14.317
14.147
13.888
13.649
13.202

Annex B

Hydraulic Modeling
25, 50, 100 Year ARI from Overtopping of Padma River

(Pre Development Stage)

Annex B-1

Hydraulic Modeling set up from Overtopping of Padma river

1. MODEL SET UP

To assess the flood risk for this Solar Plant site under existing conditions 2-dimensional hydraulic models were set up using HEC-RAS 5.0.7 (USACE 2019).

Terrain. The underlying terrain for the site area was provided as a spot elevation in CSV format under file name: "Coordinate _ RL.csv." spot elevation were converted to a 1-metre by 1-metre resolution raster grid digital elevation model in geotif format using Geohecras.

The underlying terrain for the outside area was provided as a SRTM elevation data at a 1-arc-second resolution (approximately 30-metres)

2D Flow Area. A two-dimensional (2D) flow area was delineated across the of project site . A computational mesh spacing of 30 metres was applied to the floodplain areas, with a mesh size of 1 metres by 1 metres applied to the channel areas.

Roughness. A range of Manning's roughness coefficients was applied to the model as a sensitivity analysis. Channel roughness values ranges from 0.035 to 0.05, and floodplain roughness ranges from 0.05 to 0.08. The higher values were selected for the baseline runs for additional conservatism and to account for shallow flow depths relative to the size of the roughness elements.

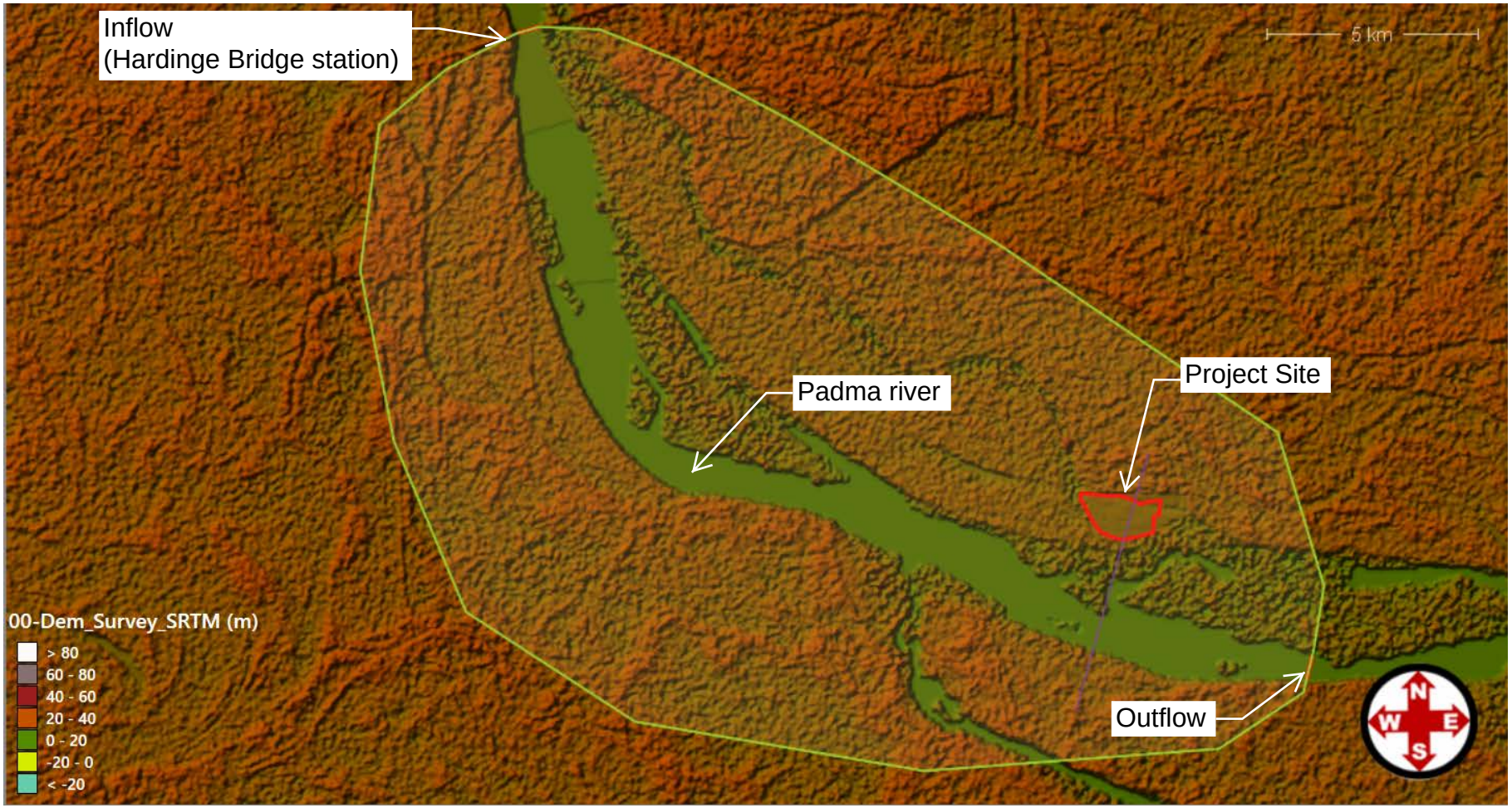
Inflow Boundary Condition. three inflow scenarios were applied as time series flow hydrographs based on available hydrologic analyses:

Q25(pre development stage) = 72,567.81 m3/s.
Q50(pre development stage) = 78,631.09 m3/s.
Q100(pre development stage) = 84,649.60 m3/s.

Outflow Boundary Condition. Normal depth slope :
slope = 0.000035

Computational time step. A variable time step was assigned based on a maximum Currant Number of 2.0. Using this option, HEC-RAS selected the time step based on the assigned computational mesh size and computed velocities. The adopted time step generally ranged between 0.5 and 1.0 seconds. Mass balance errors and water surface elevation convergence errors were checked to ensure model stability and that imbalances remained below reasonable thresholds, confirming compliance with Courant Number criteria.

Simulation window. 6 hrs simulation window was applied in the model runs. Peak discharge rates were converted to unsteady flow hydrographs in the 2D model, with a gradual increase to the peak flow, which is maintained until the maximum inundation extent is reached at all points in the model to simulated an extended, near-steady flow condition.



HEC-RAS 2D model schematic for Pre Development Stage

Annex B-2

Peak Discharge Calculation by Gumbel method

Frequency Analysis of Maximum Annual Discharge of Hardinge Bridge station

Station : Hardinge Bridge River: Ganges-Padma
District : Pabna Country : Bangladesh

Year	Qmax (cu ft/s)	Qmax (m3/s)
1972	1,205,352	34,135.57
1973	1,585,324	44,896.38
1974	966,772	27,378.98
1975	1,752,437	49,629.02
1976	1,814,085	51,374.89
1977	1,734,722	49,127.33
1978	2,027,121	57,408.07
1979	1,288,530	36,491.17
1980	2,050,262	58,063.42
1981	1,899,813	53,802.70
1982	2,129,287	60,301.41
1983	2,042,261	57,836.83
1984	1,992,069	56,415.39
1985	1,691,925	47,915.32
1986	1,799,424	50,959.69
1987	2,685,118	76,042.54
1988	2,484,918	70,372.88
1989	1,116,147	31,609.28
1990	1,761,470	49,884.83
1991	1,944,222	55,060.37
1992	1,474,385	41,754.58
1993	1,579,445	44,729.88
1994	1,615,018	45,737.31
1995	1,718,239	48,660.53
1996	1,924,221	54,493.94
1997	1,409,644	39,921.12
1998	2,581,199	73,099.56
1999	2,158,530	61,129.57
2000	2,130,219	60,327.80
2001	1,886,078	53,413.73
2002	1,447,224	40,985.38
2003	2,114,493	59,882.44
2004	1,331,569	37,710.03
2005	1,540,427	43,624.89
2006	1,315,625	37,258.50
2007	1,914,650	54,222.89
2008	1,785,593	50,567.99
2009	1,363,177	38,605.17
2010	1,422,320	40,280.10
2011	1,719,289	48,690.26
2012	1,563,568	44,280.25
2013	1,914,952	54,231.44
2014	1,533,069	43,416.51
2015	1,648,455	46,684.25
2016	1,982,374	56,140.83
2017	1,731,646	49,040.21
2018	1,429,509	40,483.69
2019	1,992,601	56,430.46
2020	1,600,623	45,329.64
2021	1,991,470	56,398.43

Result of Gumbel Distribution Analysis

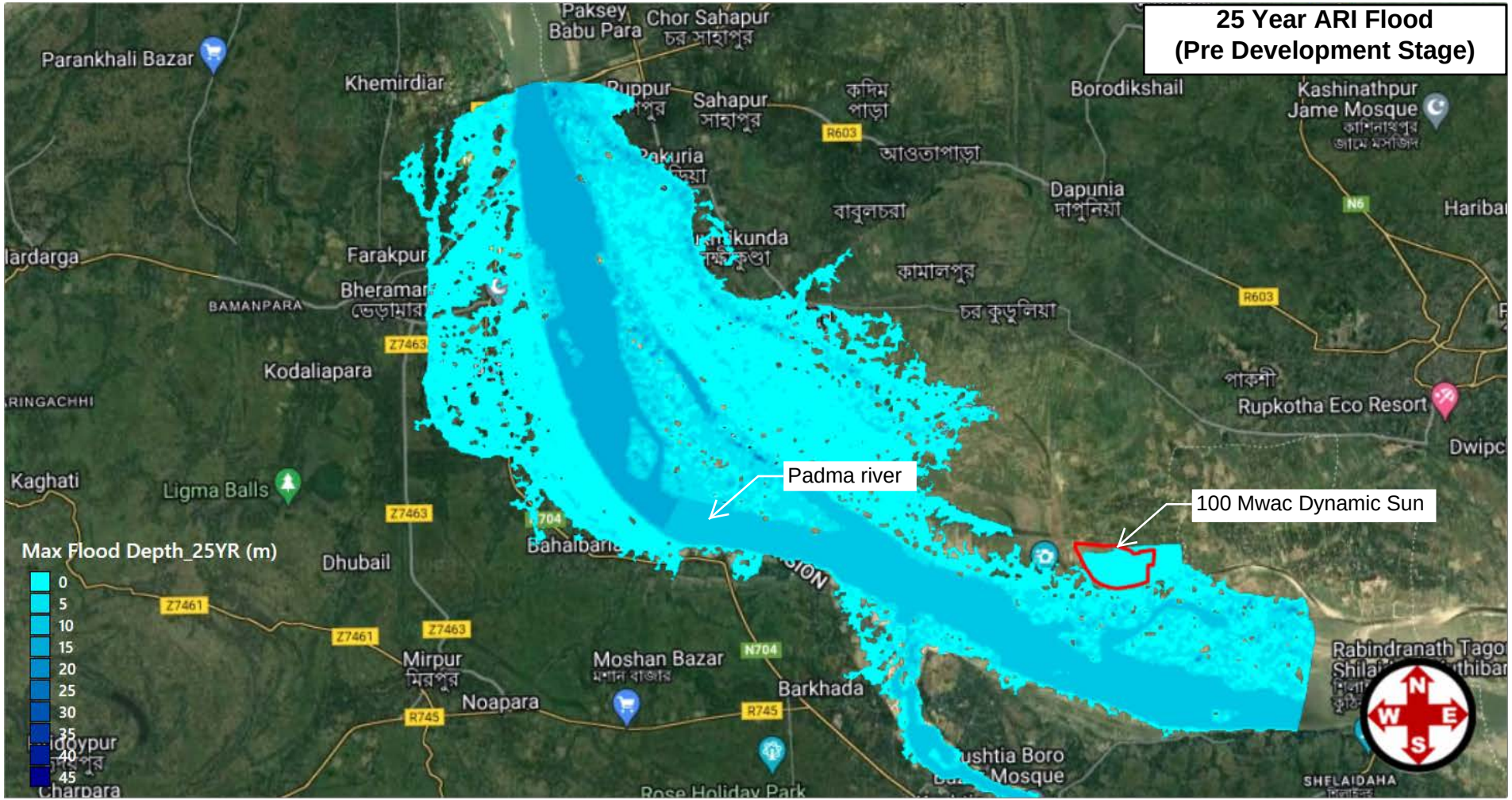
No.	Year	Qmax (m3/s)	(Xi-X̄)	(Xi-X̄)^2
1	1972	34135.57	-15589.1807	243022554.7227
2	1973	44896.38	-4828.3737	23313192.1465
3	1974	27378.98	-22345.7663	499333271.2839
4	1975	49629.02	-95.7335	9164.9020
5	1976	51374.89	1650.1379	2722954.9755
6	1977	49127.33	-597.4223	356913.3978
7	1978	57408.07	7683.3174	59033366.0479
8	1979	36491.17	-13233.5797	175127632.5867
9	1980	58063.42	8338.6705	69533425.8010
10	1981	53802.70	4077.9548	16629715.5596
11	1982	60301.41	10576.6585	111865705.1441
12	1983	57836.83	8112.0822	65805877.3859
13	1984	56415.39	6690.6447	44764727.1118
14	1985	47915.32	-1809.4333	3274048.9916
15	1986	50959.69	1234.9383	1525072.7174
16	1987	76042.54	26317.7924	692626198.1570
17	1988	70372.88	20648.1284	426345207.4801
18	1989	31609.28	-18115.4663	328170119.0635
19	1990	49884.83	160.0811	25625.9476
20	1991	55060.37	5335.6177	28468816.3003
21	1992	41754.58	-7970.1661	63523548.2099
22	1993	44729.88	-4994.8669	24948695.6924
23	1994	45737.31	-3987.4396	15899674.3595
24	1995	48660.53	-1064.2209	1132566.0269
25	1996	54493.94	4769.1894	22745167.3957
26	1997	39921.12	-9803.6313	96111185.7722
27	1998	73099.56	23374.8063	546381571.6943
28	1999	61129.57	11404.8203	130069925.2906
29	2000	60327.80	10603.0527	112424727.5260
30	2001	53413.73	3688.9796	13608570.6781
31	2002	40985.38	-8739.3657	76376512.0413
32	2003	59882.44	10157.6924	103178715.4131
33	2004	37710.03	-12014.7153	144353382.6443
34	2005	43624.89	-6099.8567	37208251.6922
35	2006	37258.50	-12466.2493	155407372.4674
36	2007	54222.89	4498.1387	20233251.4550
37	2008	50567.99	843.2444	711061.1613
38	2009	38605.17	-11119.5767	123644985.8626
39	2010	40280.10	-9444.6469	89201355.7155
40	2011	48690.26	-1034.4849	1070158.9140
41	2012	44280.25	-5444.5036	29642619.1717
42	2013	54231.44	4506.6913	20310266.5240
43	2014	43416.51	-6308.2353	39793832.0249
44	2015	46684.25	-3040.5037	9244662.9589
45	2016	56140.83	6416.0823	41166112.6655
46	2017	49040.21	-684.5346	468587.6383
47	2018	40483.69	-9241.0545	85397087.4292
48	2019	56430.46	6705.7110	44966559.8224
49	2020	45329.64	-4395.1060	19316956.5262
50	2021	56398.43	6673.6811	44538018.9653
Sum		2486237.47	0.00	4905028973.46
Average, X̄		49724.7493		
Yn		0.5485		
Sn		1.1607		
Standard Deviation, Sd		10005.1303		

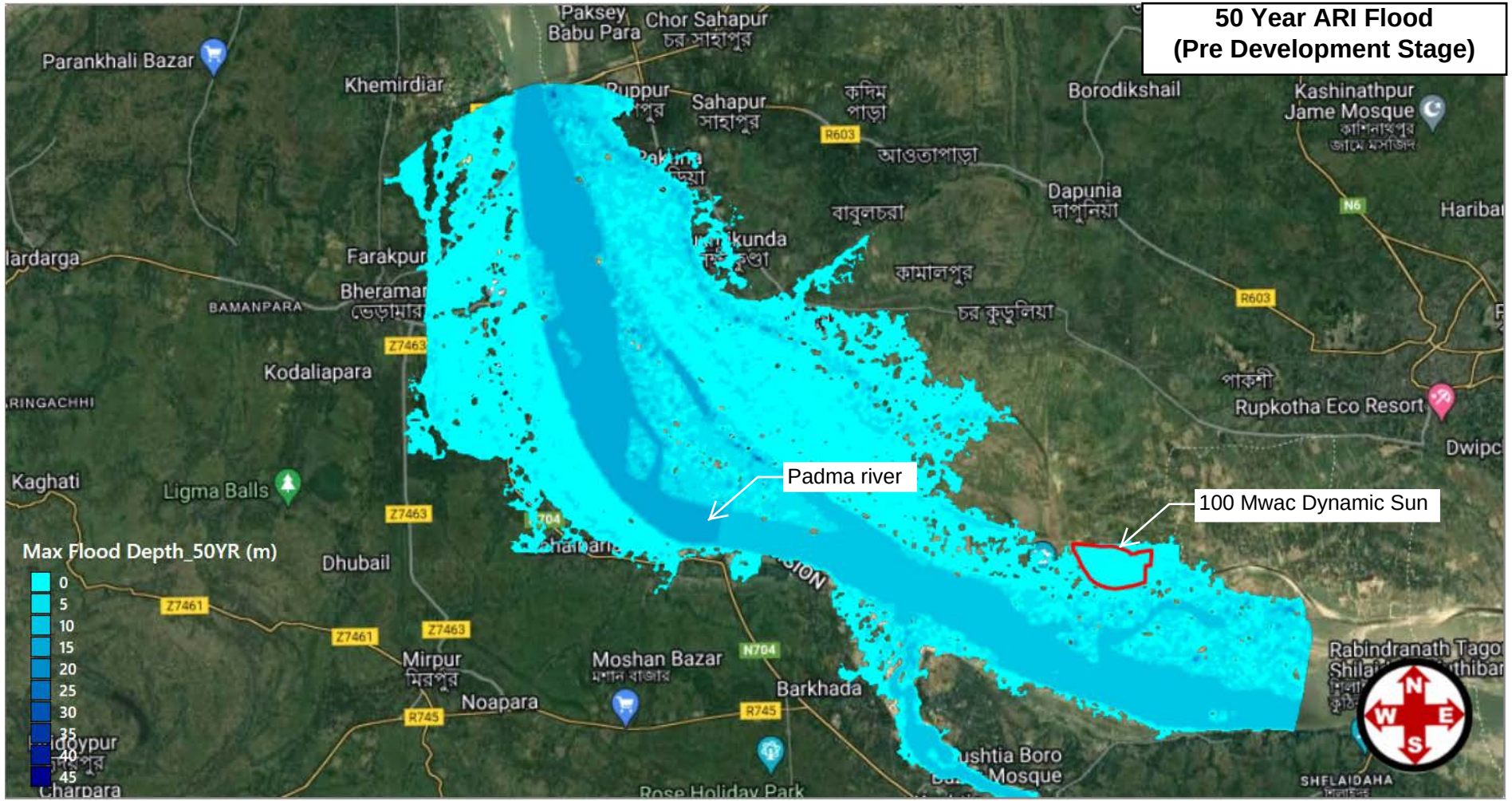
Result of Peak Discharge Calculation using Gumbel Distribution Analysis

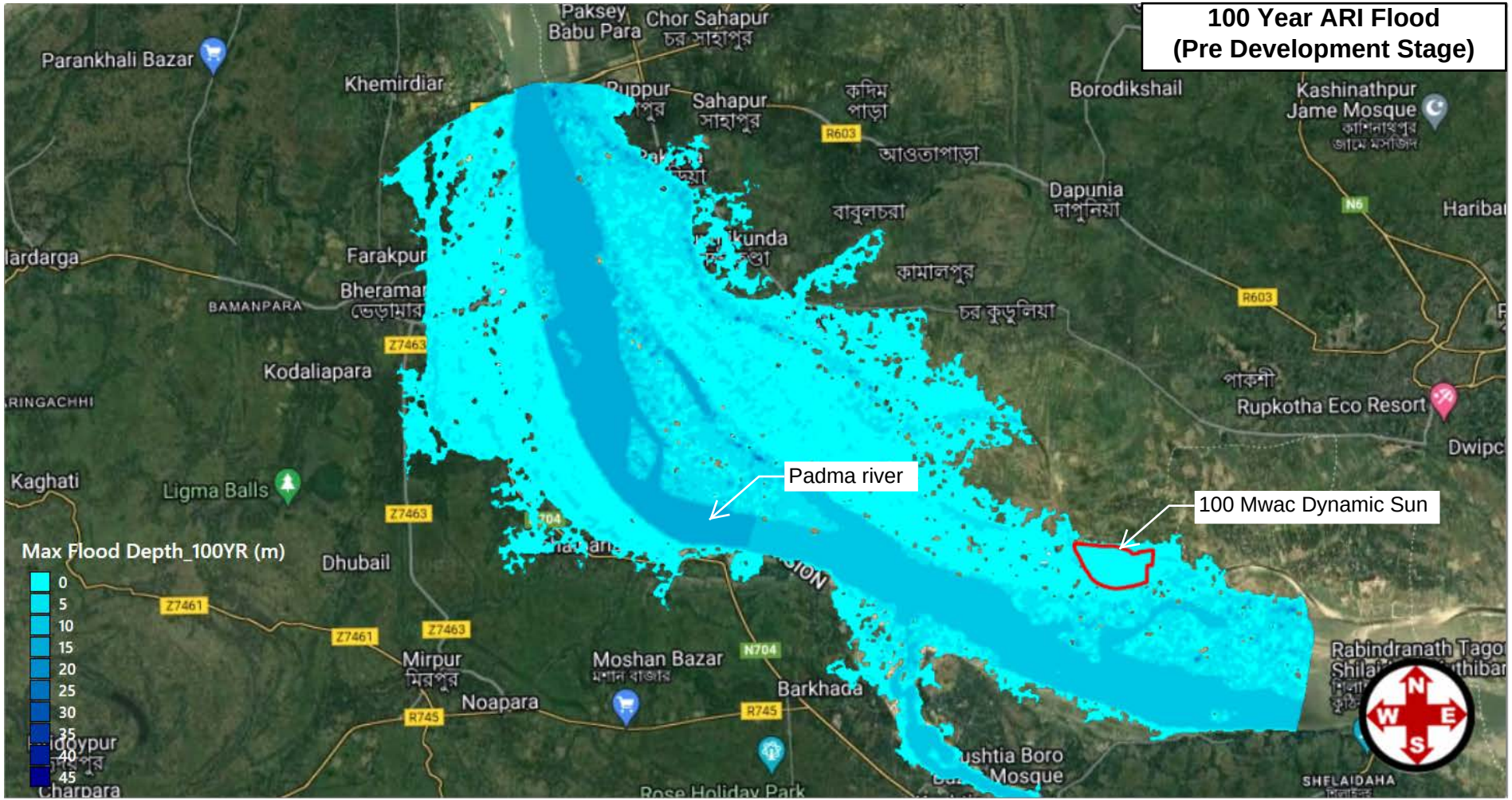
No.	$\bar{X}$	Sn	Yn	Sd	Tr	Yt	K	Qmax(design) m3/s $XT = \bar{X} + K(Sd)$
1	49724.7493	1.1607	0.5485	10005.1303	2	0.3665	-0.1568	48156.037
2	49724.7493	1.1607	0.5485	10005.1303	5	1.4999	0.8197	57926.077
3	49724.7493	1.1607	0.5485	10005.1303	10	2.2504	1.4662	64394.694
4	49724.7493	1.1607	0.5485	10005.1303	25	3.1985	2.2831	72567.808
5	49724.7493	1.1607	0.5485	10005.1303	50	3.9019	2.8892	78631.091
6	49724.7493	1.1607	0.5485	10005.1303	100	4.6001	3.4907	84649.604

Annex B-3

Flood Modeling by GeoHecRas


25 Year ARI Flood
(Pre Development Stage)
Padma river
100 Mwac Dynamic Sun
Max Flood Depth_25YR (m)
0
5
10
15
20
25
30
35
40
45
Parankhali Bazar
Khemirdiar
Paksey Babu Para
Chor Sahapur
Sahapur
Borodikshail
Kashinathpur Jame Mosque
Dapunia
Farakpur
Kodaliapara
Kaghati
Ligma Balls
Dhubail
Mirpur
Noapara
Moshan Bazar
Barkhada
Rupkotha Eco Resort
Rose Holiday Park
SHELAIDAHA
BAMANPARA
R603
N6
N704
Z7461
Z7463
R745


50 Year ARI Flood
(Pre Development Stage)
Padma river
100 Mwac Dynamic Sun
Max Flood Depth_50YR (m)
0
5
10
15
20
25
30
35
40
45
Parankhali Bazar
Khemirdiar
Paksey
Babu Para
Chor Sahapur
চর সাহাপুর
Sahapur
সাহাপুর
কদিম
পাড়া
Borodikshail
Kashinathpur
Jame Mosque
কাশিনাথপুর
জামে মসজিদ
R603
আওতাপাড়া
Dapunia
দাপুনিয়া
N6
বাবুলচরা
কামালপুর
চর কুড়ুলিয়া
Farakpur
BAMANPARA
Kodaliapara
Z7463
Kaghati
Ligma Balls
Dhubail
Z7461
Mirpur
মিরপুর
Noapara
Moshan Bazar
মশান বাজার
N704
Barkhada
R745
Rose Holiday Park
Rupkotha Eco Resort
পাকশী
SHFLAIDAHA
N
W
E
S


100 Year ARI Flood
(Pre Development Stage)
Padma river
100 Mwac Dynamic Sun
Max Flood Depth_100YR (m)
0
5
10
15
20
25
30
35
40
45
Parankhali Bazar
Khemirdiar
Paksey
Babu Para
Chor Sahapur
চর সাহাপুর
Sahapur
সাহাপুর
কদিম
পাড়া
Borodikshail
Kashinathpur
Jame Mosque
কাশিনাথপুর
জামে মসজিদ
R603
আওতাপাড়া
Dapunia
দাপুনিয়া
N6
বাবুলচরা
কামালপুর
চর কুড়ুলিয়া
Farakpur
BAMANPARA
Z7463
Kodaliapara
পাকশী
Rupkotha Eco Resort
Kaghati
Ligma Balls
Dhubail
Z7461
Mirpur
মিরপুর
Moshan Bazar
মশান বাজার
N704
Barkhada
Noapara
R745
Rose Holiday Park
Mosque
SHELAIDAHA
N
W
E
S

Annex C

Hydraulic Modeling
25, 50, 100 Year ARI from
Local Catchment

(Post Development Stage)

Annex C-1

Hydraulic Modeling set up from Local Catchment

1. MODEL SET UP

To assess the flood risk for this Solar Plant site under proposed conditions 2-dimensional hydraulic models were set up using HEC-RAS 5.0.7 (USACE 2019).

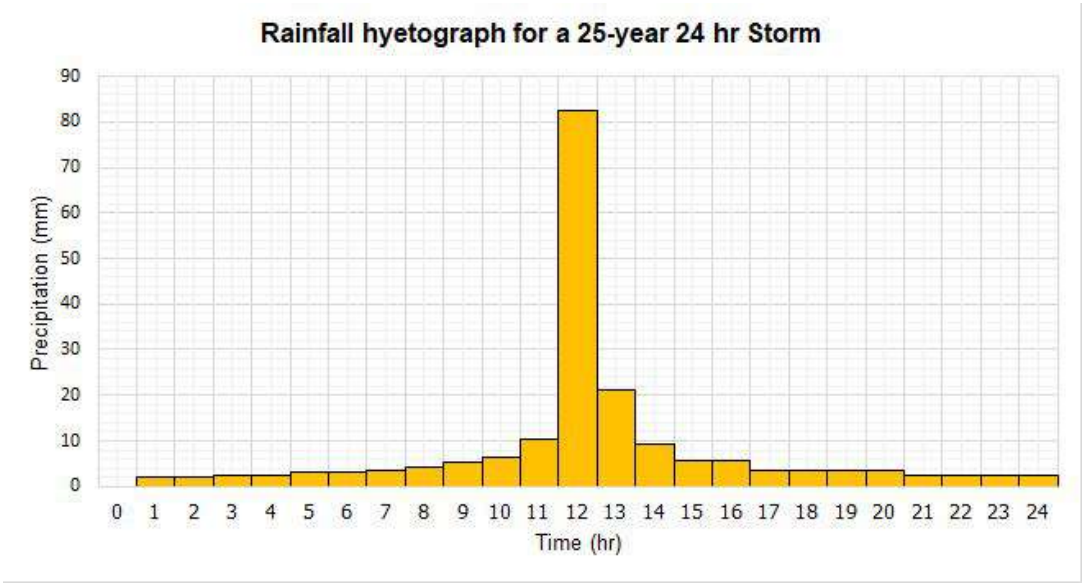
Terrain. The underlying terrain for the site area was provided as a spot elevation in CSV format under file name: "Coordinate _ RL.csv." spot elevation were converted to a 1-metre by 1-metre resolution raster grid digital elevation model in geotif format using Geohecras.

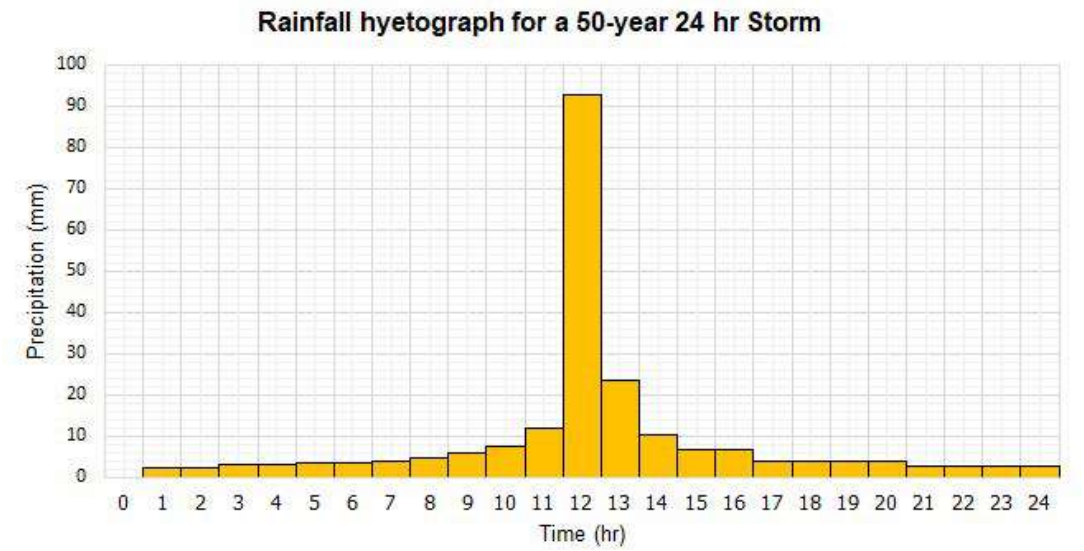
2D Flow Area. A two-dimensional (2D) flow area was delineated across the of project site . A computational mesh spacing of 1 metres was applied to the floodplain areas

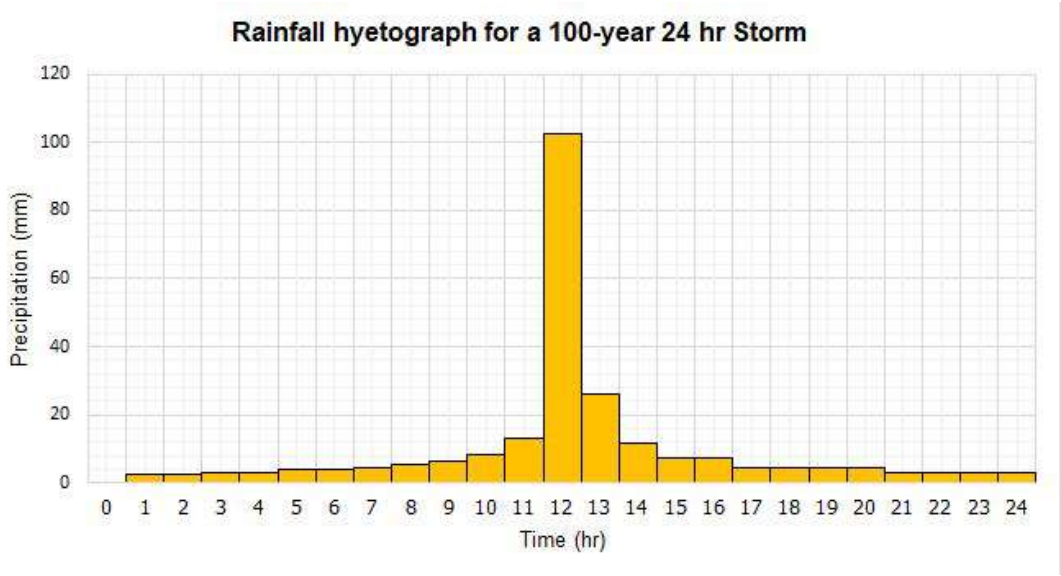
Roughness. A range of Manning's roughness coefficients was applied to the model as a sensitivity analysis. Channel roughness values ranges from 0.035 to 0.05, and floodplain roughness ranges from 0.05 to 0.08. The higher values were selected for the baseline runs for additional conservatism and to account for shallow flow depths relative to the size of the roughness elements.

Precipitation Boundary Condition.

Boundary Condition: Precipitation Hydrograph





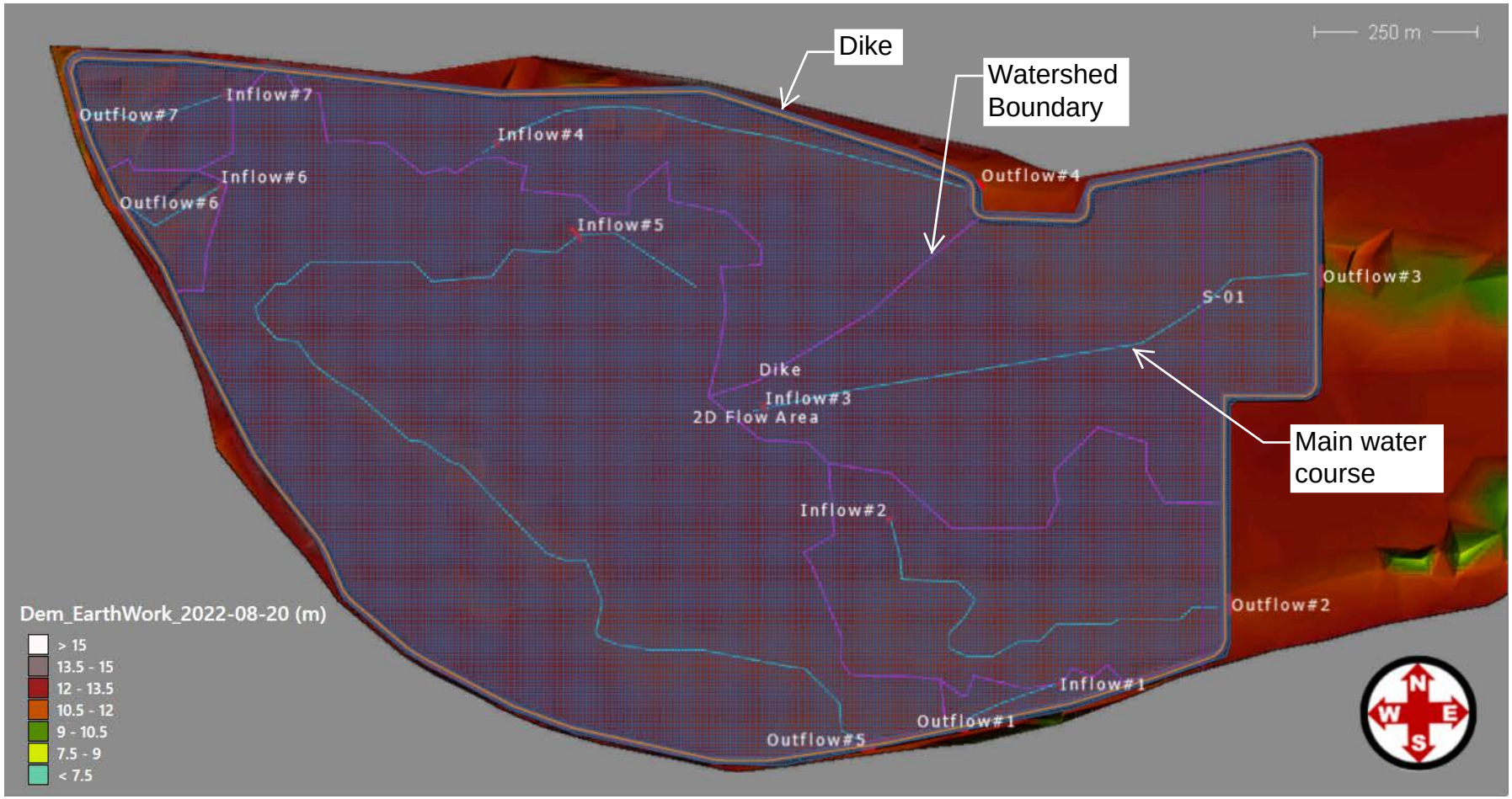


Outflow Boundary Condition. Normal depth slope :

Slope(Outflow#1) = 0.020095
Slope(Outflow#2) = 0.004989
Slope(Outflow#3) = 0.009909
Slope(Outflow#4) = 0.016861
Slope(Outflow#5) = 0.005715
Slope(Outflow#6) = 0.027521
Slope(Outflow#7) = 0.004271

Computational time step. A variable time step was assigned based on a maximum Currant Number of 2.0. Using this option, HEC-RAS selected the time step based on the assigned computational mesh size and computed velocities. The adopted time step generally ranged between 0.5 and 1.0 seconds. Mass balance errors and water surface elevation convergence errors were checked to ensure model stability and that imbalances remained below reasonable thresholds, confirming compliance with Courant Number criteria.

Simulation window. 24 hrs simulation window was applied in the model runs.



HEC-RAS 2D model schematic for Post Development Stage

Annex C-2

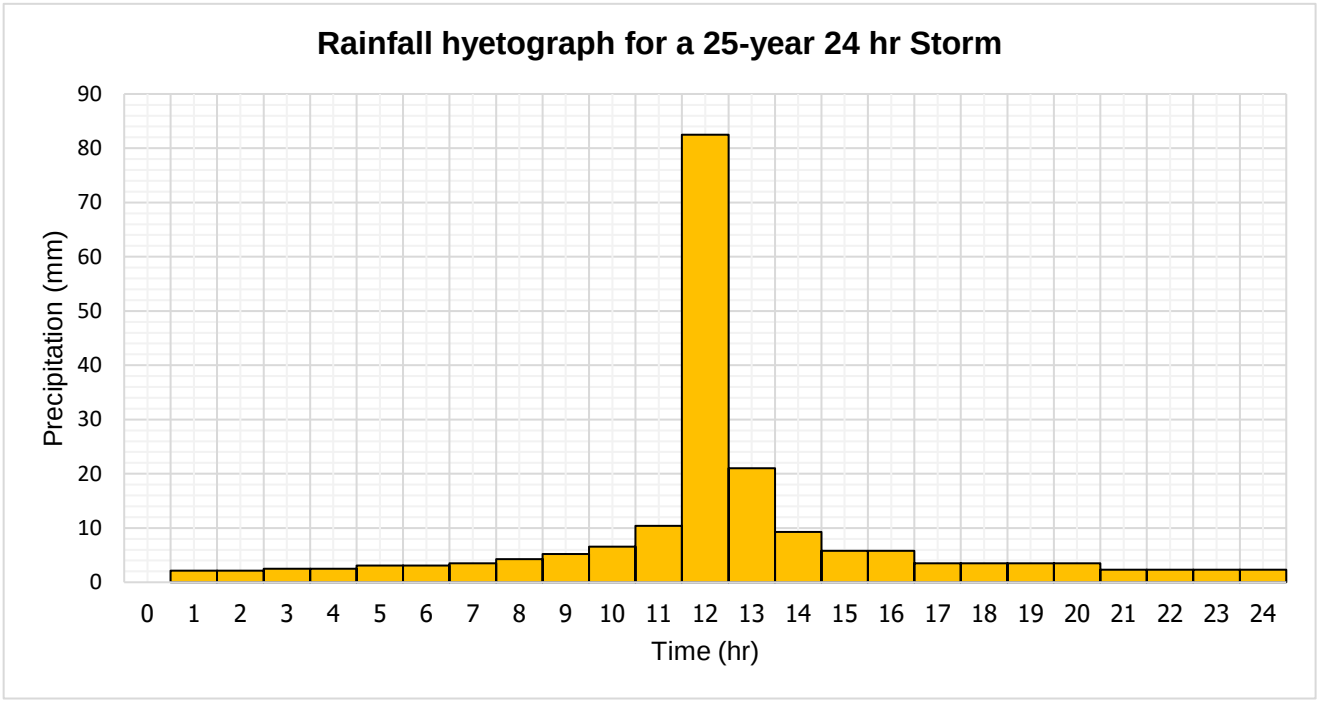
Design Precipitation Hyetographs by SCS method

Design Precipitation Hyetographs by SCS method

SCS rainfall type curves = Type II

P(24hr)
at 25 Year ARI = 192.7309 mm
Time increment 1 hr

Time	Cumulative Fraction	Cumulative Precipitation	Incremental Precipitation
hr	Pt/P24	Pt (mm)	(mm)
0	0.000	0.00	0
1	0.011	2.12	2.12
2	0.022	4.24	2.12
3	0.035	6.75	2.51
4	0.048	9.25	2.51
5	0.064	12.33	3.08
6	0.080	15.42	3.08
7	0.098	18.89	3.47
8	0.120	23.13	4.24
9	0.147	28.33	5.20
10	0.181	34.88	6.55
11	0.235	45.29	10.41
12	0.663	127.78	82.49
13	0.772	148.79	21.01
14	0.820	158.04	9.25
15	0.850	163.82	5.78
16	0.880	169.60	5.78
17	0.898	173.07	3.47
18	0.916	176.54	3.47
19	0.934	180.01	3.47
20	0.952	183.48	3.47
21	0.964	185.79	2.31
22	0.976	188.11	2.31
23	0.988	190.42	2.31
24	1.000	192.73	2.31

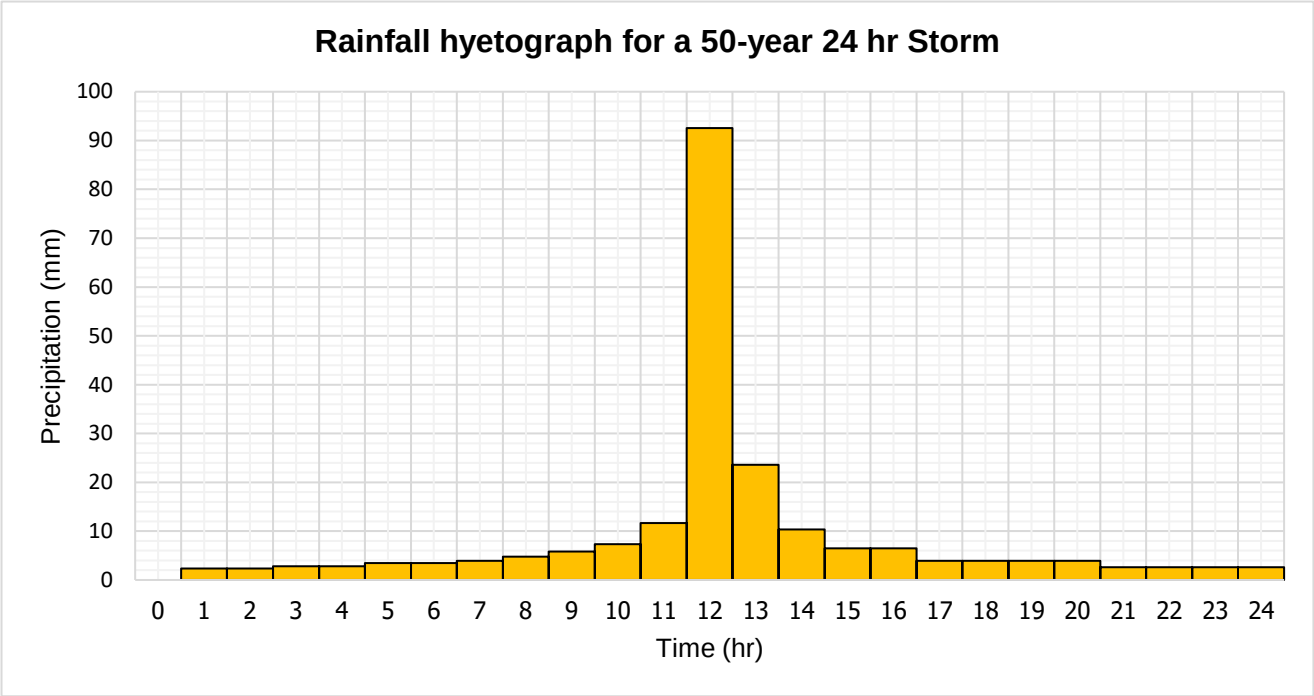

Rainfall hyetograph for a 25-year 24 hr Storm
Precipitation (mm)
90
80
70
60
50
40
30
20
10
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Time (hr)

Design Precipitation Hyetographs by SCS method

SCS rainfall type curves = Type II

P(24hr)
at 50 Year ARI = 216.1982 mm
Time increment 1 hr

Time	Cumulative Fraction	Cumulative Precipitation	Incremental Precipitation
hr	Pt/P24	Pt (mm)	(mm)
0	0.000	0.00	0
1	0.011	2.38	2.38
2	0.022	4.76	2.38
3	0.035	7.57	2.81
4	0.048	10.38	2.81
5	0.064	13.84	3.46
6	0.080	17.30	3.46
7	0.098	21.19	3.89
8	0.120	25.94	4.76
9	0.147	31.78	5.84
10	0.181	39.13	7.35
11	0.235	50.81	11.67
12	0.663	143.34	92.53
13	0.772	166.91	23.57
14	0.820	177.28	10.38
15	0.850	183.77	6.49
16	0.880	190.25	6.49
17	0.898	194.15	3.89
18	0.916	198.04	3.89
19	0.934	201.93	3.89
20	0.952	205.82	3.89
21	0.964	208.42	2.59
22	0.976	211.01	2.59
23	0.988	213.60	2.59
24	1.000	216.20	2.59

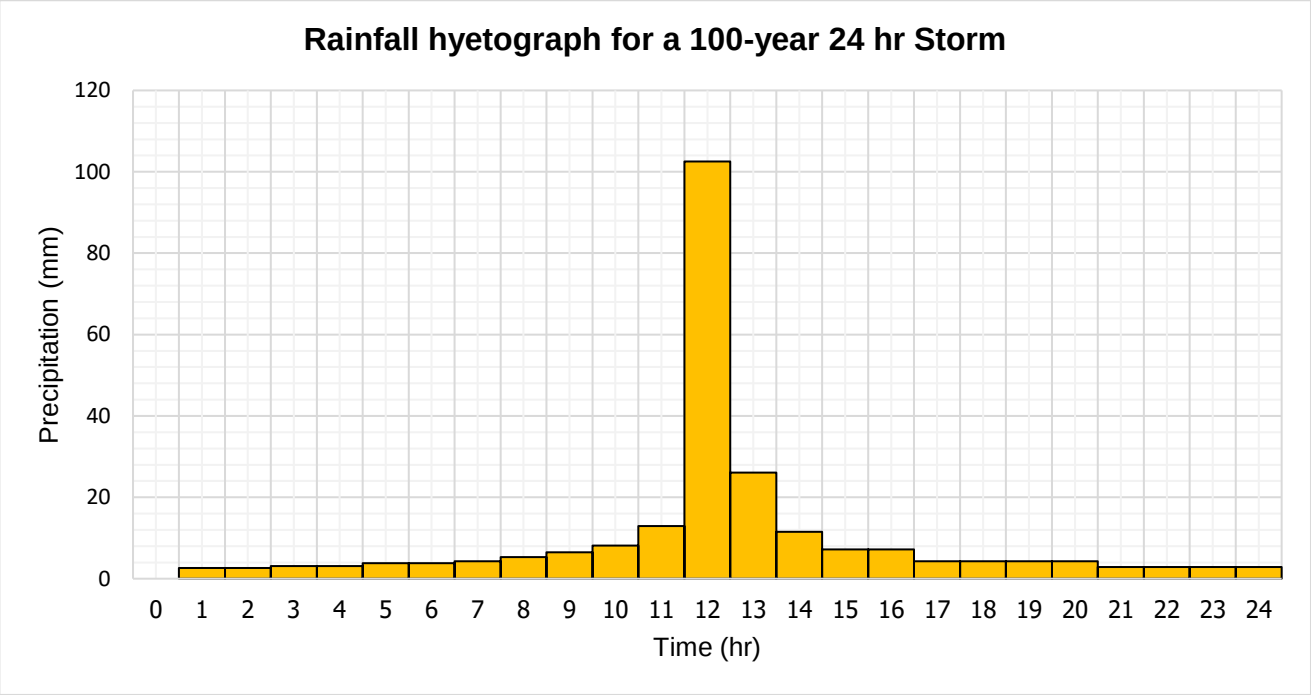

Rainfall hyetograph for a 50-year 24 hr Storm
Precipitation (mm)
100
90
80
70
60
50
40
30
20
10
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Time (hr)

Design Precipitation Hyetographs by SCS method

SCS rainfall type curves = Type II

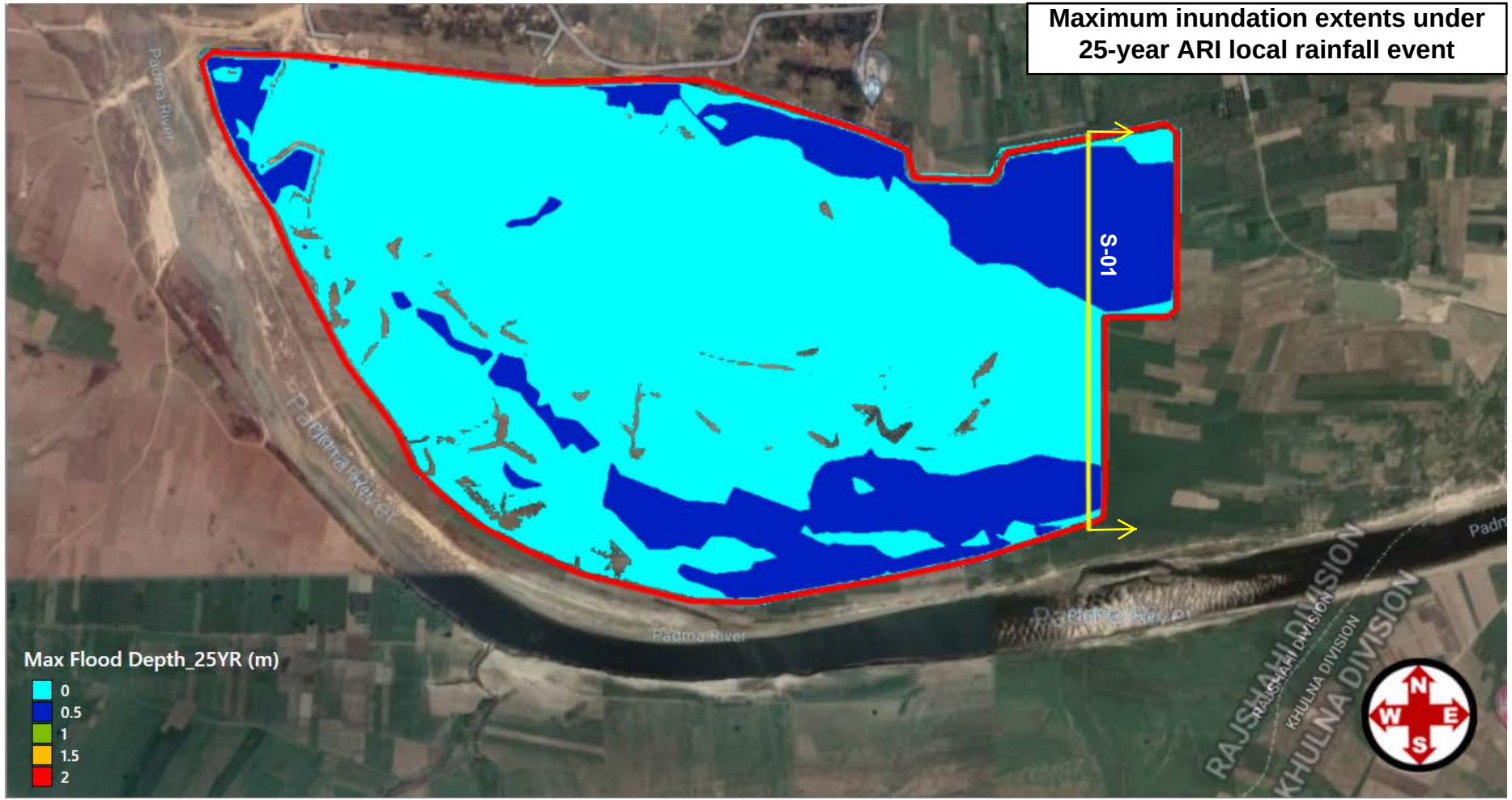
P(24hr)
at 100 Year ARI = 239.4923 mm
Time increment 1 hr

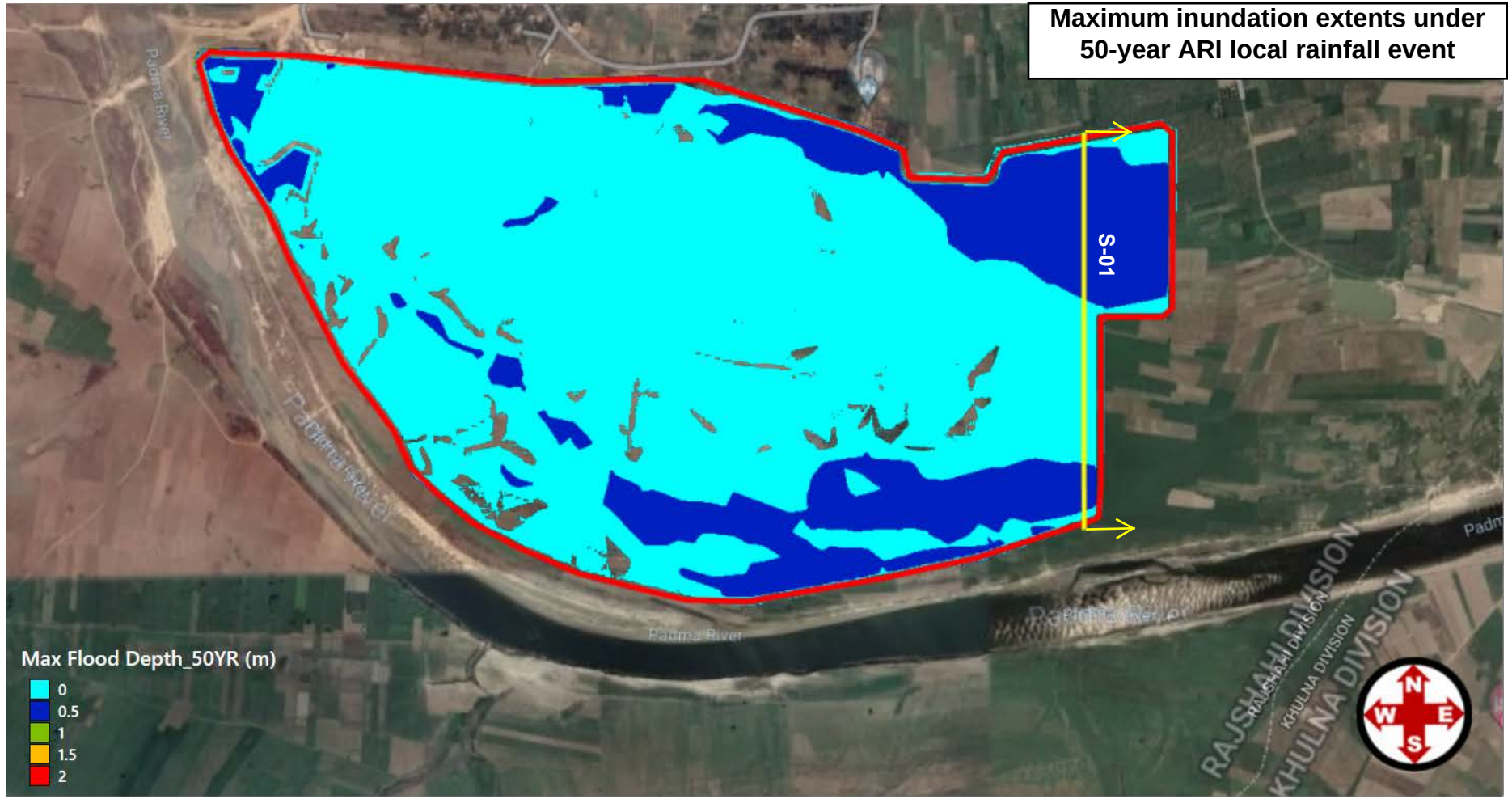
Time	Cumulative Fraction	Cumulative Precipitation	Incremental Precipitation
hr	Pt/P24	Pt (mm)	(mm)
0	0.000	0.00	0
1	0.011	2.63	2.63
2	0.022	5.27	2.63
3	0.035	8.38	3.11
4	0.048	11.50	3.11
5	0.064	15.33	3.83
6	0.080	19.16	3.83
7	0.098	23.47	4.31
8	0.120	28.74	5.27
9	0.147	35.21	6.47
10	0.181	43.35	8.14
11	0.235	56.28	12.93
12	0.663	158.78	102.50
13	0.772	184.89	26.10
14	0.820	196.38	11.50
15	0.850	203.57	7.18
16	0.880	210.75	7.18
17	0.898	215.06	4.31
18	0.916	219.37	4.31
19	0.934	223.69	4.31
20	0.952	228.00	4.31
21	0.964	230.87	2.87
22	0.976	233.74	2.87
23	0.988	236.62	2.87
24	1.000	239.49	2.87

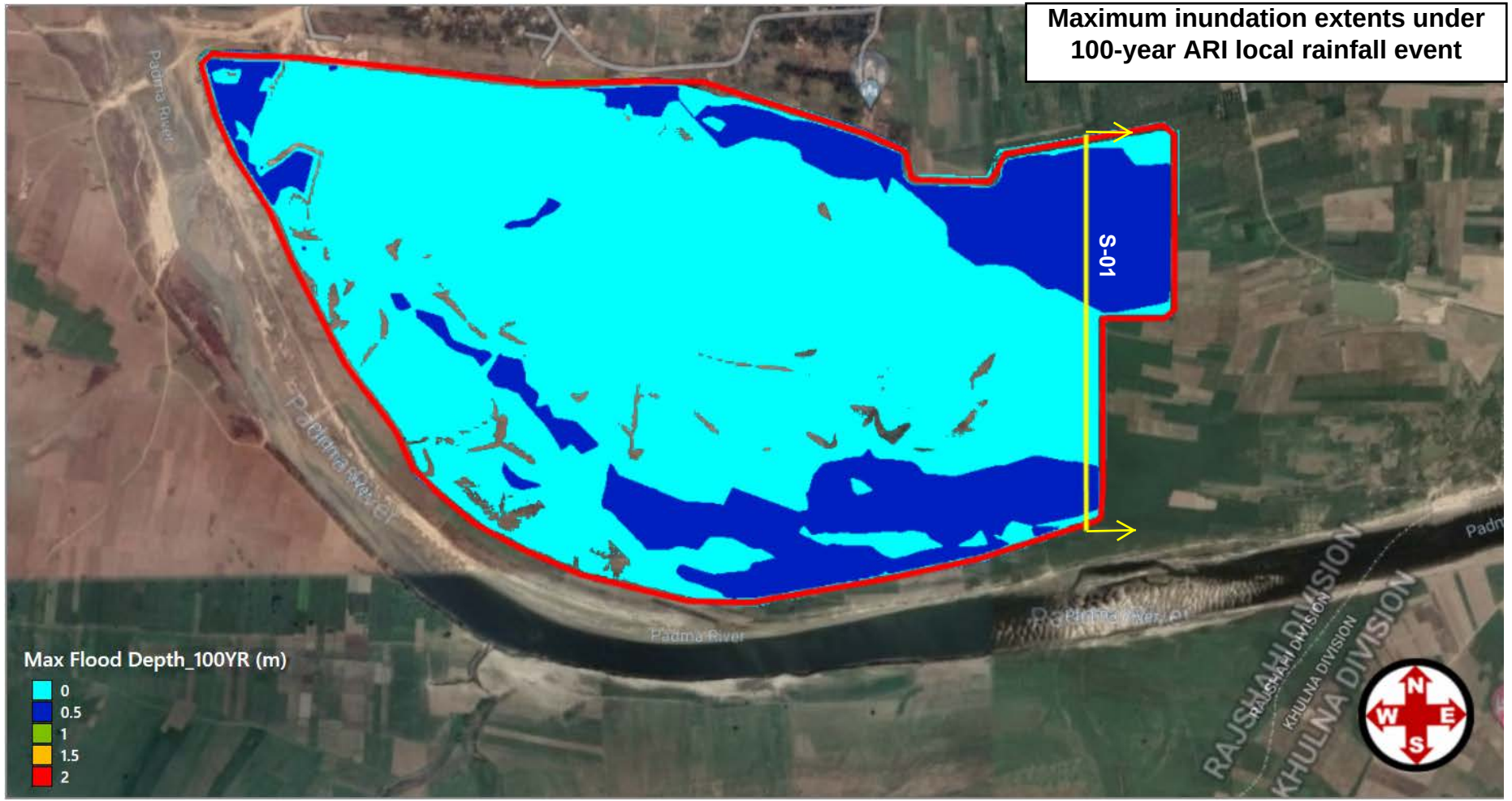

Rainfall hyetograph for a 100-year 24 hr Storm
Precipitation (mm)
120
100
80
60
40
20
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Time (hr)

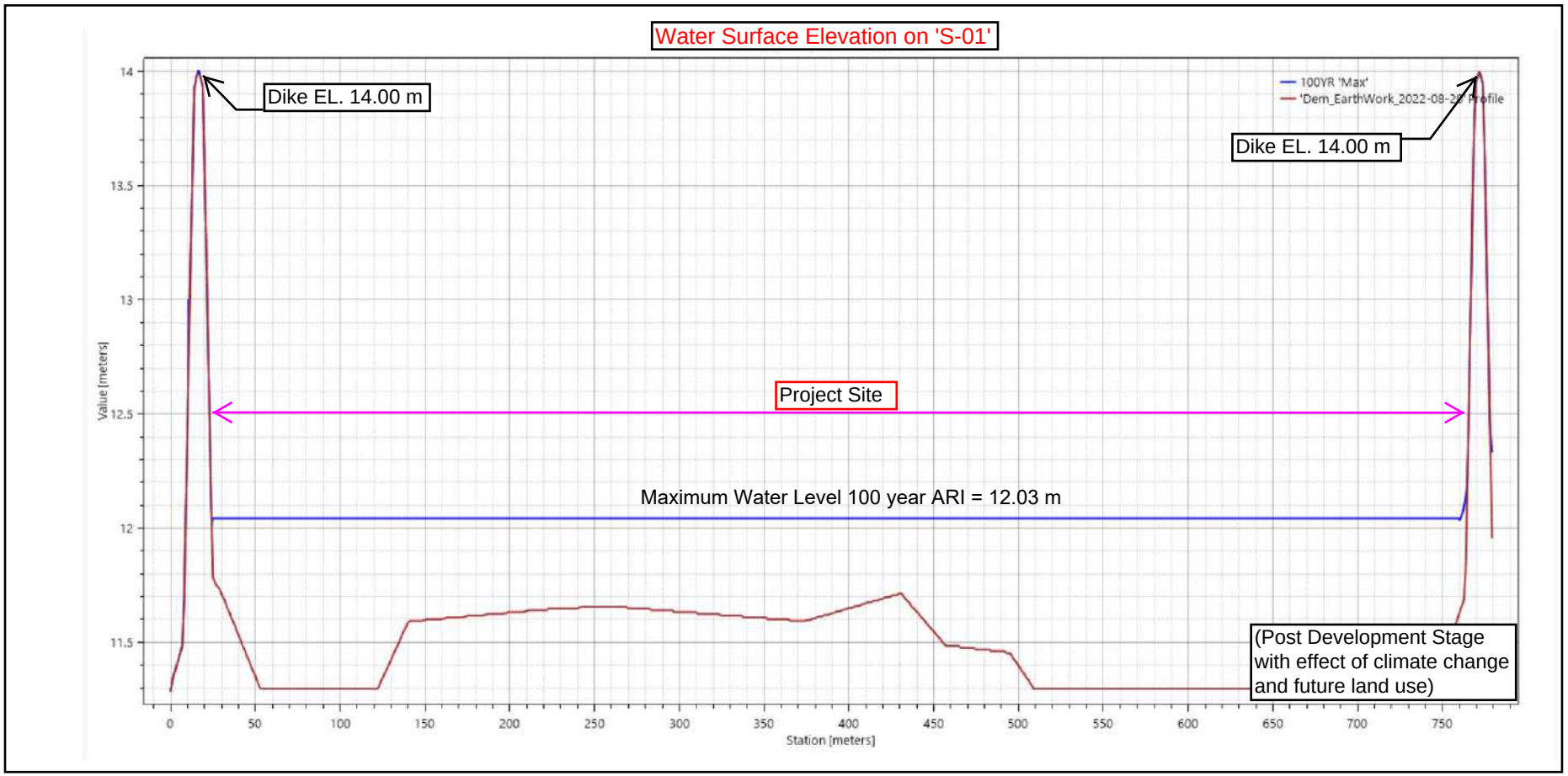
Annex C-3

Flood Modeling by GeoHecRas


Maximum inundation extents under
25-year ARI local rainfall event
S-01
Padma River
Padma River
Padma River
RAJSHAHI DIVISION
KHULNA DIVISION
Max Flood Depth_25YR (m)
0
0.5
1
1.5
2
N
W
E
S


Maximum inundation extents under
50-year ARI local rainfall event
S-01
Padma River
Padma River
Padma River
RAJSHAHI DIVISION
KHULNA DIVISION
Max Flood Depth_50YR (m)
0
0.5
1
1.5
2
N
W
E
S


Maximum inundation extents under 100-year ARI local rainfall event
S-01
Padma River
Padma River
Padma River
Max Flood Depth_100YR (m)
0
0.5
1
1.5
2
RAJSHAHI DIVISION
KHULNA DIVISION
N
W
E
S


Water Surface Elevation on 'S-01'
Dike EL. 14.00 m
Dike EL. 14.00 m
Project Site
Maximum Water Level 100 year ARI = 12.03 m
(Post Development Stage with effect of climate change and future land use)
100YR 'Max'
'Dem_EarthWork_2022-08-22' Profile
Value [meters]
Station [meters]
14
13.5
13
12.5
12
11.5
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750

Annex D

The Flow Rate at The Project Site from Local Rain

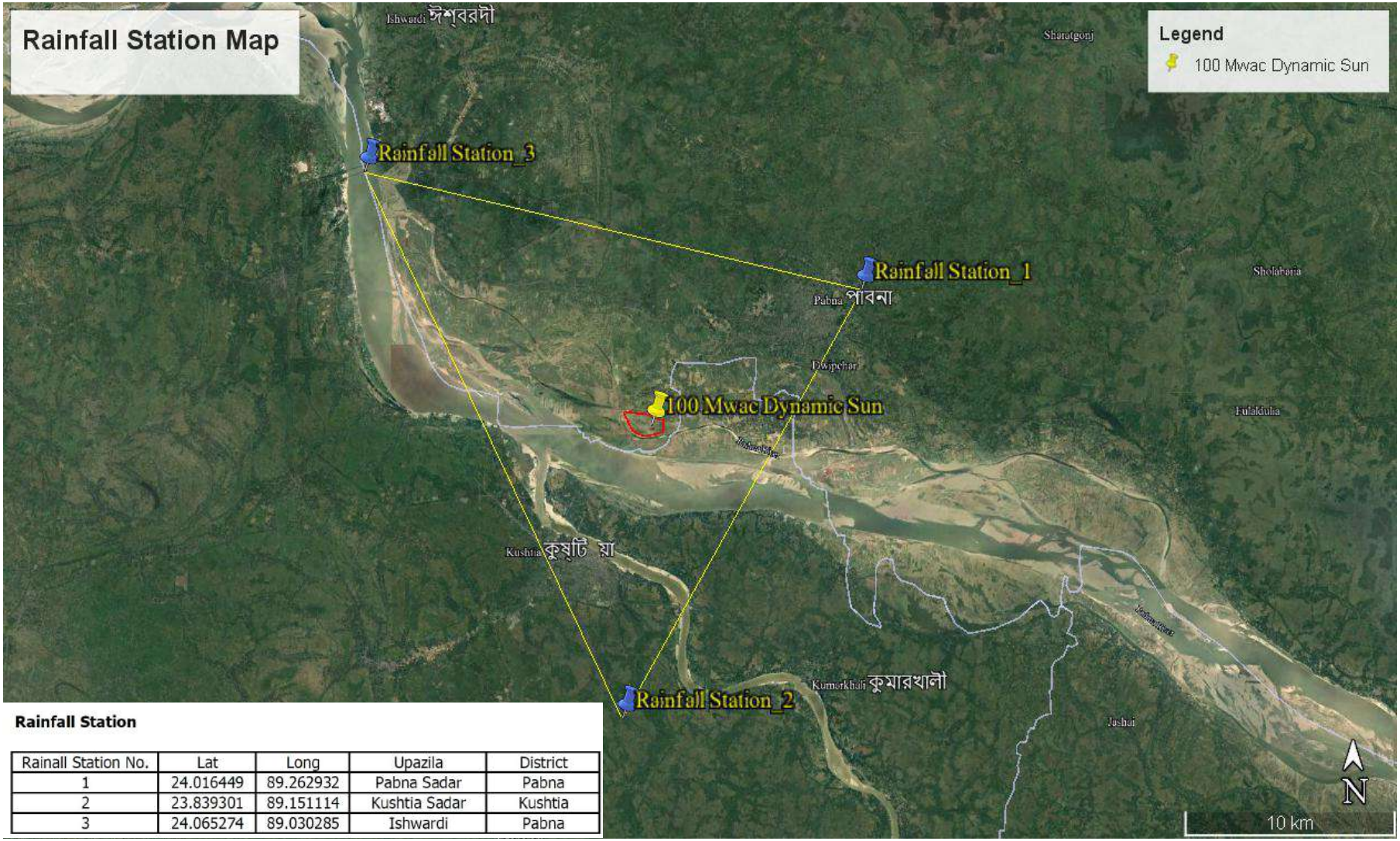
Annex D-1

Double Mass Curve Analysis of Rainfall Data

Station: 1
Station: 2
Station: 3

Rainfall data 15 years back records from (https://openweathermap.org/)

Map of Rainfall Stations



Rainfall Station

Rainall Station No.	Lat	Long	Upazila	District
1	24.016449	89.262932	Pabna Sadar	Pabna
2	23.839301	89.151114	Kushtia Sadar	Kushtia
3	24.065274	89.030285	Ishwardi	Pabna

Summary of Rainfall Data From

Station: 1
Station: 2
Station: 3

Table D1-1 : Maximum Daily Rainfall Data

Station : 1 Lat : 24.016449
Duration : 2007-2021 Long: 89.262932

Year	Maximum Daily Rainfall
	mm
2007	126.90
2008	93.18
2009	96.63
2010	74.60
2011	121.09
2012	40.05
2013	61.23
2014	135.03
2015	176.40
2016	74.75
2017	78.28
2018	62.57
2019	43.90
2020	108.72
2021	74.82

Table D1-2 : Maximum Daily Rainfall Data

Station : 2 Lat : 23.839301
Duration : 2007-2021 Long: 89.151114

Year	Maximum Daily Rainfall
	mm
2007	111.16
2008	96.59
2009	69.53
2010	52.43
2011	163.83
2012	51.61
2013	37.67
2014	74.95
2015	154.83
2016	52.98
2017	78.30
2018	53.22
2019	65.11
2020	113.46
2021	80.69

Table D1-3 : Maximum Daily Rainfall Data

Station : 3 Lat : 24.065274
Duration : 2007-2021 Long: 89.030285

Year	Maximum Daily Rainfall
	mm
2007	104.89
2008	88.51
2009	64.58
2010	58.22
2011	152.25
2012	87.99
2013	42.86
2014	118.04
2015	189.62
2016	71.87
2017	64.68
2018	63.01
2019	116.16
2020	71.66
2021	76.44

Double Mass Curve Analysis for Consistency Checking of Rainfall Data

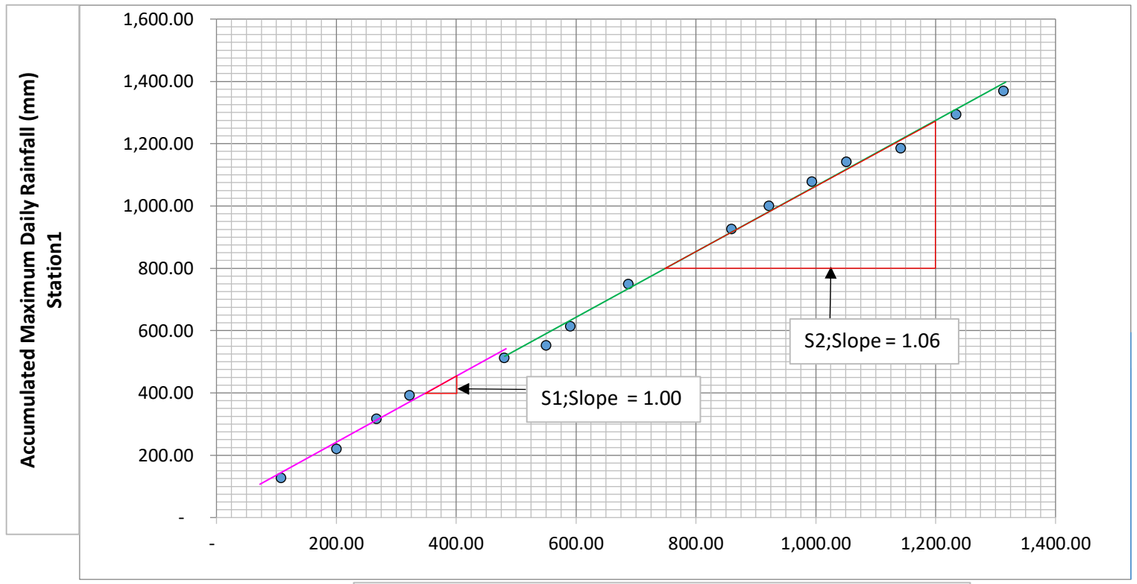
Station: 1

Table D1-4: Maximum Daily Rainfall Data (2007 - 2021) for Double Mass Curve Analysis

Stations : Station1 - Station2 - Station3

Year	Station1		Station2	Station3	Avg Maximum Daily Rainfall	Avg Acc Maximum Daily Rainfall
	Maximum Daily Rainfall	Acc Maximum Daily Rainfall	Maximum Daily Rainfall	Maximum Daily Rainfall	Total_Station2 + Station3	Total_Station2 + Station3
	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)
2007	126.90	126.90	111.16	104.89	108.03	108.03
2008	93.18	220.08	96.59	88.51	92.55	200.58
2009	96.63	316.71	69.53	64.58	67.06	267.63
2010	74.60	391.31	52.43	58.22	55.33	322.96
2011	121.09	512.40	163.83	152.25	158.04	481.00
2012	40.05	552.45	51.61	87.99	69.80	550.80
2013	61.23	613.68	37.67	42.86	40.27	591.06
2014	135.03	748.71	74.95	118.04	96.50	687.56
2015	176.40	925.11	154.83	189.62	172.23	859.78
2016	74.75	999.86	52.98	71.87	62.43	922.21
2017	78.28	1,078.14	78.30	64.68	71.49	993.70
2018	62.57	1,140.71	53.22	63.01	58.12	1,051.81
2019	43.90	1,184.61	65.11	116.16	90.64	1,142.45
2020	108.72	1,293.33	113.46	71.66	92.56	1,235.01
2021	74.82	1,368.15	80.69	76.44	78.57	1,313.57

Y	X
Acc Maximum Daily Rainfall	Avg Acc Maximum Daily Rainfall
Station1	Station2 + Station3
(mm)	(mm)
126.90	108.03
220.08	200.58
316.71	267.63
391.31	322.96
512.40	481.00
552.45	550.80
613.68	591.06
748.71	687.56
925.11	859.78
999.86	922.21
1,078.14	993.70
1,140.71	1,051.81
1,184.61	1,142.45
1,293.33	1,235.01
1,368.15	1,313.57



ID	y2	y1	x2	x1	Slope
S1	450.00	400.00	400.00	350.00	1.00
S2	1,275.00	800.00	1,200.00	750.00	1.06

% Diff Slope [(S2-S1)/S2]*100%

5.26 %

Double Mass Curve Analysis of Maximum Daily Rainfall
Year : 2007 - 2021
Stations : Station1 - Station2 - Station3

Summary of Analysis

Rainfall data from these 3 stations were further tested for consistency by Double Mass Curve Method. From the plotted double mass curve, the maximum different of the slope between any 2 portions on the curve is equal to 5.26% which is less than 10%, therefore, from this comparison with 2 other nearby stations, it can be concluded that rainfall data from station 1 is on the level of acceptable consistency.

Back ground Theory of Homogeinty and Double Mass Curve Analysis

Statistical Methods

Four homogeneity tests are used to test the homogeneity of the rainfall data. Standard normal homogeneity test (SNHT), Buishand range (BR) test, Pettitt test, and von Neumann ratio (VNR) test are selected. Under null hypothesis, the annual values Y_i of the testing variables Y are independent and identically distributed and the series are considered as homogeneous. Meanwhile under alternative hypothesis, SNHT, BR test and Pettitt test assume the series consisted of break in the mean and considered as inhomogeneous. These three tests are capable to detect the year where break occurs. Meanwhile VNR test is not able to give information on the year break because the test assumes the series is not randomly distributed under alternative hypothesis.

There are some differences between SNHT, BR test and Pettitt test. SNHT is sensitive in detecting the breaks near the beginning and the end of the series. BR test and Pettitt test are easier to identify the break in the middle of the series. Besides, the SNHT and BR test assumed Y_i is normally distributed, whereas Pettitt test does not need this assumption because it is a non-parametric rank test.

1. Standard Normal Homogeneity Test

A statistic $T(y)$ is used to compare the mean of the first y years with the last of (n-y) years and can be written as below:

$$T_y = y\overline{z_1} + (n-y)\overline{z_2},\ y = 1,2,....,n \tag{1}$$

where

$$\overline{z_1} = \frac{1}{y}\sum_{i=1}^{n}\frac{(Y_i - \overline{Y})}{s} \quad \text{and} \quad \overline{z_2} = \frac{1}{n-y}\sum_{i=y+1}^{n}\frac{(Y_i - \overline{Y})}{s} \tag{2}$$

The year y consisted of break if value of T is maximum. To reject null hypothesis, the test statistic,

$$T_0 = \max_{1\le y\le n} T_y \tag{3}$$

is greater than the critical value, which depends on the sample size.

2. Buishand Range Test

The adjusted partial sum is defined as:

$$S_0^* = 0 \text{ and } S_y^* = \sum_{i=1}^{y}(Y_i - \overline{Y}),\ y = 1,2,...,n \tag{4}$$

When the series is homogeneous, then the value of S_y^* will rise and fall around zero. The year y has break when S_y^* has reached a maximum (negative shift) or minimum (positive shift). Rescaled adjusted range, R is obtained by

$$R = \frac{(\max_{0 \le y \le n} S_y^* - \min_{0 \le y \le n} S_y^*)}{s} \tag{5}$$

The $R/\sqrt{n}$ is then compared with the critical values given by Buishand (1982).

3. Pettitt Test

This test is based on the rank, r_i of the Y_i and ignores the normality of the series.

$$X_y = 2\sum_{i=1}^{y} r_i - y(n+1), \quad y = 1,2,...,n \tag{6}$$

The break occurs in year k when

$$X_k = \max_{1 \le y \le n} |X_y| \tag{7}$$

The value is then compared with the critical value by Pettitt (1979).

4. Von Neumann Ratio Test

It is a test that used the ratio of mean square successive (year to year) difference to the variance. The test statistic is shown as follows:

$$N = \frac{\sum_{i=1}^{n-1} (Y_i - Y_{i+1})^2}{\sum_{i=1}^{n} (Y_i - \overline{Y})^2} \tag{8}$$

THEORETICAL BASIS OF THE DMC

The principle of the DMC, as stated in Searcy and Hardison (1960), is that the cumulative values of one variable increase linearly with those of another if the ratio of the studied variables is a constant. In the DMC, the cumulative values of relevant variables are plotted with the x- and y- coordinates. If values of x and y axes are equally affected by external disturbances, then a DMC is a straight line; however, slope breaks are common in the DMC and present additional information on the relationship between the studied variables (Kalra & Kumar, 1989; Searcy & Hardison, 1960; Wigbout, 1973). The breaks can be driven by various factors, which impact the collection of sediment or run-off discharge such as changes in sediment or run-off flow, urbanization, revegetation or deforestation, and soil and water conservation measures and climate change. Most importantly, slope breaks are able to help determine the time for the occurrence of a change in the DMC (i.e., change-point year) (Searcy & Hardison, 1960). Generally, a slope break can be ignored if it lasts no more than 5 years, otherwise, it should be treated as a trend and further studied (Searcy & Hardison, 1960). Once the change-point year has been determined, records for the relevant variables would be checked to determine whether there were any anthropogenic disturbances before the change-point year. It can be concluded that slope changes are driven by natural causes if there were no anthropogenic disturbances; otherwise, the changes may result from human activities, and a further study can be undertaken to quantitatively assess the impact of natural causes and human activities for the period after the change-point year. In hydrological studies, the DMC is often used to quantify the relative impact of climate (i.e., precipitation) and human activities (i.e., land use) on the change of total streamflow and sediment discharge for the period after the transition years (Gao, Geissen, Ritsema, Mu, & Wang, 2013). Such work is useful for policy makers to optimize land use patterns and improve the sustainability of eco-environment.

DERIVATION OF THE DMC

The DMC is a widely used approach to investigate the consistency and long-term trend of hydro-meteorological time series (Mu, Zhang, Gao et al., 2010). The method was first employed to analyse the consistency of precipitation records in order to correct the measurements,

The derivation of the DMC for hydrological benefit evaluations includes four steps, which are the establishment of a plot between cumulative annual precipitation and streamflow or sediment discharge, detection of changing points in the DMC, estimation of the total variation of run-off (ΔR_c) and sediment flow (ΔS_c) over the time after the change-point year, and determination of the relative effect of precipitation and anthropogenic disturbances. They are detailed in the following paragraphs, in which T_i represents a time series whereas P_i, R_i, and S_i stand for precipitation, run-off, and sediment discharge at

i year, respectively. It should be noted that in the DMC, other precipitation-related factors (e.g., rainfall intensity of flood seasons) can also be used to develop relationships with streamflow or sediment discharge. Here, we used annual precipitation as an example.

Step 1. Establishing the DMC.

This step includes the calculation of cumulative precipitation (ΣP), run-off (ΣR) and sediment discharge (ΣS), and plotting of ΣP versus ΣR (or ΣP versus ΣS). In general, vertical axis is the tested variable (i.e., ΣR or ΣS) whereas horizontal axis is the reference variable (i.e. ΣP; Figure 1).

$$\sum P = \sum_{i=1}^{n} P_i \tag{1}$$

$$\sum R = \sum_{i=1}^{n} R_i \tag{2}$$

$$\sum S = \sum_{i=1}^{n} S_i \tag{3}$$

Step 2. Detecting changing points of the DMC

Actually identification of changing points is to find the turning points of the DMC slope (k) (i.e., slope breaks). For the DMC shown in Figure 1, the slope (k) can be expressed as

$$k_{i+1} = \tan\theta = \frac{\Delta R}{\Delta P} = \frac{\sum R_{i+1} - \sum R_i}{\sum P_{i+1} - \sum P_i}. \tag{4}$$

In order to avoid the shortfalls of previous methods (i.e., empirical methods and the direct use of changing points in streamflow or sediment discharge), a nonparametric method proposed by Pettitt (1979) was employed to identify changing points of the DMC slope (k). This method determines a significant change in the mean of a time series when the occurrence of them is unassured. The test utilizes the Mann–Whitney statistic $U_{t,N}$ that examines if two sample sets (x_1, ... x_t and x_{t+1}, ... x_N) come out of the same population. The test statistic $U_{t,N}$ is defined as

$$U_{t,N} = U_{t-1,N} + \sum_{j=1}^{N} \operatorname{sgn}(X_t - X_j) \quad \text{for} \quad t = 2, \ \ldots, \ N \tag{5}$$

and

$$\begin{aligned} &\text{if} (X_t - X_j) > 0, && \operatorname{sgn}(X_t - X_j) = 1 \\ &\text{if} \ (X_t - X_j) = 0, && \operatorname{sgn}(X_t - X_j) = 0 \\ &\text{if} \ (X_t - X_j) < 0, && \operatorname{sgn}(X_t - X_j) = -1. \end{aligned} \tag{6}$$

$U_{t,N}$ counts the times for which members of the first sample are over those of the second. In the Pettitt's test, the null hypothesis has no changing point. The test statistic K_N and the associated probability (P) are derived as below:

$$K_N = \max_{1 \le t \le N} |U_{t,N}| \tag{7}$$

$$P \cong 2 \exp\left\{-6(K_N)^2 / \left(N^3 + N^2\right)\right\}. \tag{8}$$

Step 3. Estimating the total variation in run-off (ΔR_c) and sediment discharge (ΔS_c) over the period following the change-point years.

Once the change-point year (T_b) has been determined in Step 2, regression equations can be developed based on the data points for the period before T_b:

$$\sum R = a_1 \sum P + b_1 \tag{9}$$

$$\sum S = a_2 \sum P + b_2. \tag{10}$$

The cumulative run-off (ΣR_c) and sediment discharge (ΣS_c) at T_n year are derived through taking the cumulative precipitation over the

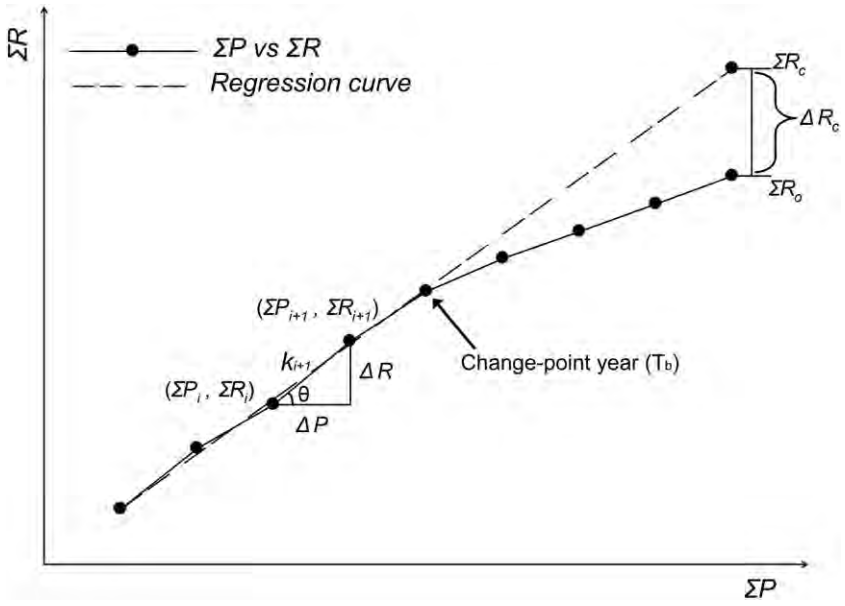


FIGURE 1 Sketch of the double mass curve of precipitation versus run-off

whole study period (ΣP) as the input of the regression Equations 9 and 10. The total variation of run-off (ΔR_c) and sediment (ΔS_c) over the time following the change-point year can then be expressed as (Figure 1)

$$\Delta R_c = \sum R_c - \sum R \tag{11}$$

$$\Delta S_c = \sum S_c - \sum S. \tag{12}$$

Then, the run-off or sediment reduction rate (η_R or η_S) can be expressed as

$$\eta_R = \frac{\Delta R_c}{\sum R_c} \times 100\% \tag{13}$$

$$\eta_S = \frac{\Delta S_c}{\sum S_c} \times 100\%. \tag{14}$$

Step 4. Identifying the relative effect of precipitation and anthropogenic disturbances on changes in streamflow or sediment discharge.

The relative influence of precipitation and anthropogenic disturbances on streamflow and sediment shifts can be determined according to the procedure presented in Table 1. In the table, $\overline{R_b}$ and $\overline{R_a}$ represent observed mean annual run-off or sediment for a certain period before and after the transition year. Total change in run-off or sediment (ΔR) equals the discrepancy between $\overline{R_b}$ and $\overline{R_a}$. Predicted mean annual run-off and sediment for a certain period (e.g., say 10 years) after the change-point year, $\overline{R_{ca}}$ can then be derived on the basis of the run-off and sediment predicted by Equations 9 and 10 for individual years. The discrepancy between and $\overline{R_b}$ and $\overline{R_{ca}}$ indicates the effect of precipitation change (ΔP), whereas the difference of $\overline{R_a}$ and $\overline{R_{ca}}$ or between ΔR and ΔP is attributed to human interventions.

with an area of 344,000 km^2. In this study, annual precipitation was collected at 33 meteorological stations across the region. They were provided by the National Meteorological Information Centre and China Meteorological Administration. Annual streamflow and sediment discharge for the study region were derived on the basis of measurements of two key hydrological stations (i.e., Toudaoguai and Huayuankou) provided by the Chinese River Streamflow and Sediment Communiques, the Ministry of Water Resources of PRC. All the measured data underwent a strict quality control process conducted by corresponding agencies.

Annex D-2

Homogeinity Test of Rainfall Data

Station: 1

Results for the homogeneity test of rainfall data

Pettitt's test for single change-point detection

data: Maximum Daily Rainfall_Station1
U* = 20, p-value = 1
alternative hypothesis: two.sided
sample estimates:
probable change point at time K
9

Buishand U test

data: Maximum Daily Rainfall_Station1
U = 0.10912, n = 15, p-value = 0.5772
alternative hypothesis: true delta is not equal to 0
sample estimates:
probable change point at time K
9

Standard Normal Homogeneity Test (SNHT)

data: Maximum Daily Rainfall_Station1
T = 2.1953, n = 15, p-value = 0.74
alternative hypothesis: true delta is not equal to 0
sample estimates:
probable change point at time K
9

Summary of Analysis

Station: 1

Test method	Statistics value	Critical value	Check
		Significance level 5%	
Pettitt	20.00	36.27	Homogeneous
Buishand	0.11	1.37	Homogeneous
Standard	2.20	6.40	Homogeneous

The maximum daily rainfall from station 1, were used for
checking of data homogeneity and data consistency by Homogeneity Test.
From the analysis of homogeneity test with 2 variables and by 3 mentioned methods
it is found that the computed statistics values are less than critical values in all tests, therefore it can be concluded that the maximum daily rainfall data from station 1 is on the acceptable homogeneous.

Annex D-3

Rainfall Distribution

Rainfall Distribution

The recorded maximum daily rainfall data obtained from the meteorology station is as shown in Table D3-1.

Rainfall intensity at different return periods 2, 5, 10, 20, 25, 50 and 100 years were estimated through statistical analysis by using Log-Normal Distribution, Gumbel Theoretical of Extreme Value Distribution and Log Pearson Type III Distribution then the results from the analysis were investigated by using Kolmogorov-Smirnov Test and the best goodness-of-fit method was selected, as following:

Theoretical Extreme Value (EV) Distribution Approach

To illustrate the second approach, let us select the Gumbel (Type I) distribution as our EV distribution. The Gumbel Type I distribution is,

$$G(x;\mu,\beta)=\frac{1}{\beta}e^{\frac{x-\mu}{\beta}}e^{-e^{\frac{x-\mu}{\beta}}}$$

where μ is the location parameter and β is the scale parameter.

It can be shown that the value of the random variable X_T associated with a given return period, T, may be obtained from the following expression,

$$X_T=\bar{X}+K_T S$$

where $\bar{X}$ is the mean of the observations (*e.g.*, arithmetic average of the observations), and S is the standard deviation of the observations. The frequency factor associated with return period T, K_T, is given by

$$K_T=-\frac{\sqrt{6}}{\pi}[0.5772+\ln(\ln(\frac{T}{T-1}))]$$

Log-Normal Distribution

The log-normal distribution is the probability distribution of a random variable whose logarithm is normally distributed. Let X be a random variable with a normal distribution, then Y = exp(X) has a log-normal distribution. In other words, if Y is log-normally distributed, then X = log(Y) is normally distributed. When a random variable represents a process that is the resultant of multiplicative product of many small effects each of which is positive, then it can be expressed the sum of logarithms of these small effects. The logarithm of such a random variable can be expected to follow a normal distribution. Hence, if the variable is transformed to the log domain, it is likely to follow he normal distribution. An advantage of the log-normal distribution is that it

is often useful to represent quantities that cannot have negative values. It has proven useful to model rainfall amounts, size distributions of aerosol particles, etc.

The PDF of the log-normal distribution is

$$f(x) = \frac{1}{x\sigma_y\sqrt{2\pi}} \exp\left[-\frac{(\ln x - \mu_y)^2}{2\sigma_y^2}\right] \qquad x > 0$$

The log-normal distribution has two parameters μ_y and σ_y which can be estimated by transforming all x_i's to y_i's by

$y_i = \ln x_i$

Log Pearson Type - III (LP3) Distribution

Log Pearson Type III distribution was found to give good results in numerous studies dealing with flood peak data. This distribution is the standard distribution for flood frequency analysis in the USA since its use for flood frequency analysis was recommended by the US Water

Resources Council.

LP3 is a three-parameter distribution and is widely used in hydrology. Its parameters are related to mean, standard deviation, and skewness.

$$f(x) = \frac{1}{a\Gamma(b)}\left(\frac{x-c}{a}\right)^{b-1}\exp\left(-\frac{x-c}{a}\right)$$

where *a, b*, and *c* are scale, shape, and location parameters, respectively, and Γ(b) is a gamma function. If *c = 0*, this distribution becomes a two-parameter gamma distribution. Parameters *a, b*, and *c* are related to mean, standard deviation, and coefficient of skewness as (method of moment estimates)

$a = \sigma/\sqrt{b}$
$b = (2/C_s)^2$
$c = \mu - \sigma\sqrt{b}$

To determine flood for a return period T by using the LP3 distribution, the procedure described below is followed.

First of all, the frequency factor, K_T is computed by (Chow et al. 1988):

$$K_T = z + (z^2 - 1)k + (z^3 - 6z)k^2/3 + (z^2 - 1)k^3 + zk^4 + k^5/3$$

Where $k = C_s/6$. To complete z for a given return period T, exceedance probability p is obtained as p = 1/T. Now, complete a variable *w* as

$$w = \sqrt{\ln(1/p^2)} \qquad 0 < p \le 0.5$$

Now z is calculated by (Abramowitz and Stegun, 1965)

$$z = w - \frac{2.515517 + 0.802853w + 0.010328w^2}{1 + 1.432788w + 0.189269w^2 + 0.001308w^3}$$

when p > 0.5, p in eq. (10.41) is replaced by (1-p) and the negative sign is put before z computed by eq. (10.42). Now, by following the frequency factor method, the flood for the return period T years is computed by:

$$y_T = \bar{y} + K_T s_y$$

:

Table D3-1: Maximum Daily Rainfall

Station: 1	
Year	Maximum Daily Rainfall (mm)
2007	126.90
2008	93.18
2009	96.63
2010	74.60
2011	121.09
2012	40.05
2013	61.23
2014	135.03
2015	176.40
2016	74.75
2017	78.28
2018	62.57
2019	43.90
2020	108.72
2021	74.82

Results of Rainfall Distribution Analysis using Log Pearson Type 3, Gumbel EV1 and Log-Normal Method with Goodness-of-Fit Kolmogorov-Smirnov Test

INPUT FILE: INPUT.TXT (NON-ZERO DATA = 15 , ZERO DATA = 0)
OUTPUT FILE: OUTPUT.LP3

LOG-PEARSON TYPE 3 DISTRIBUTION

METHOD OF MOMENT (INDIRECT)

ALPHA	-.04649	M1	4.43580
BETA	78.62656	M2	.16992
GAMMA	8.09092	SKEW	-.22555

SKEW IS NEGATIVE - DISTRIBUTION HAS AN UPPER BOUND

T,YEARS	T-ADJUST	XT(MM)
2.00	2.00	85.7361
5.00	5.00	119.8583
10.00	10.00	141.6147
20.00	20.00	161.8243
25.00	25.00	168.1138
50.00	50.00	187.1717
100.00	100.00	205.6877
200.00	200.00	223.8203
500.00	500.00	247.3706
1000.00	1000.00	264.9533

KOLMOGOROV-SMIRNOV TEST

M	XT(MM)	F'(X)	F(X)ADJ	F(X)	D
1	176.4000	.0625	.0297	.0297	.0328
2	135.0300	.1250	.1241	.1241	.0009
3	126.9000	.1875	.1610	.1610	.0265
4	121.0900	.2500	.1927	.1927	.0573
5	108.7200	.3125	.2773	.2773	.0352
6	96.6300	.3750	.3843	.3843	.0093
7	93.1800	.4375	.4191	.4191	.0184
8	78.2800	.5000	.5869	.5869	.0869
9	74.8200	.5625	.6283	.6283	.0658
10	74.7500	.6250	.6291	.6291	.0041
11	74.6000	.6875	.6309	.6309	.0566
12	62.5700	.7500	.7719	.7719	.0219
13	61.2300	.8125	.7867	.7867	.0258
14	43.9000	.8750	.9379	.9379	.0629
15	40.0500	.9375	.9587	.9587	.0212

D MAX = .0869
D CRITICAL = .3400
ACCEPTED AT 0.05 SIGNIFICANCE LEVEL

INPUT FILE: INPUT.TXT (NON-ZERO DATA = 15 , ZERO DATA = 0)
OUTPUT FILE: OUTPUT.EV1

EXTREME VALUE TYPE I DISIBUTION

METHOD OF MOMENT

ALPHA	.03460	M1	91.20999
BETA	74.52733	M2	1374.37700
		SKEW	.62049

T,YEARS	T-ADJUST	XT(MM)
2.00	2.00	85.1215
5.00	5.00	117.8837
10.00	10.00	139.5750
20.00	20.00	160.3819
25.00	25.00	166.9822
50.00	50.00	187.3143
100.00	100.00	207.4964
200.00	200.00	227.6048
500.00	500.00	254.1340
1000.00	1000.00	274.1841

KOLMOGOROV-SMIRNOV TEST

M	XT(MM)	F'(X)	F(X)ADJ	F(X)	D
1	176.4000	.0625	.0290	.0290	.0335
2	135.0300	.1250	.1160	.1160	.0090
3	126.9000	.1875	.1507	.1507	.0368
4	121.0900	.2500	.1810	.1810	.0690
5	108.7200	.3125	.2639	.2639	.0486
6	96.6300	.3750	.3722	.3722	.0028
7	93.1800	.4375	.4082	.4082	.0293
8	78.2800	.5000	.5845	.5845	.0845
9	74.8200	.5625	.6284	.6284	.0659
10	74.7500	.6250	.6293	.6293	.0043
11	74.6000	.6875	.6312	.6312	.0563
12	62.5700	.7500	.7796	.7796	.0296
13	61.2300	.8125	.7949	.7949	.0176
14	43.9000	.8750	.9442	.9442	.0692
15	40.0500	.9375	.9630	.9630	.0255

D MAX = .0845
D CRITICAL = .3400
ACCEPTED AT 0.05 SIGNIFICANCE LEVEL

INPUT FILE: INPUT.TXT (NON-ZERO DATA = 15 , ZERO DATA = 0)
OUTPUT FILE: OUTPUT.LN3

THREE PARAMETER LOGNORM DISTRIBUTION

METHOD OF MOMENTS

A	-56.80856
MEAN OF LN(X-A)	4.96692
VARIANCE OF LN(X-A)	.06084
SKEW OF X	.76709

T,YEARS	T ADJUST	XT(MM)
2.00	2.00	86.7750
5.00	5.00	119.8944
10.00	10.00	140.1646
20.00	20.00	158.6404
25.00	25.00	164.3404
50.00	50.00	181.5085
100.00	100.00	198.0836
200.00	200.00	214.2595
500.00	500.00	235.2422
1000.00	1000.00	250.9216

KOLMOGOROV-SMIRNOV TEST

M	XT(MM)	F'(X)	F(X)ADJ	F(X)	D
1	176.4000	.0625	.0246	.0246	.0379
2	135.0300	.1250	.1201	.1201	.0049
3	126.9000	.1875	.1589	.1589	.0286
4	121.0900	.2500	.1925	.1925	.0575
5	108.7200	.3125	.2821	.2821	.0304
6	96.6300	.3750	.3939	.3939	.0189
7	93.1800	.4375	.4298	.4298	.0077
8	78.2800	.5000	.5976	.5976	.0976
9	74.8200	.5625	.6377	.6377	.0752
10	74.7500	.6250	.6386	.6386	.0136
11	74.6000	.6875	.6403	.6403	.0472
12	62.5700	.7500	.7729	.7729	.0229
13	61.2300	.8125	.7865	.7865	.0260
14	43.9000	.8750	.9248	.9248	.0498
15	40.0500	.9375	.9448	.9448	.0073

D MAX = .0976
D CRITICAL = .3400
ACCEPTED AT 0.05 SIGNIFICANCE LEVEL

Smirnov Kolmogorov Test for Log Pearson Type III Distribution

Significance level	D CRITICAL (Dc)	D MAX (Dn)	Dn < Dc
0.05	0.340	0.0869	Accepted

Smirnov Kolmogorov Test for Gumbel Distribution

Significance level	D CRITICAL (Dc)	D MAX (Dn)	Dn < Dc
0.05	0.340	0.0845	Accepted

Smirnov Kolmogorov Test for Log Normal Distribution

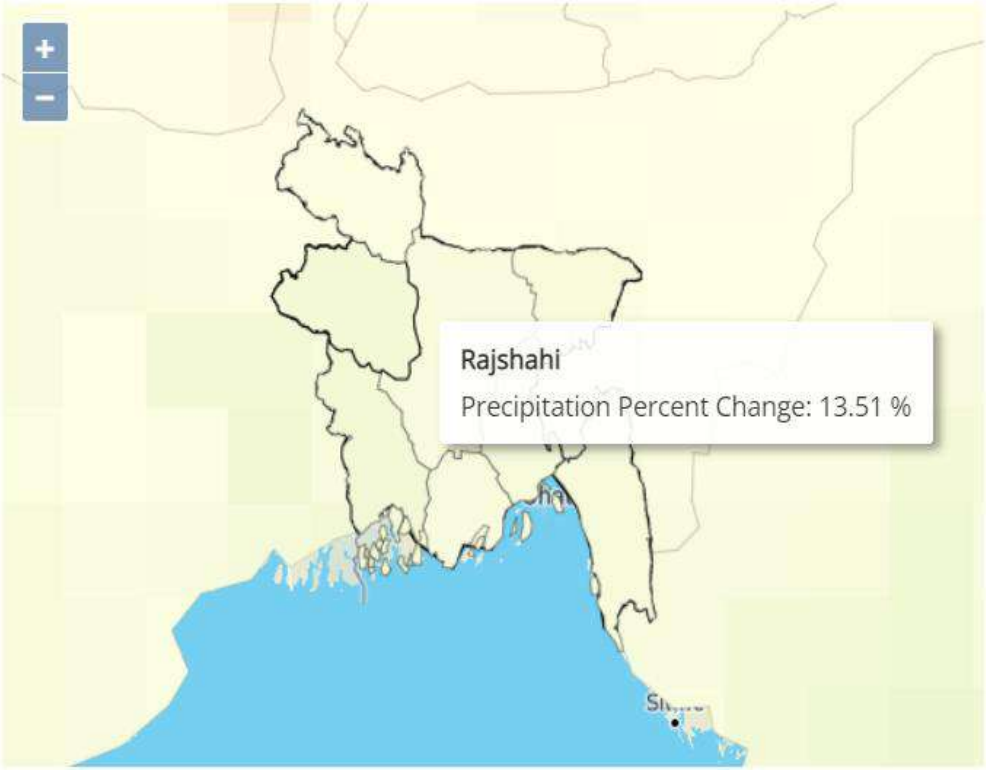
Significance level	D CRITICAL (Dc)	D MAX (Dn)	Dn < Dc
0.05	0.340	0.0976	Accepted

When a test result can accept the suitability of more than one distribution function and use criteria to determine whether
Functions that can be best adapted to the data have the least value Dn.

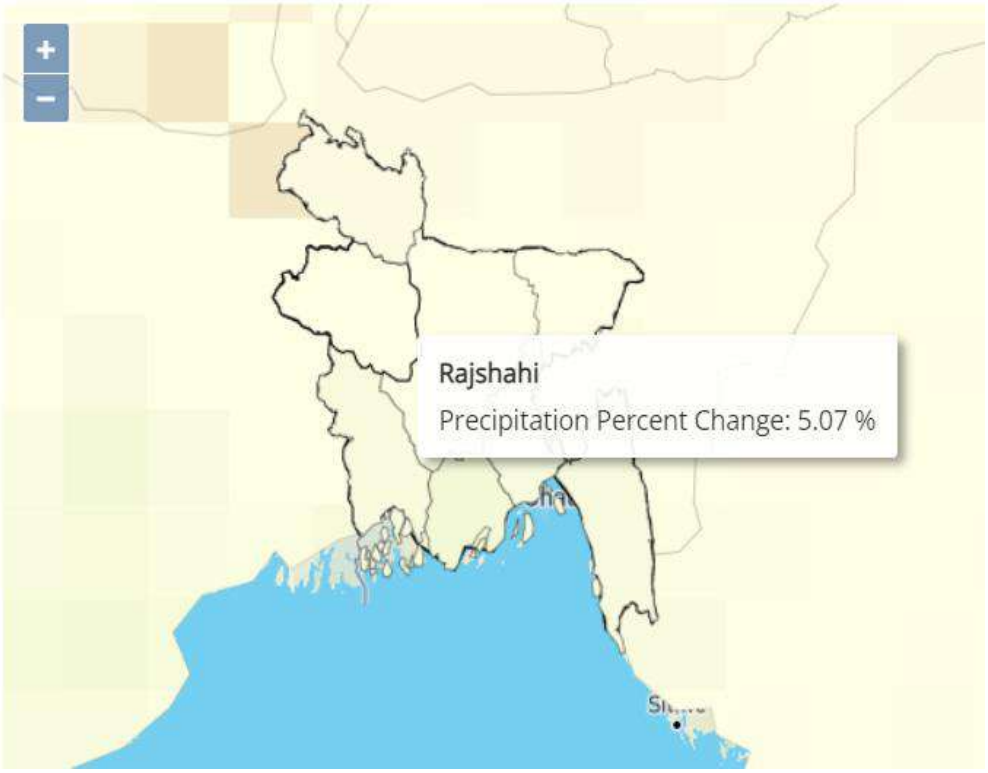
From the calculation analysis and taking into account the physical aspects of the field, it can be determined the design flood discharge analysis can use the rainfall design by Gumbel Distribution method. So the results of the calculation of rainfall design with various time can be seen in the following table.

Projected Precipitation Percent Change Anomaly for 2020-2039 (Annual)
Bangladesh; (Ref. Period: 1995-2014), SSP1-1.9

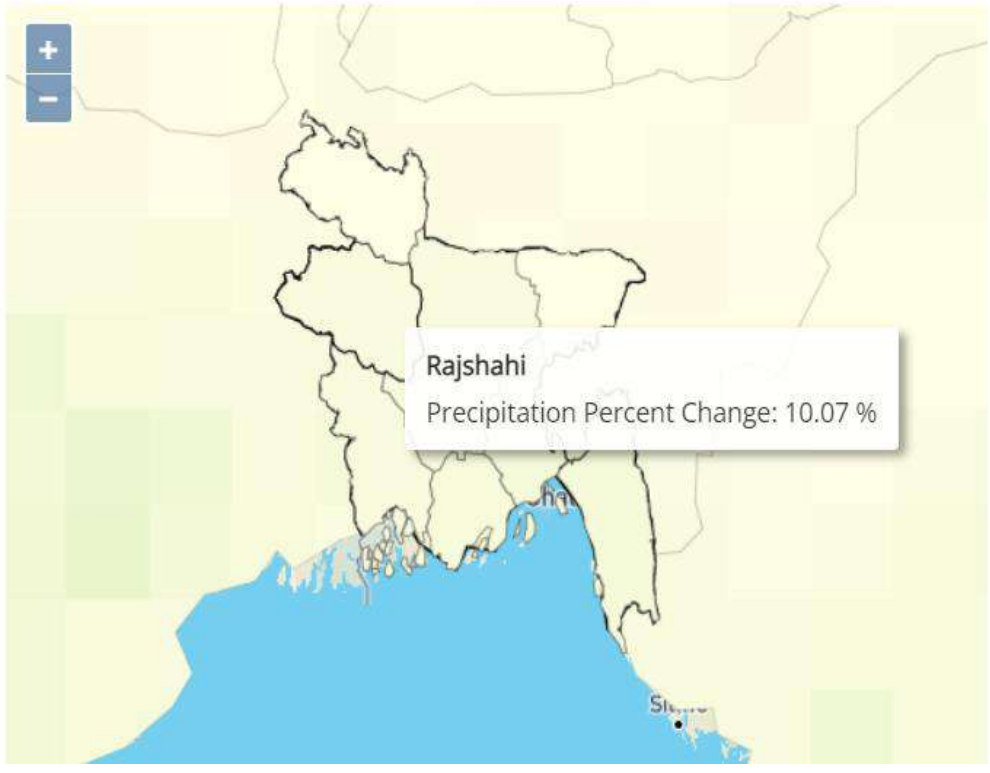
Projected Precipitation Percent Change Anomaly for 2040-2059 (Annual)
Bangladesh; (Ref. Period: 1995-2014), SSP1-1.9



Projected Precipitation Percent Change Anomaly for 2060-2079 (Annual)
Bangladesh; (Ref. Period: 1995-2014), SSP1-1.9



Projected Precipitation Percent Change Anomaly for 2080-2099 (Annual)
Bangladesh; (Ref. Period: 1995-2014), SSP1-1.9



Projected Change in Annual Precipitation as Percentage

	Annual Precipitation (%)			
	2020-2039	2040-2059	2060-2079	2080-2099
Bangladesh	7.6	9.12	4.48	7.46
Barisal	10.39	9.89	13.84	11.58
Chittagong	8.89	10.97	8.72	12.31
Rajshahi	10.02	13.51	5.07	10.07
Dhaka	9.72	10.08	3.69	9.43
Rangpur	5.07	6.17	0.69	3.81
Khulna	11.54	14.61	8.84	10.17
Sylhet	7.86	10.9	3.7	3.9

** Project site is located in Rajshahi Division

Ref.
https://climateknowledgeportal.worldbank.org/country/bangladesh/climate-data-projections

As presented from (https://climateknowledgeportal.worldbank.org/country/bangladesh/climate-data-projections) "Projected change in annual precipitation as percentage for Rajshahi Division". Predict rainfall increase +15.42% by the 2047's.

From predicted rainfall increase +15.42% by 2047 or about 25 years from present (solar power project life).
So, estimations of maximum daily rainfall will be made based on this assumption; due to future climate change rainfall intensity is considered to increase by 15.42% for the future of 25 years.

The estimated maximum daily rainfall intensity values by Gumbel Distribution method with effect from future Climate Change Factor as predicted by The World Bank Group will be used for further estimation of maximum flood discharges.

Table D3-2: Estimated max daily rainfall from Gumbel Distribution at various return periods without effect from future climate change in column (3) and with effect from future climate change in column (4)

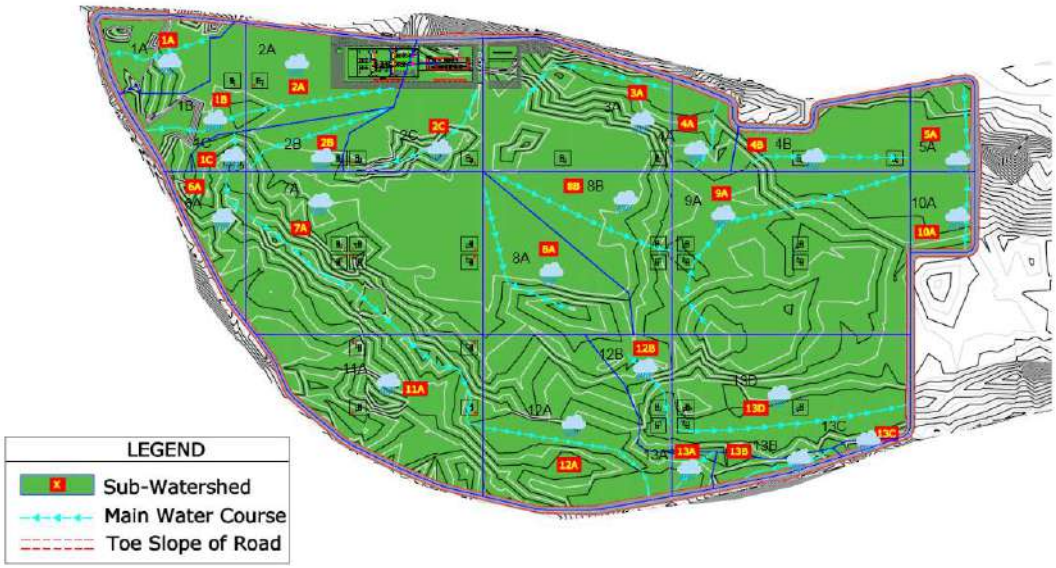
Station: 1

(1)	(2)	(3)	(4)
No.	Return Period; Tr	Estimated Max Daily Rainfall Depth; (Without effect from climate change)	Estimated Max Daily Rainfall Depth; (With effect from climate change; 15.42% in the period of 25 yr project life
	(Year)	(mm)	(mm)
1	2	85.1215	98.2472
2	5	117.8837	136.0614
3	10	139.5750	161.0975
4	20	160.3819	185.1128
5	25	166.9822	192.7309
6	50	187.3143	216.1982
7	100	207.4964	239.4923

Annex D-4

Peak Discharge Calculation using the NRCS method by Hydrology Studio software

WATERSHED MAP



Hydrograph by Return Period

Project Name:

08-25-2022

Hydrology Studio v 3.0.0.26

Hyd. No.	Hydrograph Type	Hydrograph Name	Peak Outflow (cms)							
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
1	NRCS Runoff	1A					0.4437			
2	NRCS Runoff	1B					0.4722			
3	NRCS Runoff	1C					0.1327			
4	NRCS Runoff	2A					0.3390			
5	NRCS Runoff	2B					0.1815			
6	NRCS Runoff	2C					0.5414			
7	NRCS Runoff	3A					0.8660			
8	NRCS Runoff	4A					0.2932			
9	NRCS Runoff	4B					0.3793			
10	NRCS Runoff	5A					0.3371			
11	NRCS Runoff	6A					0.3618			
12	NRCS Runoff	7A					0.8705			
13	NRCS Runoff	8A					0.5427			
14	NRCS Runoff	8B					0.4936			
15	NRCS Runoff	9A					0.9925			
16	NRCS Runoff	10A					0.3078			
17	NRCS Runoff	11A					0.7677			
18	NRCS Runoff	12A					0.4143			
19	NRCS Runoff	12B					0.3335			
20	NRCS Runoff	13A					0.1030			
21	NRCS Runoff	13B					0.1240			
22	NRCS Runoff	13C					0.0381			
23	NRCS Runoff	13D					0.3810			

Hydrograph 10-yr Summary

Project Name:

Hydrology Studio v 3.0.0.26

08-25-2022

Hyd. No.	Hydrograph Type	Hydrograph Name	Peak Flow (cms)	Time to Peak (hrs)	Hydrograph Volume (cum)	Inflow Hyd(s)	Maximum Elevation (m)	Maximum Storage (cum)
1	NRCS Runoff	1A	0.4437	12.02	1,246	----		
2	NRCS Runoff	1B	0.4722	12.02	1,326	----		
3	NRCS Runoff	1C	0.1327	11.95	270	----		
4	NRCS Runoff	2A	0.3390	12.30	2,023	----		
5	NRCS Runoff	2B	0.1815	12.15	775	----		
6	NRCS Runoff	2C	0.5414	12.10	1,958	----		
7	NRCS Runoff	3A	0.8660	12.12	3,346	----		
8	NRCS Runoff	4A	0.2932	12.00	753	----		
9	NRCS Runoff	4B	0.3793	12.13	1,559	----		
10	NRCS Runoff	5A	0.3371	12.00	866	----		
11	NRCS Runoff	6A	0.3618	12.02	1,016	----		
12	NRCS Runoff	7A	0.8705	12.35	5,703	----		
13	NRCS Runoff	8A	0.5427	12.13	2,231	----		
14	NRCS Runoff	8B	0.4936	12.18	2,347	----		
15	NRCS Runoff	9A	0.9925	12.28	5,700	----		
16	NRCS Runoff	10A	0.3078	12.00	791	----		
17	NRCS Runoff	11A	0.7677	12.18	3,650	----		
18	NRCS Runoff	12A	0.4143	12.65	3,915	----		
19	NRCS Runoff	12B	0.3335	12.00	857	----		
20	NRCS Runoff	13A	0.1030	11.98	242	----		
21	NRCS Runoff	13B	0.1240	12.03	368	----		
22	NRCS Runoff	13C	0.0381	11.93	70.6	----		
23	NRCS Runoff	13D	0.3810	12.78	4,027	----		

Hydrograph Report

Project Name:

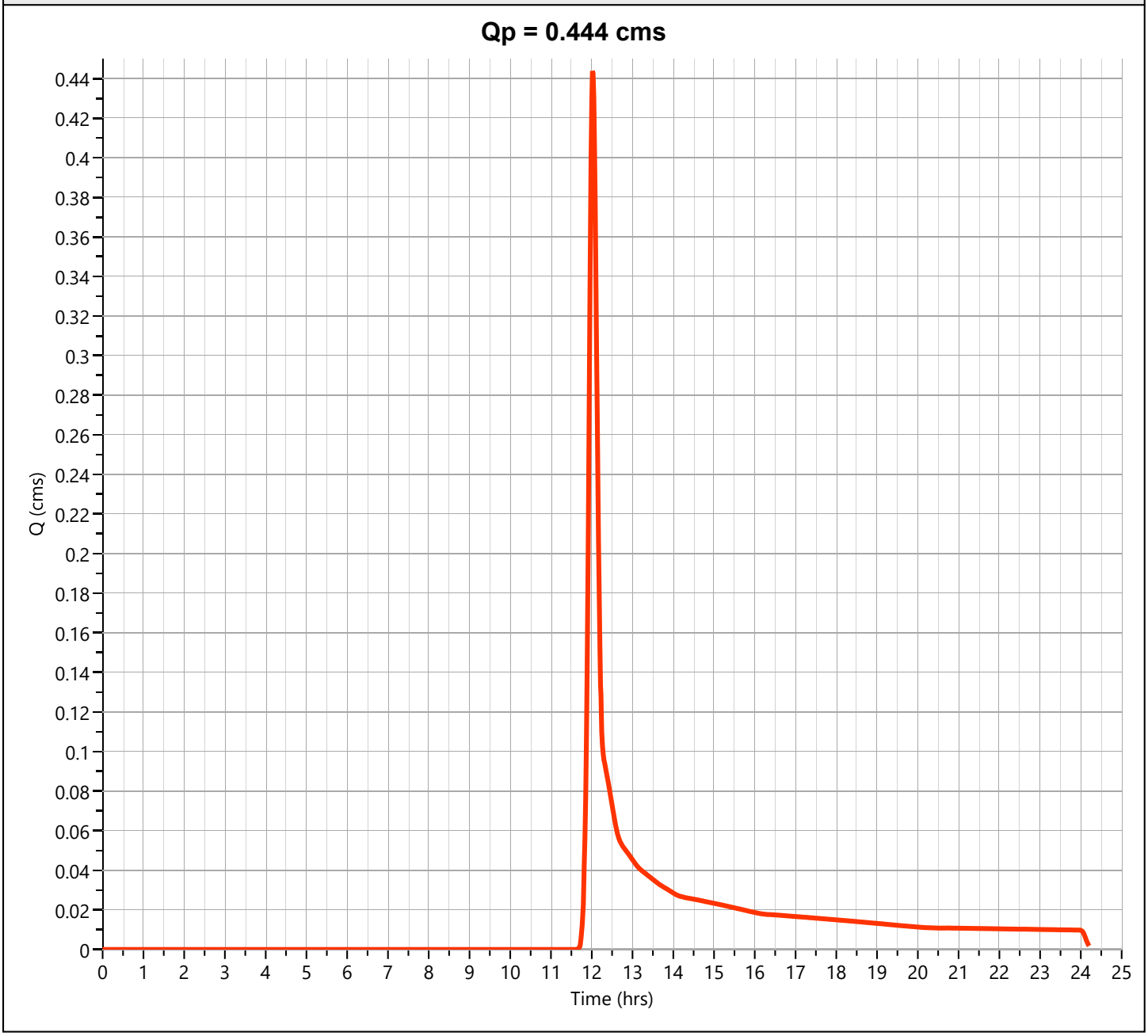
Hydrology Studio v 3.0.0.26

08-25-2022

1A

Hyd. No. 1

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.4437 cms
Storm Frequency	= 10-yr	Time to Peak	= 12.02 hrs
Time Interval	= 1 min	Runoff Volume	= 1,246 cum
Drainage Area	= 3.9 ha	Curve Number	= 49
Tc Method	= Kirpich	Time of Conc. (Tc)	= 10.33 min
Basin Slope	= 0.43 %	Hydraulic Length	= 230.91 m
Total Rainfall	= 161 mm	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 0.208



Hydrograph Report

Project Name:

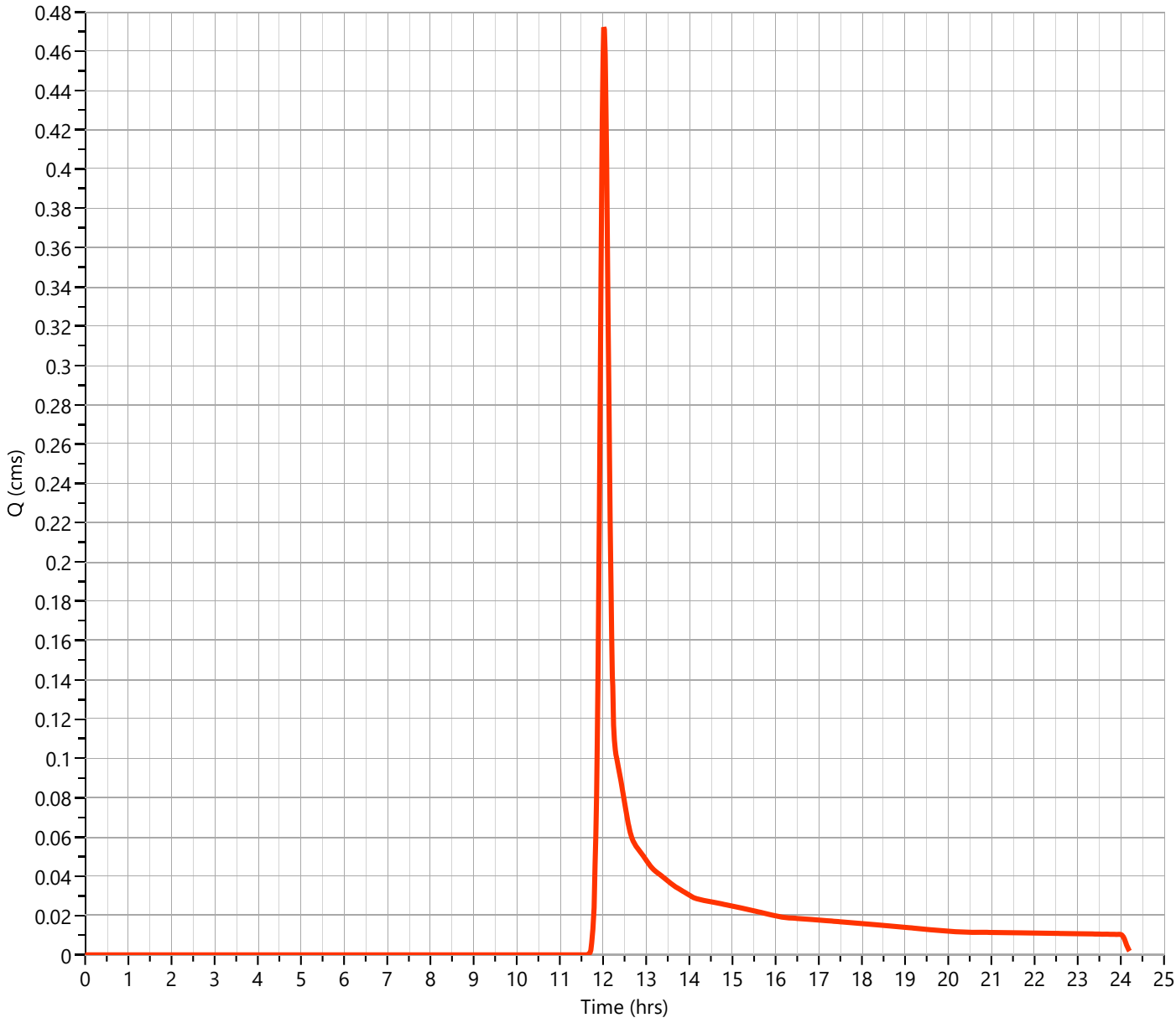
Hydrology Studio v 3.0.0.26

08-25-2022

1B

Hyd. No. 2

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.4722 cms
Storm Frequency	= 10-yr	Time to Peak	= 12.02 hrs
Time Interval	= 1 min	Runoff Volume	= 1,326 cum
Drainage Area	= 4.15 ha	Curve Number	= 49
Tc Method	= Kirpich	Time of Conc. (Tc)	= 10.4 min
Basin Slope	= 0.4 %	Hydraulic Length	= 224.47 m
Total Rainfall	= 161 mm	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 0.208



Hydrograph Report

Project Name:

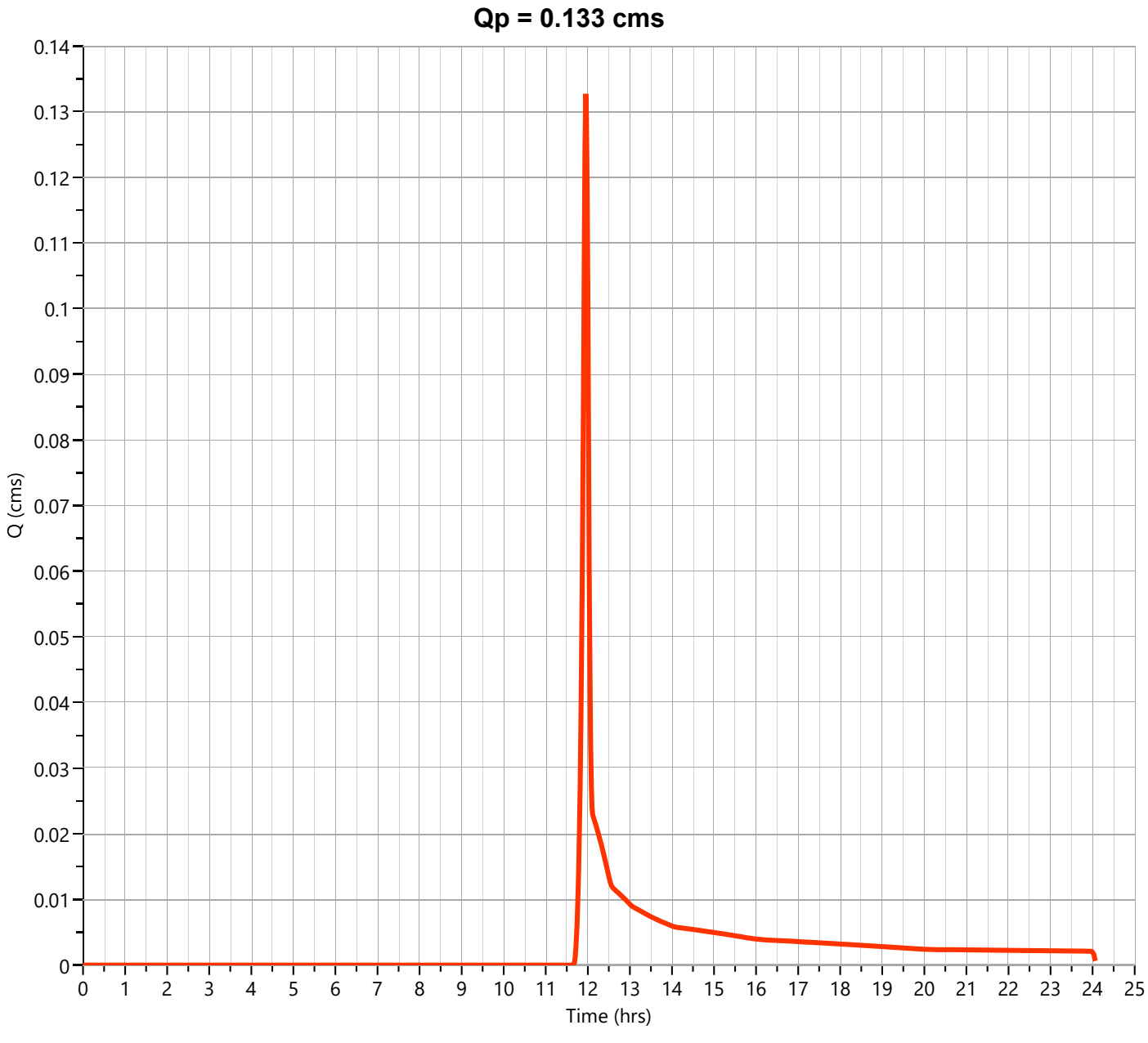
Hydrology Studio v 3.0.0.26

08-25-2022

1C

Hyd. No. 3

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.1327 cms
Storm Frequency	= 10-yr	Time to Peak	= 11.95 hrs
Time Interval	= 1 min	Runoff Volume	= 270 cum
Drainage Area	= 0.86 ha	Curve Number	= 49
Tc Method	= Kirpich	Time of Conc. (Tc)	= 4.18 min
Basin Slope	= 0.53 %	Hydraulic Length	= 79.25 m
Total Rainfall	= 161 mm	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 0.208



Hydrograph Report

Project Name:

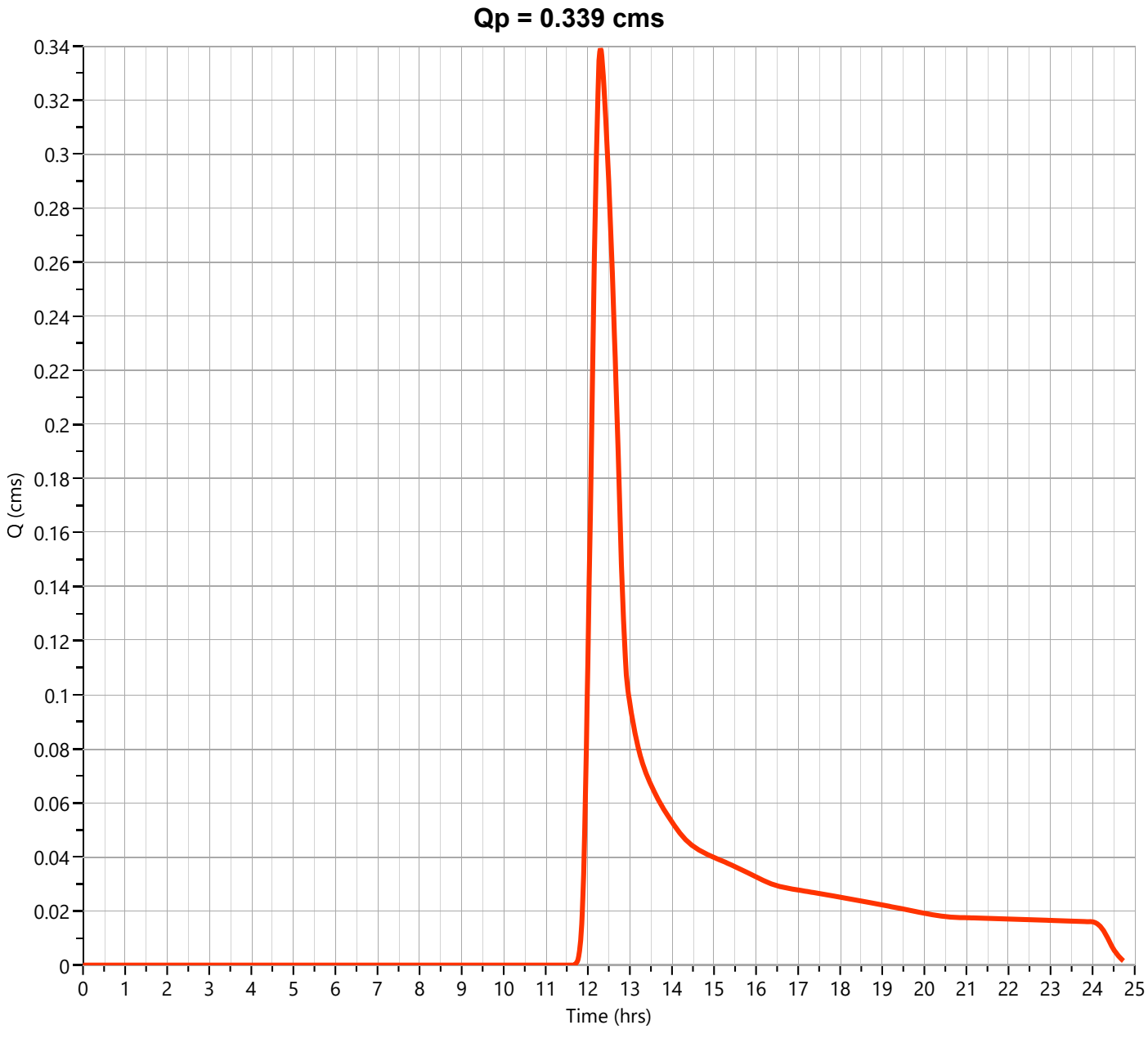
Hydrology Studio v 3.0.0.26

08-25-2022

2A

Hyd. No. 4

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.3390 cms
Storm Frequency	= 10-yr	Time to Peak	= 12.30 hrs
Time Interval	= 1 min	Runoff Volume	= 2,023 cum
Drainage Area	= 6.41 ha	Curve Number	= 49
Tc Method	= Kirpich	Time of Conc. (Tc)	= 37.04 min
Basin Slope	= 0.03 %	Hydraulic Length	= 320.11 m
Total Rainfall	= 161 mm	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 0.208



Hydrograph Report

Project Name:

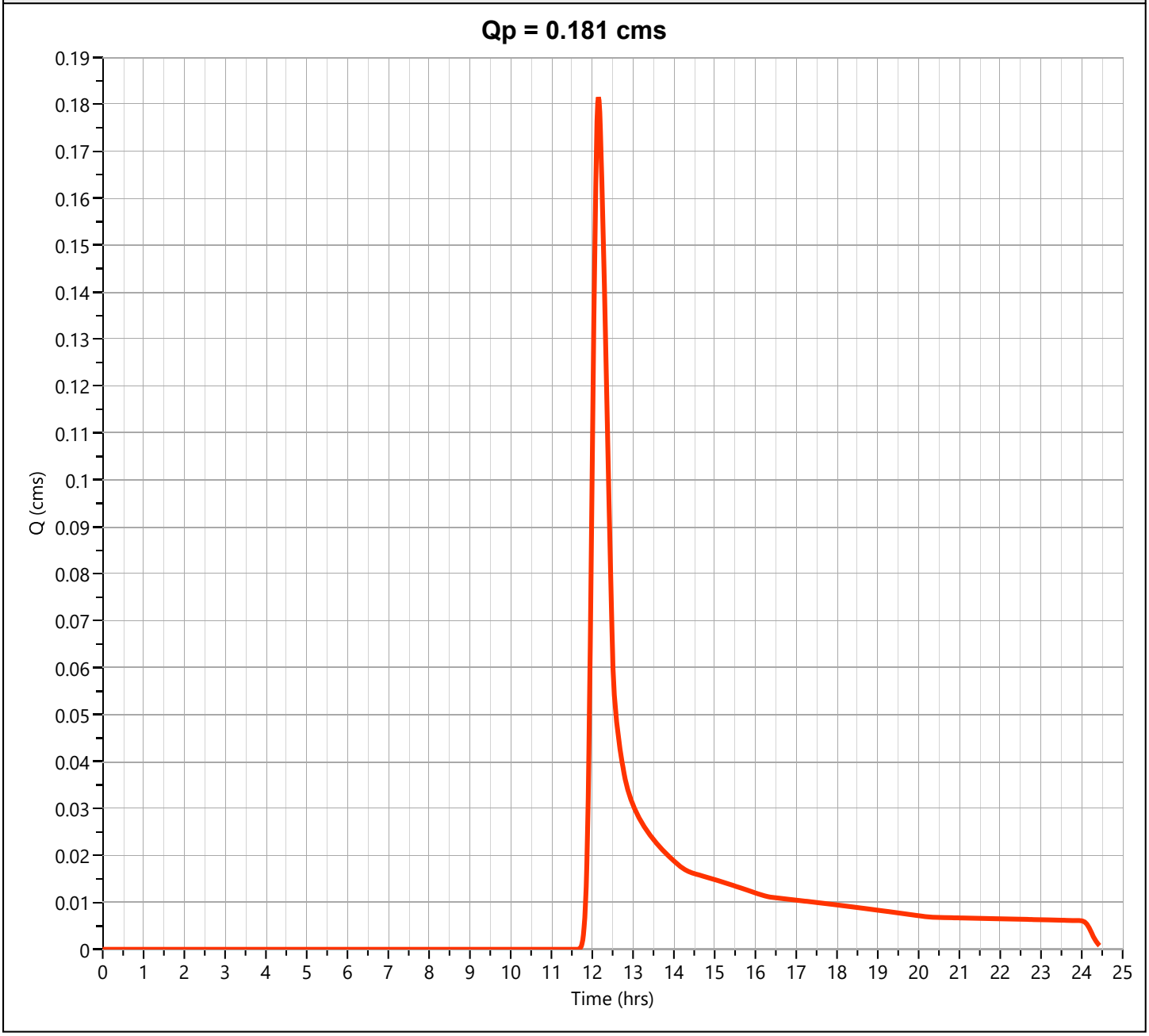
Hydrology Studio v 3.0.0.26

08-25-2022

2B

Hyd. No. 5

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.1815 cms
Storm Frequency	= 10-yr	Time to Peak	= 12.15 hrs
Time Interval	= 1 min	Runoff Volume	= 775 cum
Drainage Area	= 2.49 ha	Curve Number	= 49
Tc Method	= Kirpich	Time of Conc. (Tc)	= 22.89 min
Basin Slope	= 0.12 %	Hydraulic Length	= 342.73 m
Total Rainfall	= 161 mm	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 0.208



Hydrograph Report

Project Name:

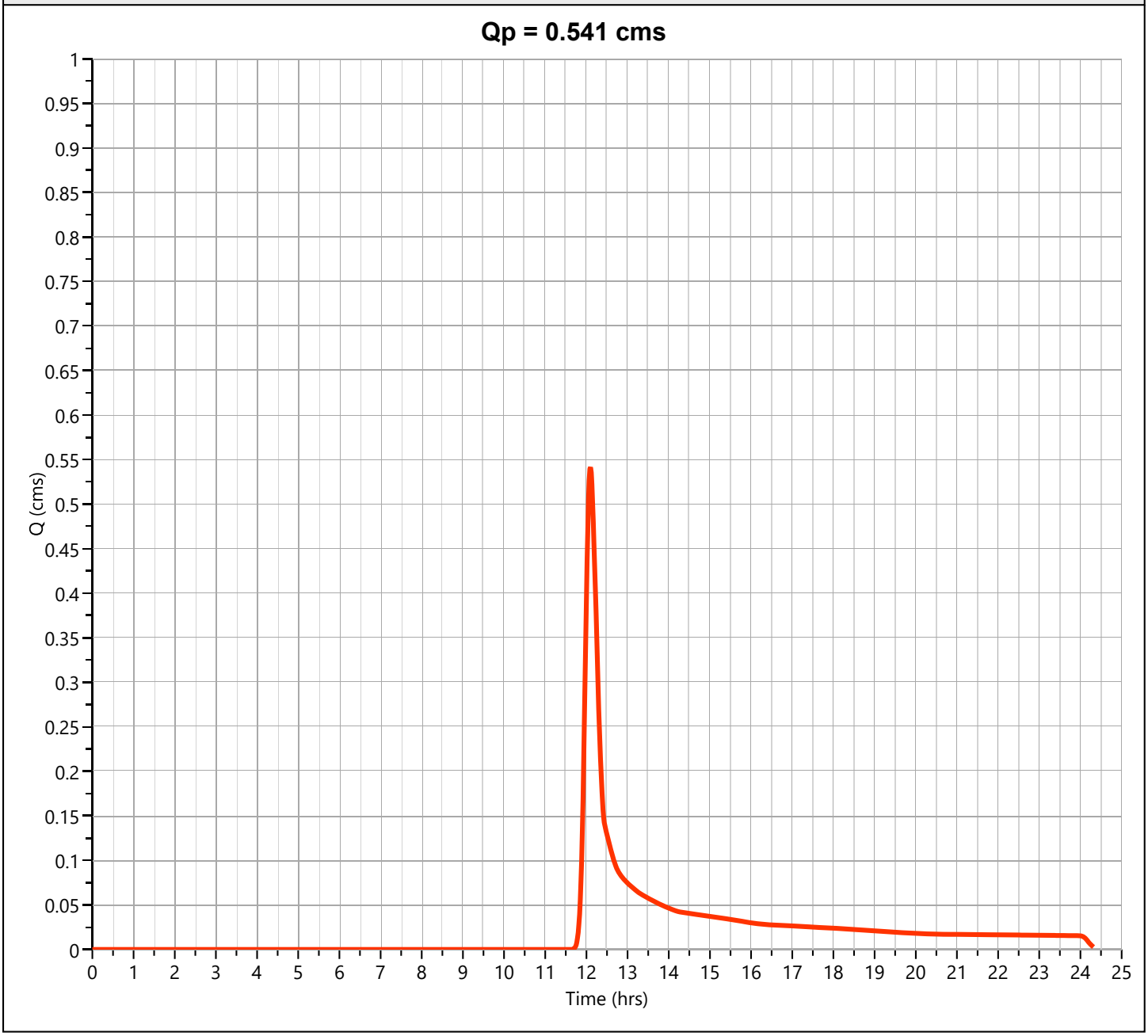
Hydrology Studio v 3.0.0.26

08-25-2022

2C

Hyd. No. 6

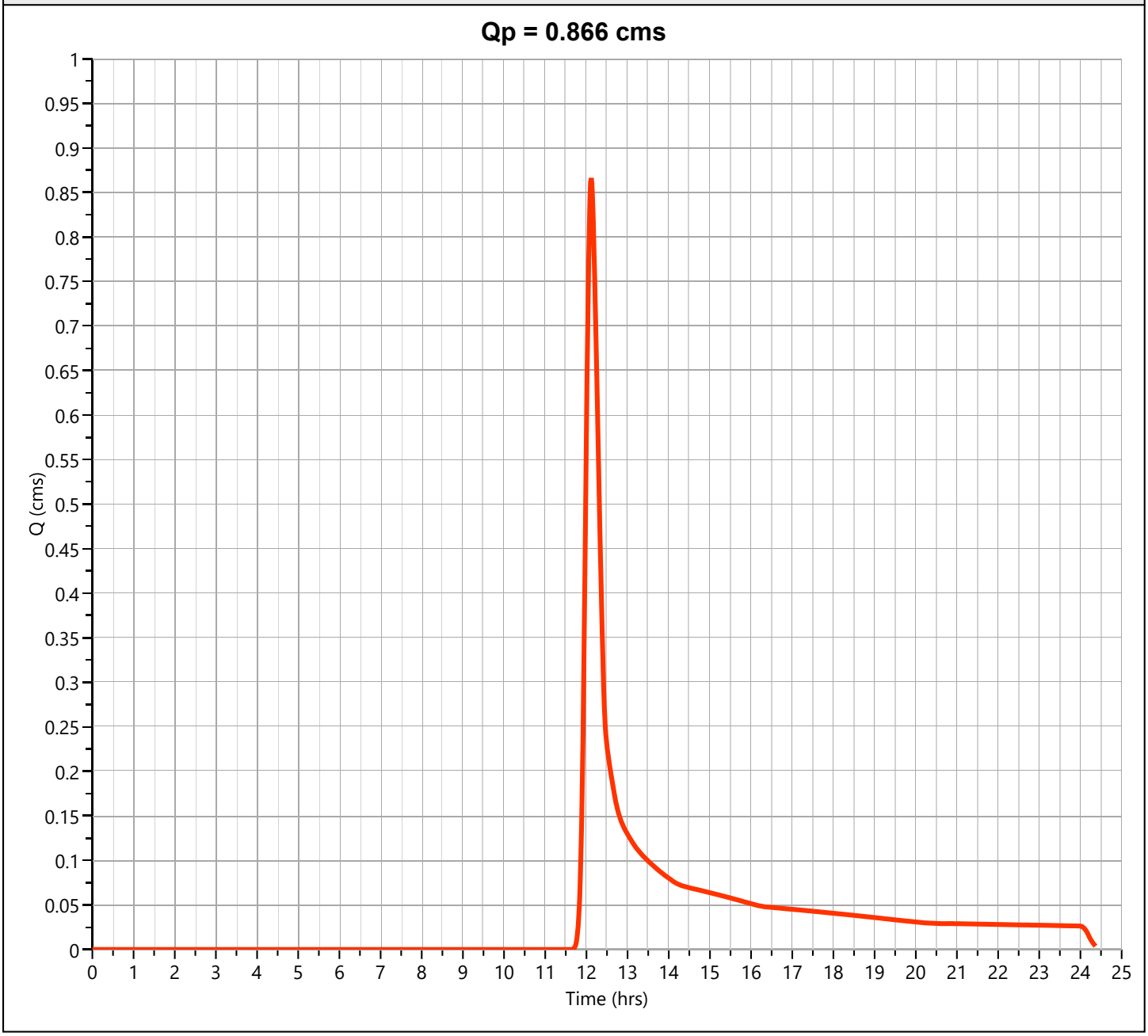
Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.5414 cms
Storm Frequency	= 10-yr	Time to Peak	= 12.10 hrs
Time Interval	= 1 min	Runoff Volume	= 1,958 cum
Drainage Area	= 6.31 ha	Curve Number	= 49
Tc Method	= Kirpich	Time of Conc. (Tc)	= 16.86 min
Basin Slope	= 0.2 %	Hydraulic Length	= 297.31 m
Total Rainfall	= 161 mm	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 0.208



3A

Hyd. No. 7

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.8660 cms
Storm Frequency	= 10-yr	Time to Peak	= 12.12 hrs
Time Interval	= 1 min	Runoff Volume	= 3,346 cum
Drainage Area	= 10.66 ha	Curve Number	= 49
Tc Method	= Kirpich	Time of Conc. (Tc)	= 18.84 min
Basin Slope	= 0.26 %	Hydraulic Length	= 391.69 m
Total Rainfall	= 161 mm	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 0.208



Hydrograph Report

Project Name:

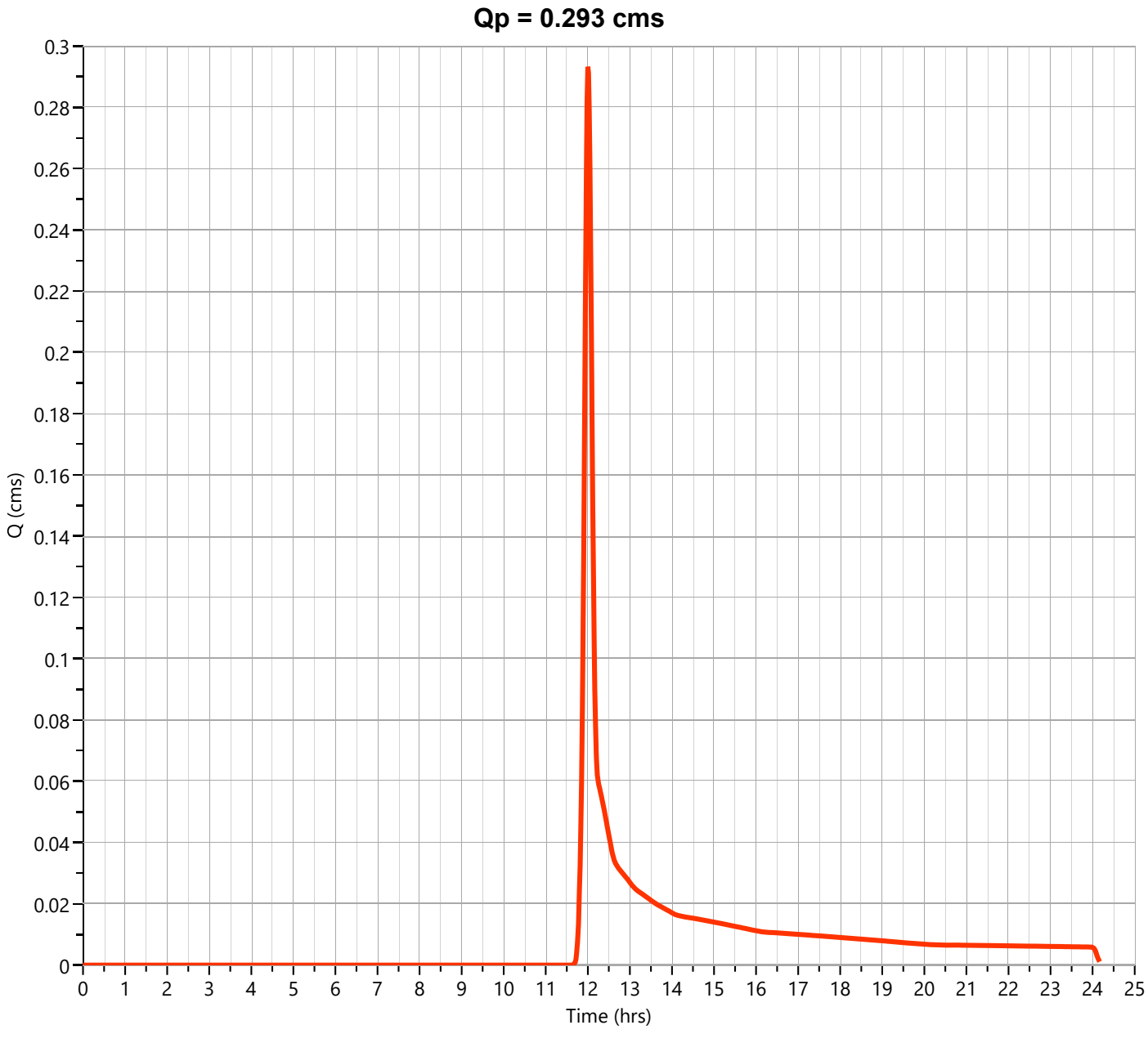
Hydrology Studio v 3.0.0.26

08-25-2022

4A

Hyd. No. 8

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.2932 cms
Storm Frequency	= 10-yr	Time to Peak	= 12.00 hrs
Time Interval	= 1 min	Runoff Volume	= 753 cum
Drainage Area	= 2.4 ha	Curve Number	= 49
Tc Method	= Kirpich	Time of Conc. (Tc)	= 8.94 min
Basin Slope	= 0.31 %	Hydraulic Length	= 162.43 m
Total Rainfall	= 161 mm	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 0.208



Hydrograph Report

Project Name:

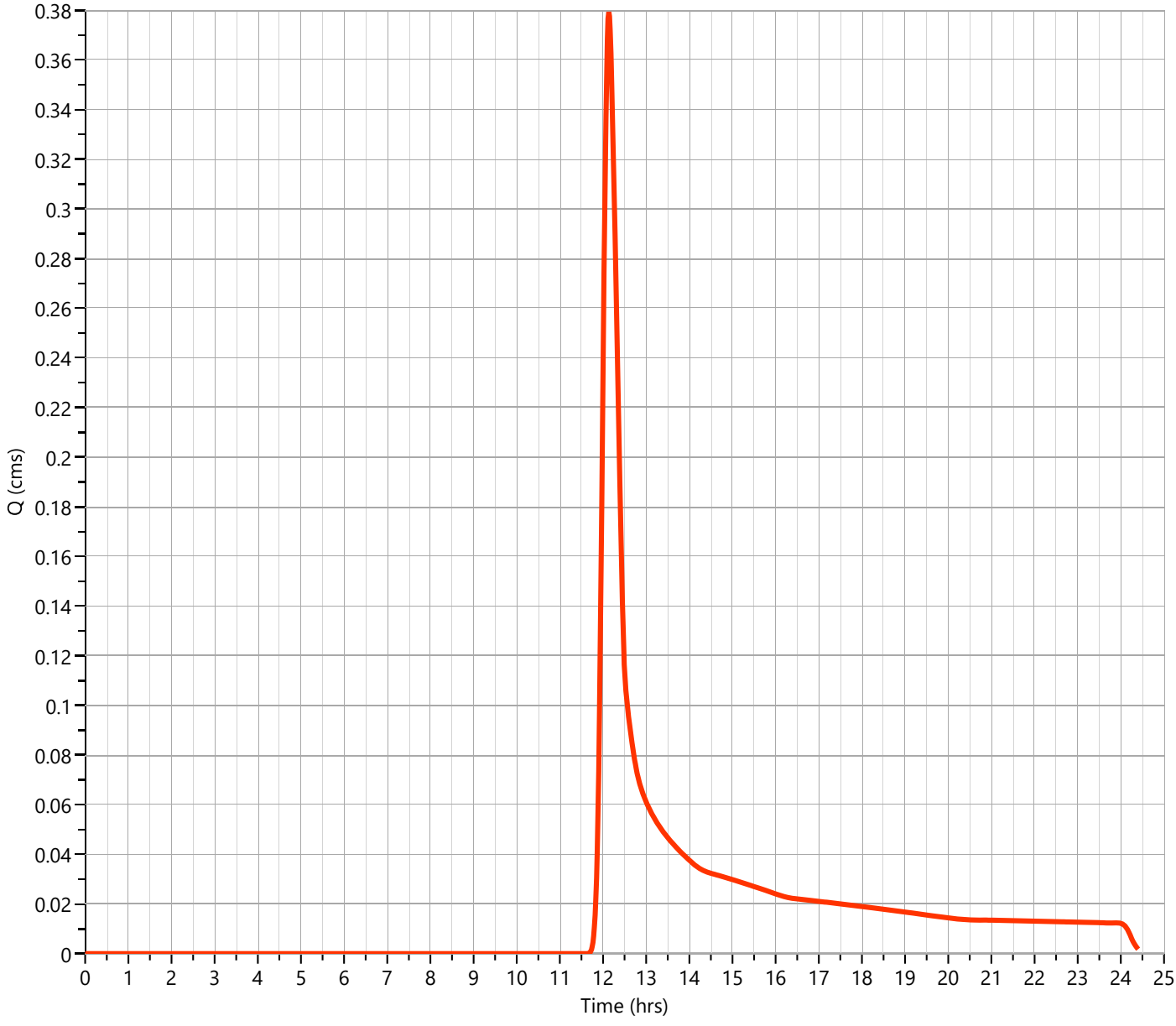
Hydrology Studio v 3.0.0.26

08-25-2022

4B

Hyd. No. 9

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.3793 cms
Storm Frequency	= 10-yr	Time to Peak	= 12.13 hrs
Time Interval	= 1 min	Runoff Volume	= 1,559 cum
Drainage Area	= 4.92 ha	Curve Number	= 49
Tc Method	= Kirpich	Time of Conc. (Tc)	= 20.96 min
Basin Slope	= 0.15 %	Hydraulic Length	= 341.77 m
Total Rainfall	= 161 mm	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 0.208



Hydrograph Report

Project Name:

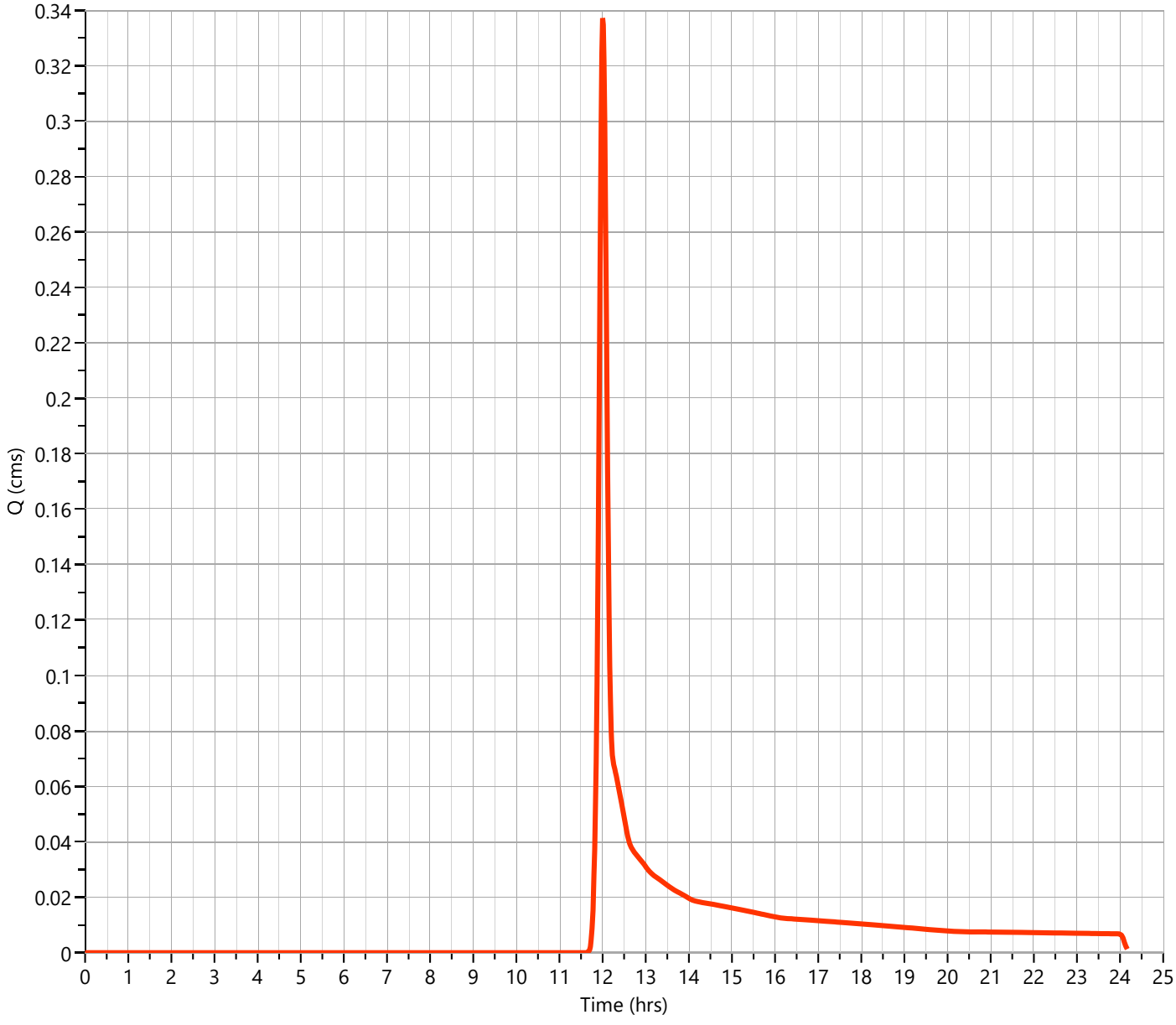
Hydrology Studio v 3.0.0.26

08-25-2022

5A

Hyd. No. 10

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.3371 cms
Storm Frequency	= 10-yr	Time to Peak	= 12.00 hrs
Time Interval	= 1 min	Runoff Volume	= 866 cum
Drainage Area	= 2.76 ha	Curve Number	= 49
Tc Method	= Kirpich	Time of Conc. (Tc)	= 9.24 min
Basin Slope	= 0.3 %	Hydraulic Length	= 166.7 m
Total Rainfall	= 161 mm	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 0.208



Hydrograph Report

Project Name:

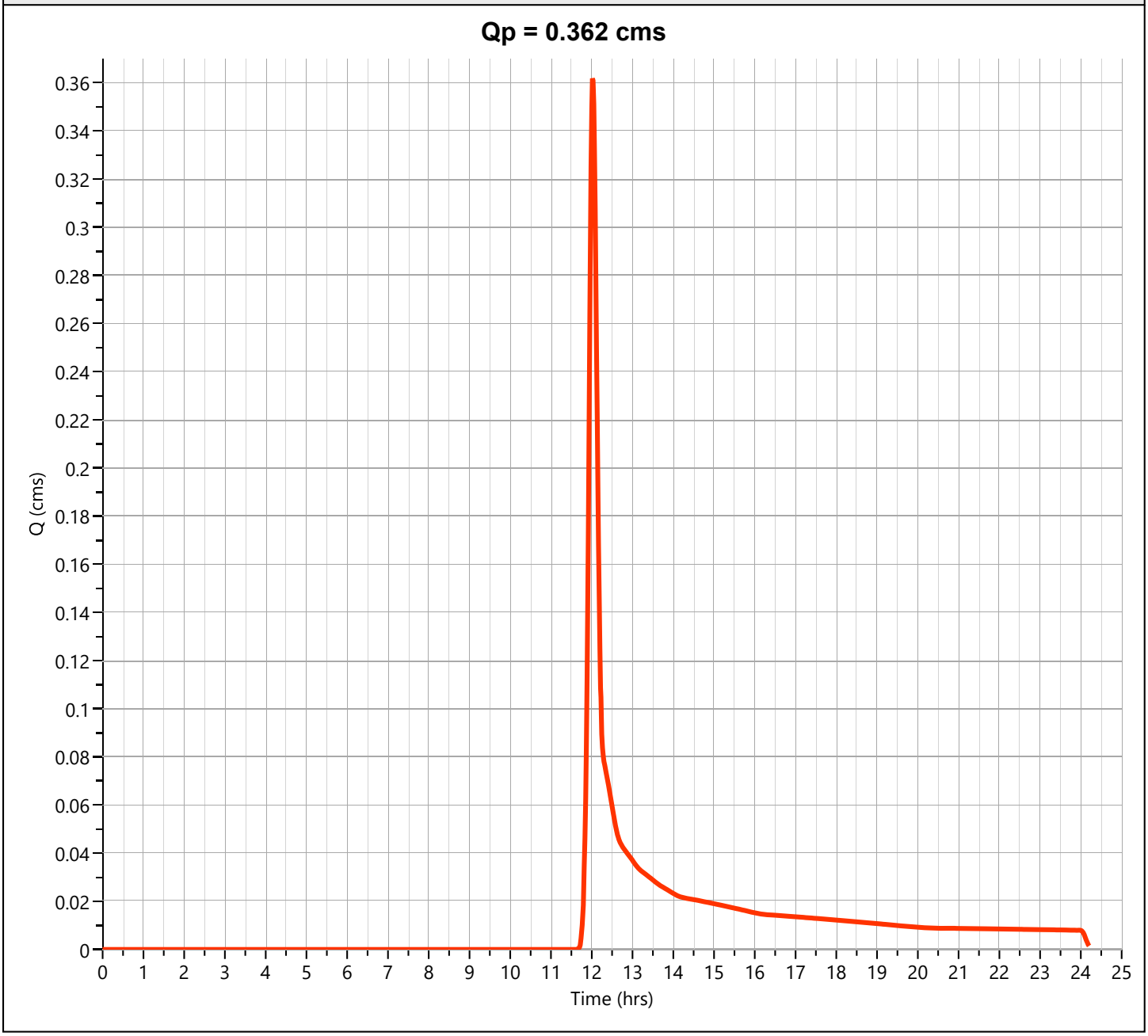
Hydrology Studio v 3.0.0.26

08-25-2022

6A

Hyd. No. 11

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.3618 cms
Storm Frequency	= 10-yr	Time to Peak	= 12.02 hrs
Time Interval	= 1 min	Runoff Volume	= 1,016 cum
Drainage Area	= 3.18 ha	Curve Number	= 49
Tc Method	= Kirpich	Time of Conc. (Tc)	= 11.66 min
Basin Slope	= 0.06 %	Hydraulic Length	= 100.95 m
Total Rainfall	= 161 mm	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 0.208



Hydrograph Report

Project Name:

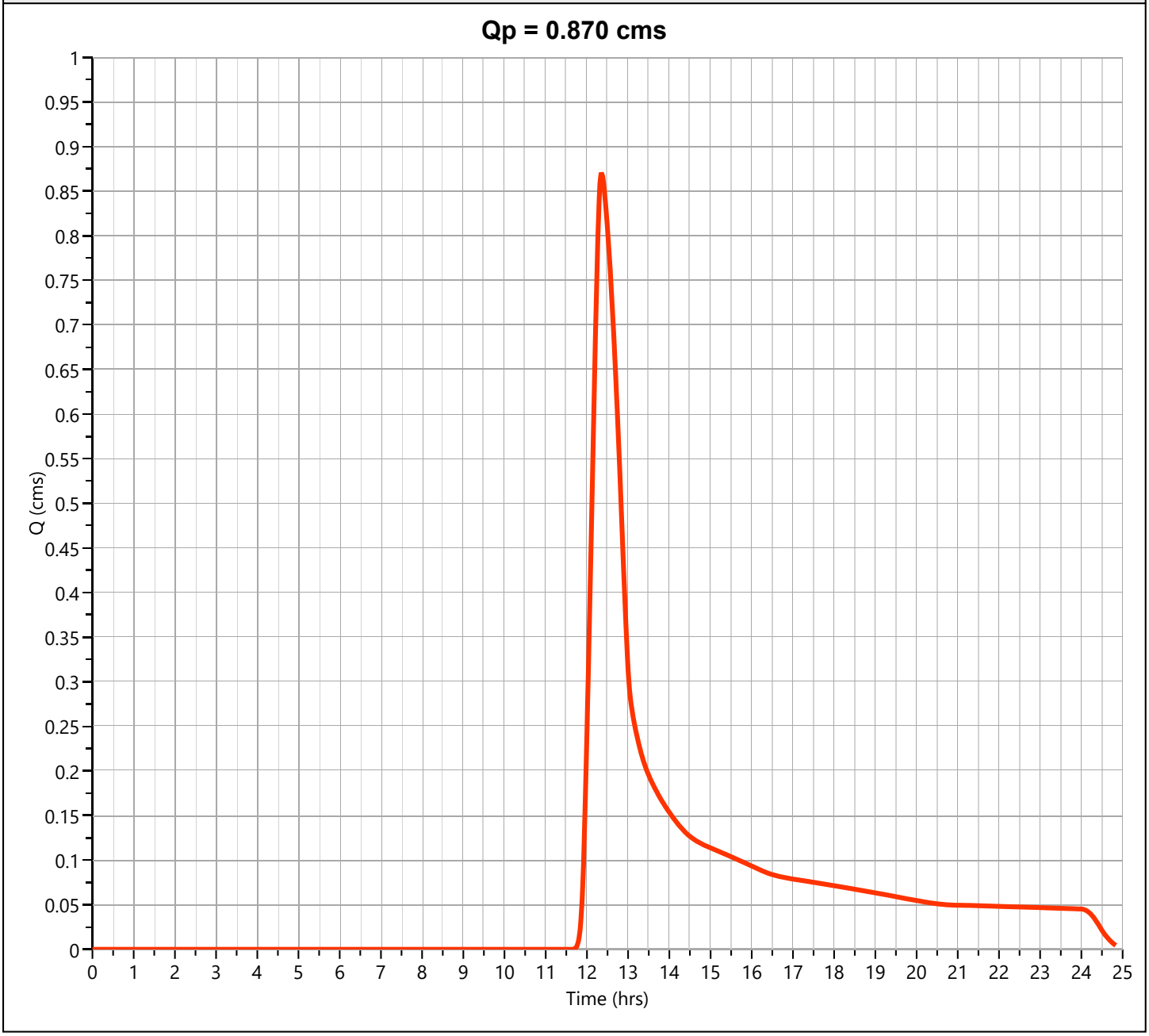
Hydrology Studio v 3.0.0.26

08-25-2022

7A

Hyd. No. 12

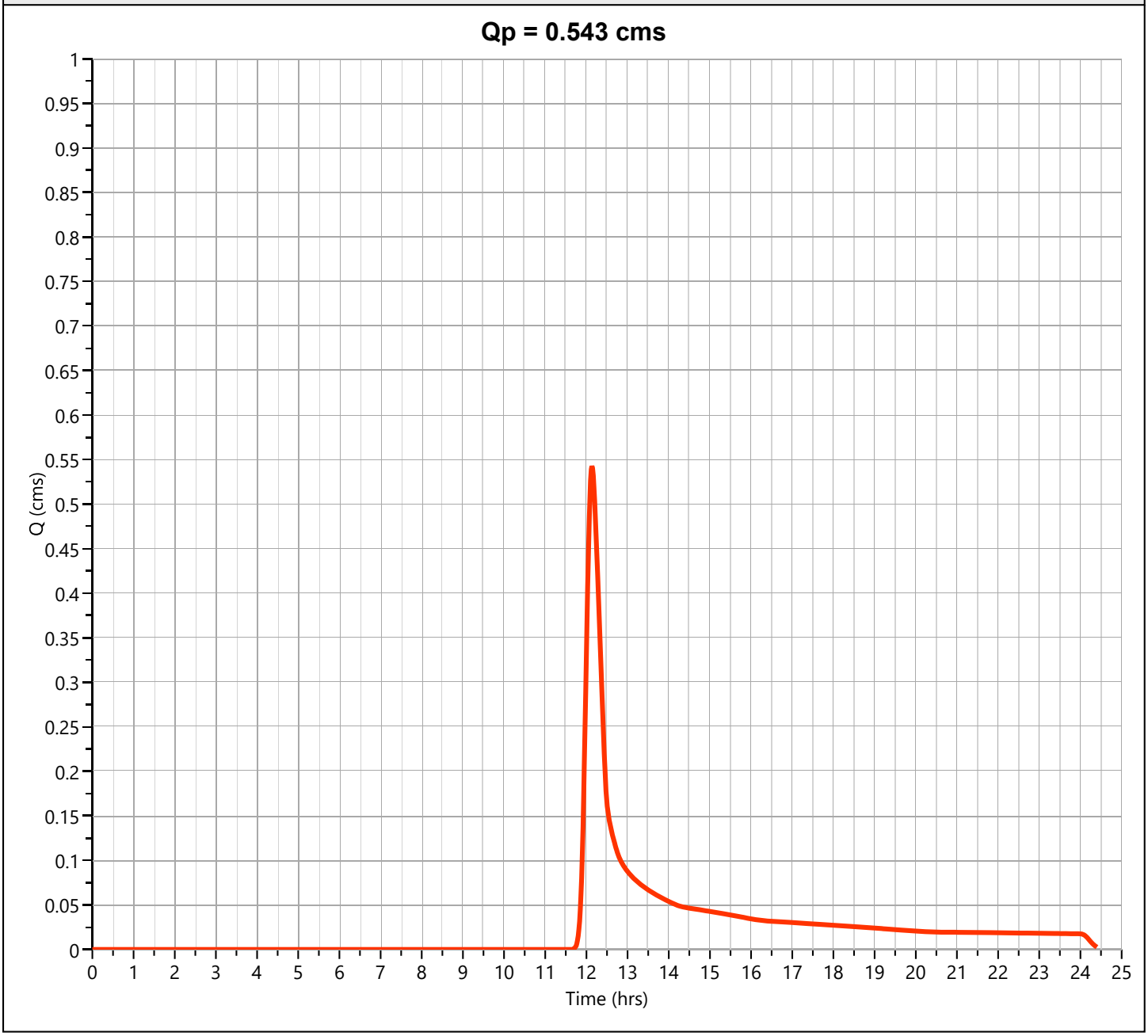
Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.8705 cms
Storm Frequency	= 10-yr	Time to Peak	= 12.35 hrs
Time Interval	= 1 min	Runoff Volume	= 5,703 cum
Drainage Area	= 18.08 ha	Curve Number	= 49
Tc Method	= Kirpich	Time of Conc. (Tc)	= 40.78 min
Basin Slope	= 0.04 %	Hydraulic Length	= 418.85 m
Total Rainfall	= 161 mm	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 0.208



8A

Hyd. No. 13

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.5427 cms
Storm Frequency	= 10-yr	Time to Peak	= 12.13 hrs
Time Interval	= 1 min	Runoff Volume	= 2,231 cum
Drainage Area	= 7.04 ha	Curve Number	= 49
Tc Method	= Kirpich	Time of Conc. (Tc)	= 20.9 min
Basin Slope	= 0.17 %	Hydraulic Length	= 362.46 m
Total Rainfall	= 161 mm	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 0.208



Hydrograph Report

Project Name:

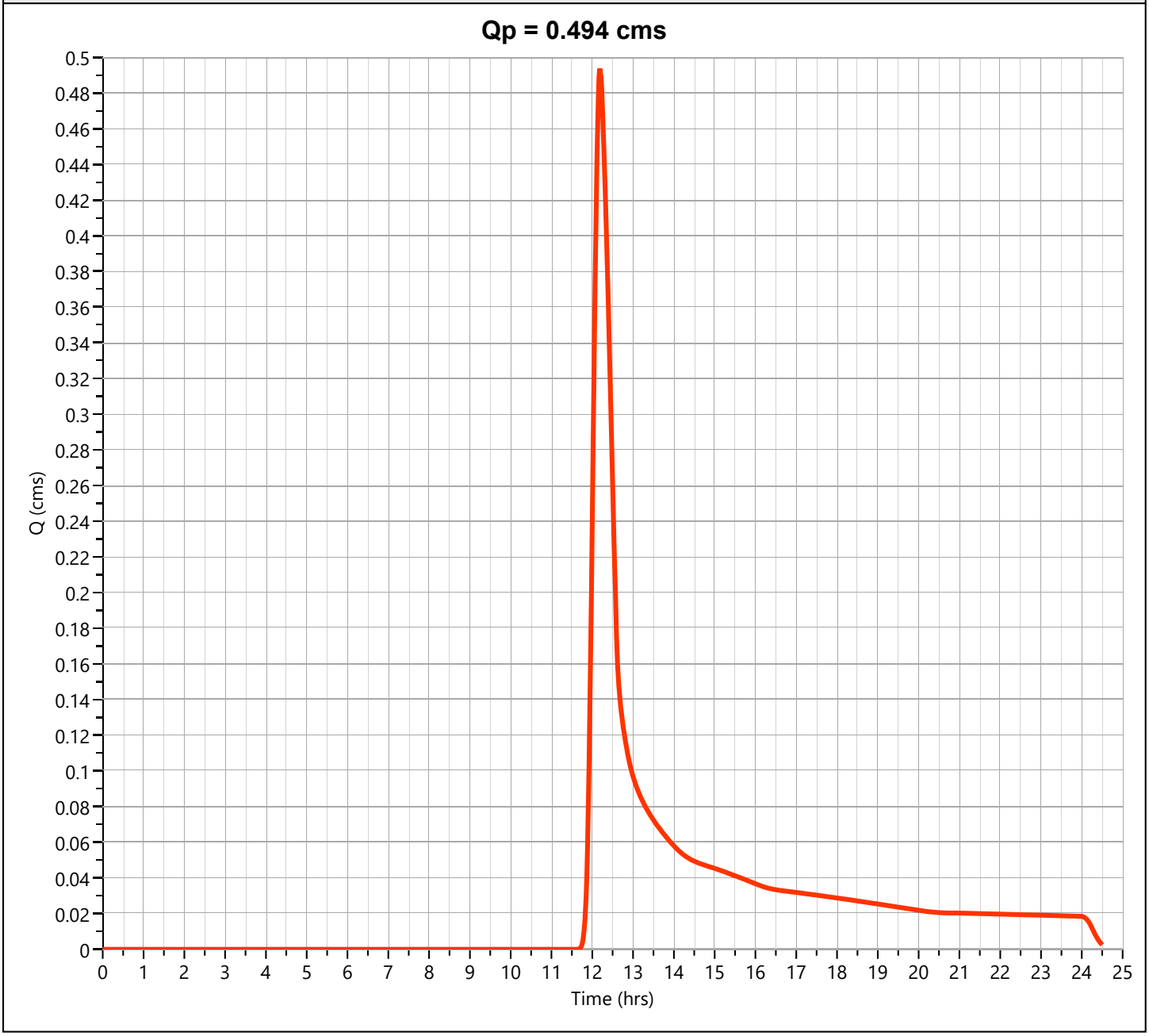
Hydrology Studio v 3.0.0.26

08-25-2022

8B

Hyd. No. 14

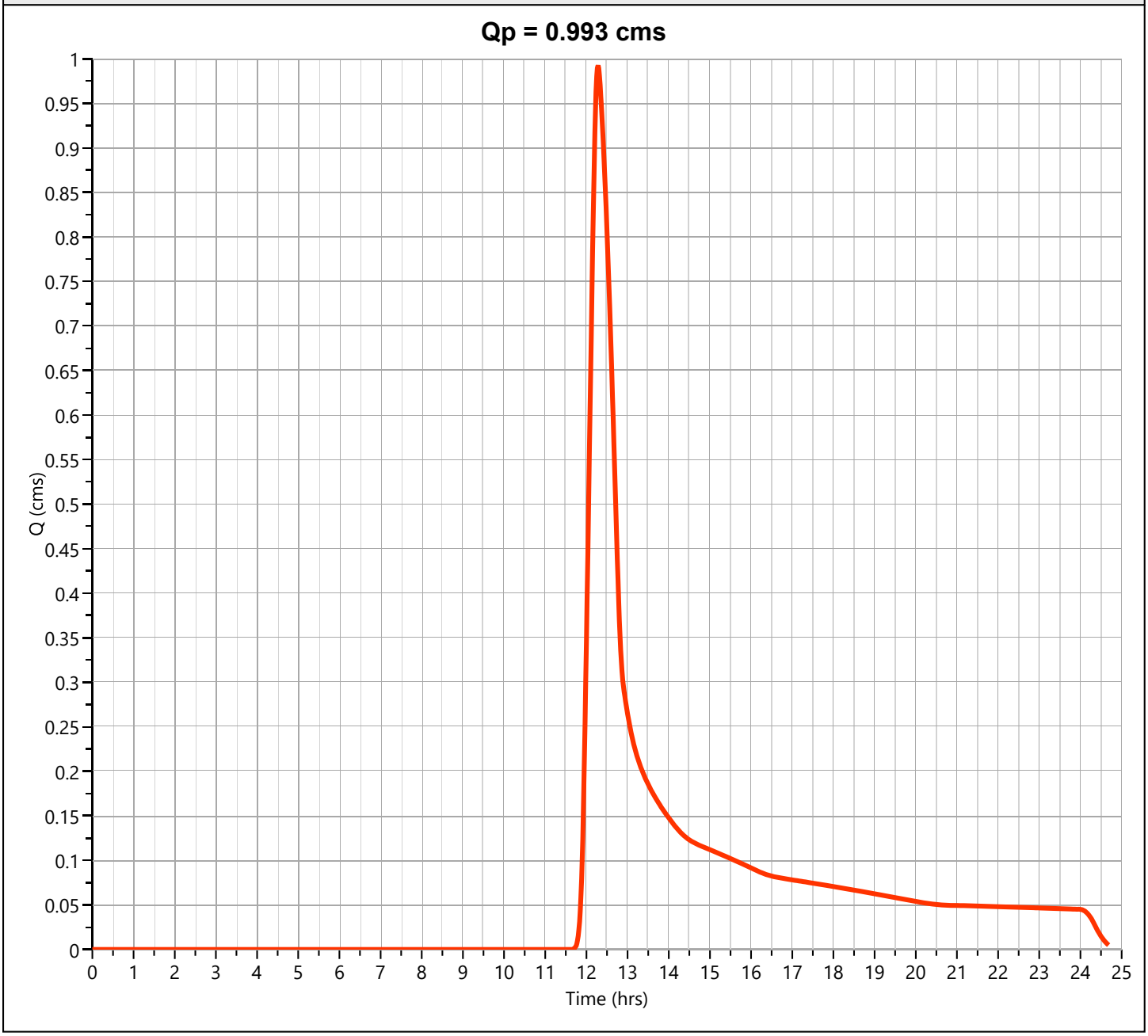
Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.4936 cms
Storm Frequency	= 10-yr	Time to Peak	= 12.18 hrs
Time Interval	= 1 min	Runoff Volume	= 2,347 cum
Drainage Area	= 7.42 ha	Curve Number	= 49
Tc Method	= Kirpich	Time of Conc. (Tc)	= 25.48 min
Basin Slope	= 0.13 %	Hydraulic Length	= 409.81 m
Total Rainfall	= 161 mm	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 0.208



9A

Hyd. No. 15

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.9925 cms
Storm Frequency	= 10-yr	Time to Peak	= 12.28 hrs
Time Interval	= 1 min	Runoff Volume	= 5,700 cum
Drainage Area	= 18.16 ha	Curve Number	= 49
Tc Method	= Kirpich	Time of Conc. (Tc)	= 35.52 min
Basin Slope	= 0.15 %	Hydraulic Length	= 677.73 m
Total Rainfall	= 161 mm	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 0.208



Hydrograph Report

Project Name:

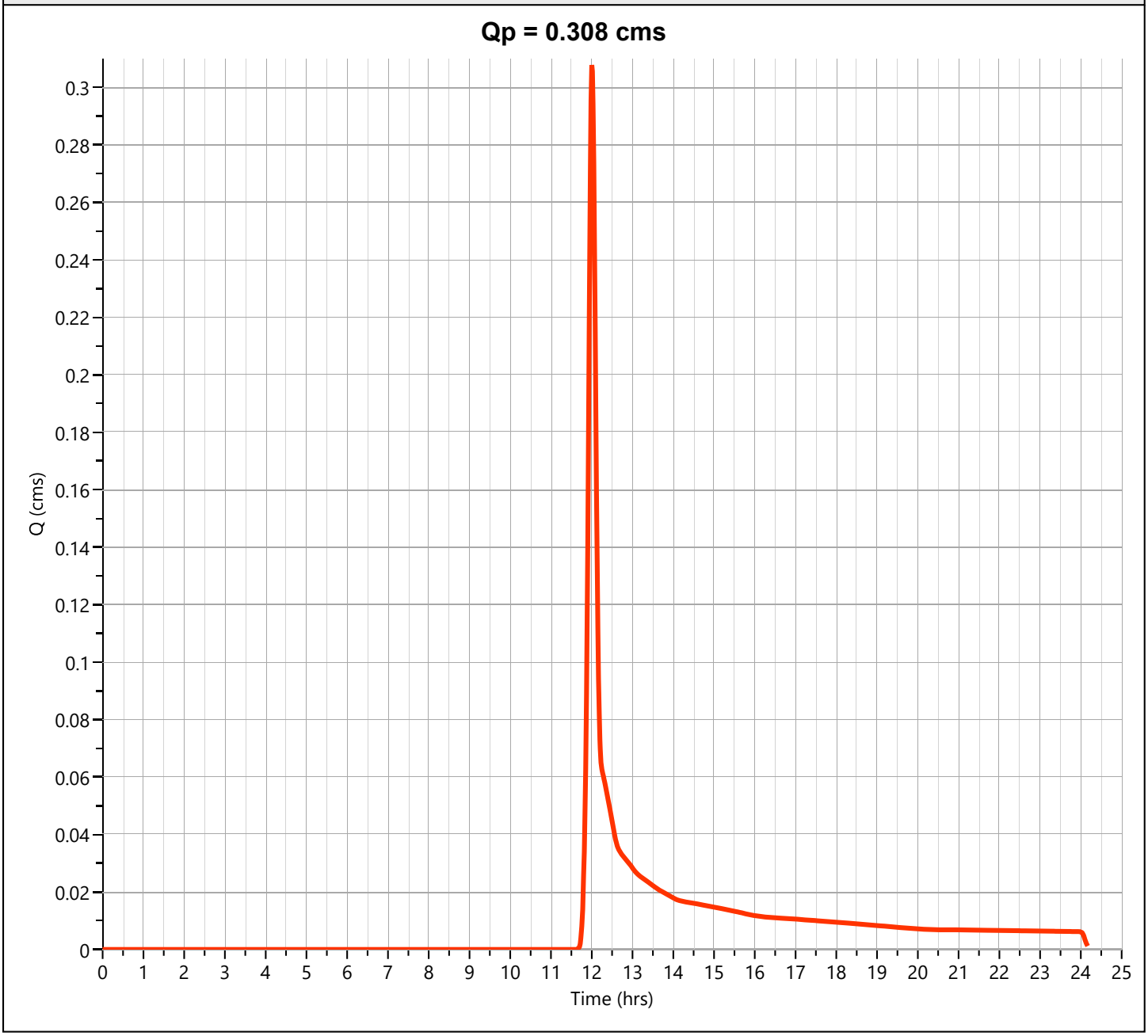
Hydrology Studio v 3.0.0.26

08-25-2022

10A

Hyd. No. 16

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.3078 cms
Storm Frequency	= 10-yr	Time to Peak	= 12.00 hrs
Time Interval	= 1 min	Runoff Volume	= 791 cum
Drainage Area	= 2.52 ha	Curve Number	= 49
Tc Method	= Kirpich	Time of Conc. (Tc)	= 10.03 min
Basin Slope	= 0.23 %	Hydraulic Length	= 162.42 m
Total Rainfall	= 161 mm	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 0.208



Hydrograph Report

Project Name:

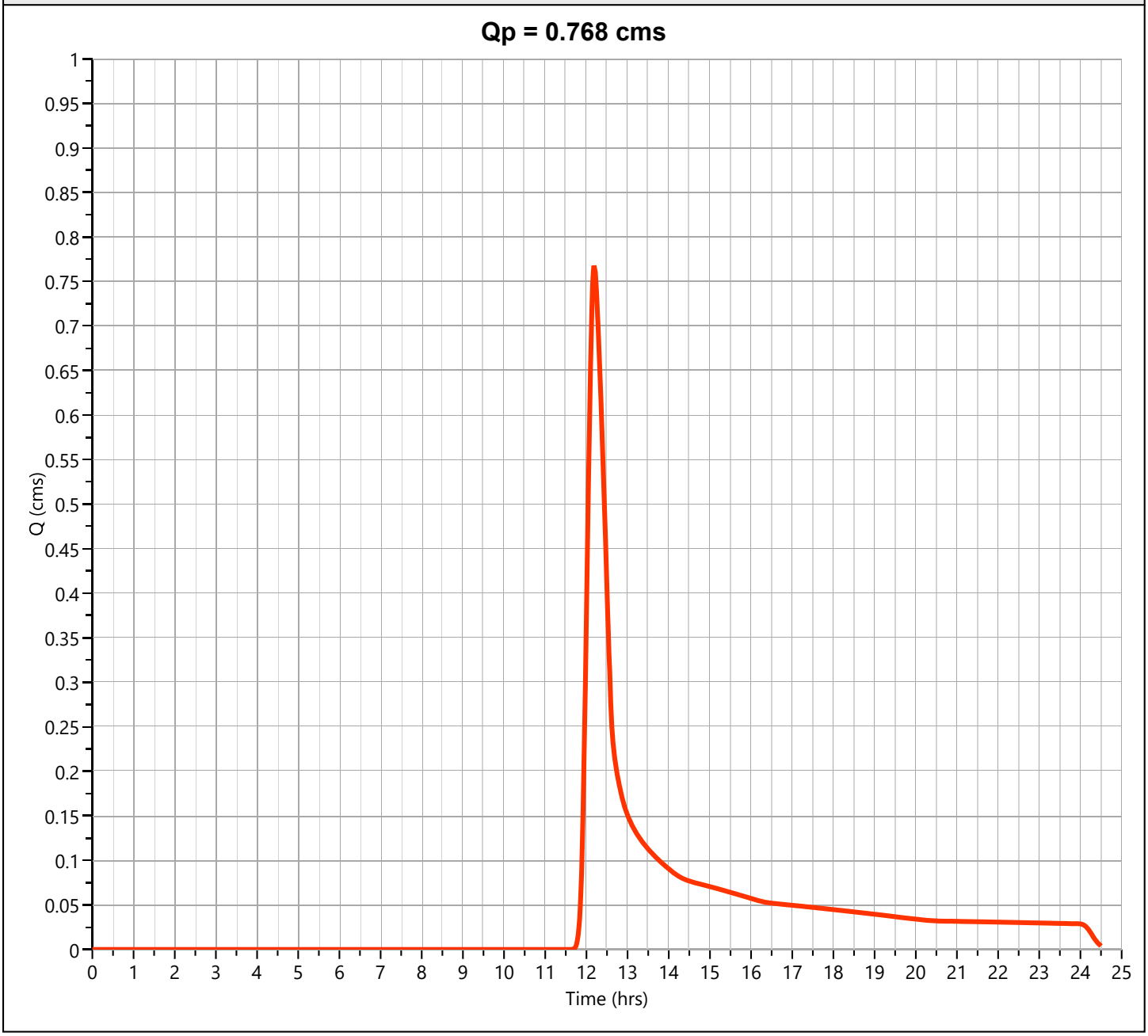
Hydrology Studio v 3.0.0.26

08-25-2022

11A

Hyd. No. 17

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.7677 cms
Storm Frequency	= 10-yr	Time to Peak	= 12.18 hrs
Time Interval	= 1 min	Runoff Volume	= 3,650 cum
Drainage Area	= 11.54 ha	Curve Number	= 49
Tc Method	= Kirpich	Time of Conc. (Tc)	= 26.81 min
Basin Slope	= 0.06 %	Hydraulic Length	= 297.45 m
Total Rainfall	= 161 mm	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 0.208



Hydrograph Report

Project Name:

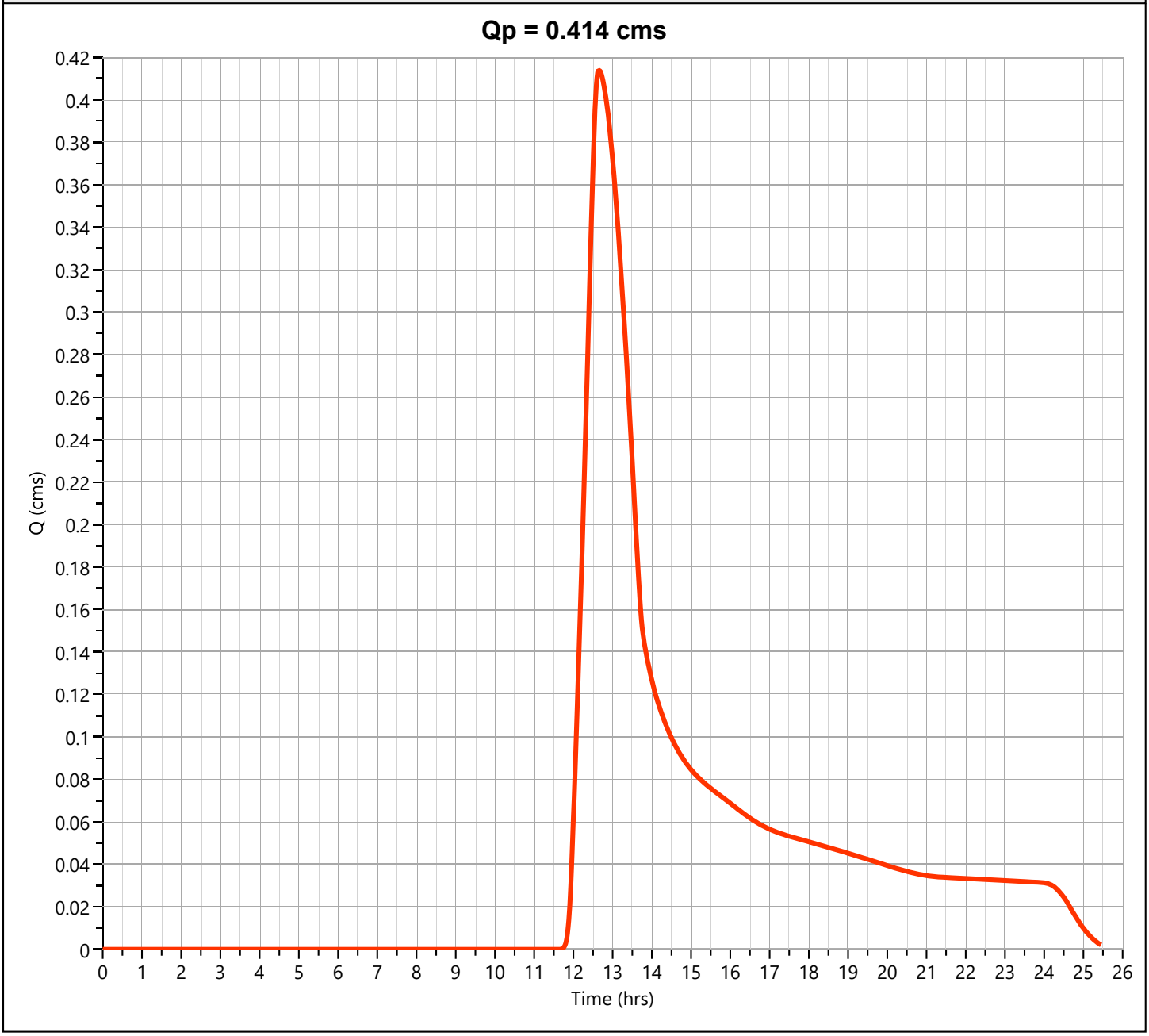
Hydrology Studio v 3.0.0.26

08-25-2022

12A

Hyd. No. 18

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.4143 cms
Storm Frequency	= 10-yr	Time to Peak	= 12.65 hrs
Time Interval	= 1 min	Runoff Volume	= 3,915 cum
Drainage Area	= 12.4 ha	Curve Number	= 49
Tc Method	= Kirpich	Time of Conc. (Tc)	= 69.28 min
Basin Slope	= 0.01 %	Hydraulic Length	= 416.74 m
Total Rainfall	= 161 mm	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 0.208



Hydrograph Report

Project Name:

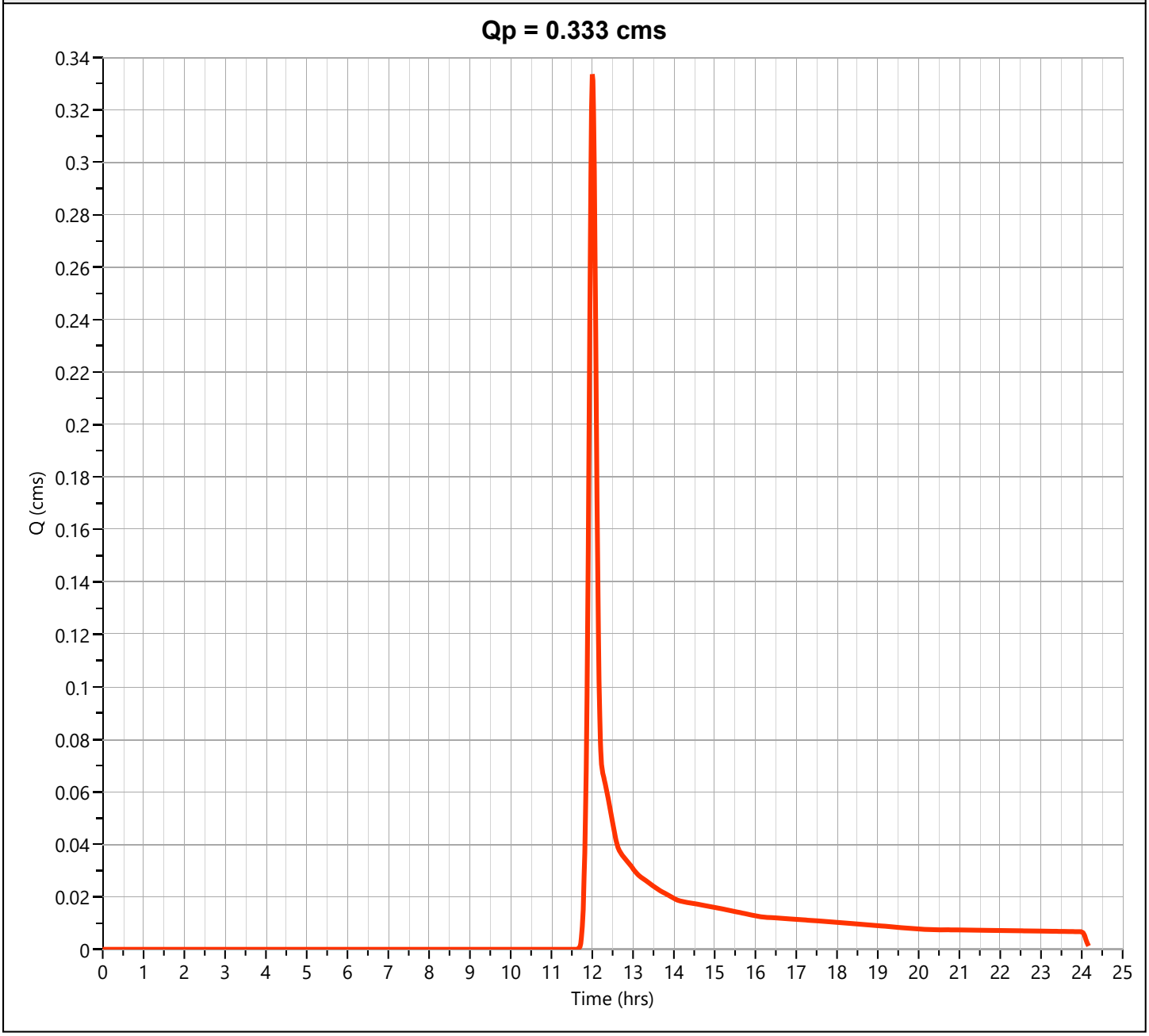
Hydrology Studio v 3.0.0.26

08-25-2022

12B

Hyd. No. 19

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.3335 cms
Storm Frequency	= 10-yr	Time to Peak	= 12.00 hrs
Time Interval	= 1 min	Runoff Volume	= 857 cum
Drainage Area	= 2.73 ha	Curve Number	= 49
Tc Method	= Kirpich	Time of Conc. (Tc)	= 9.35 min
Basin Slope	= 0.37 %	Hydraulic Length	= 188.01 m
Total Rainfall	= 161 mm	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 0.208



Hydrograph Report

Project Name:

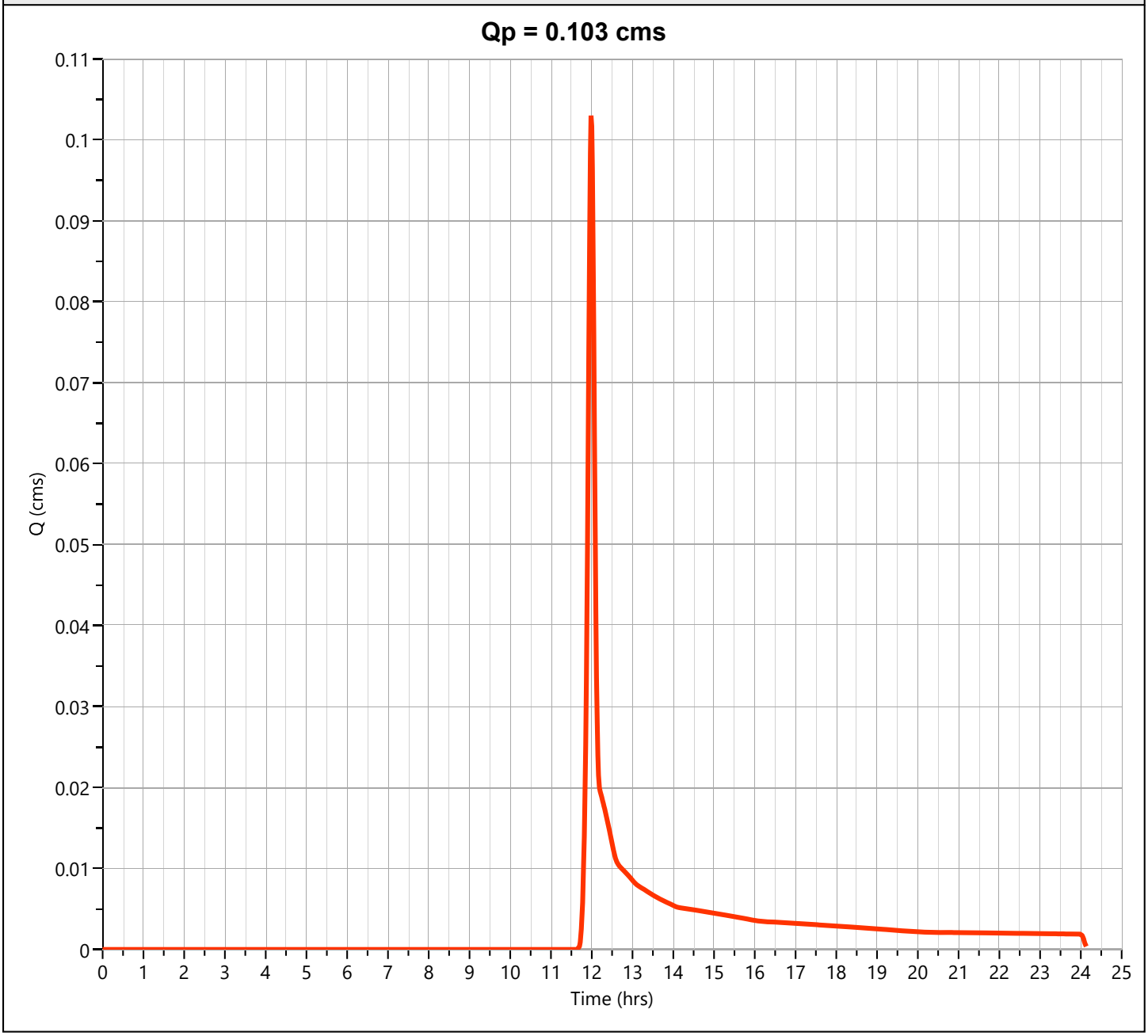
Hydrology Studio v 3.0.0.26

08-25-2022

13A

Hyd. No. 20

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.1030 cms
Storm Frequency	= 10-yr	Time to Peak	= 11.98 hrs
Time Interval	= 1 min	Runoff Volume	= 242 cum
Drainage Area	= 0.79 ha	Curve Number	= 49
Tc Method	= Kirpich	Time of Conc. (Tc)	= 7.11 min
Basin Slope	= 0.29 %	Hydraulic Length	= 116.59 m
Total Rainfall	= 161 mm	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 0.208



Hydrograph Report

Project Name:

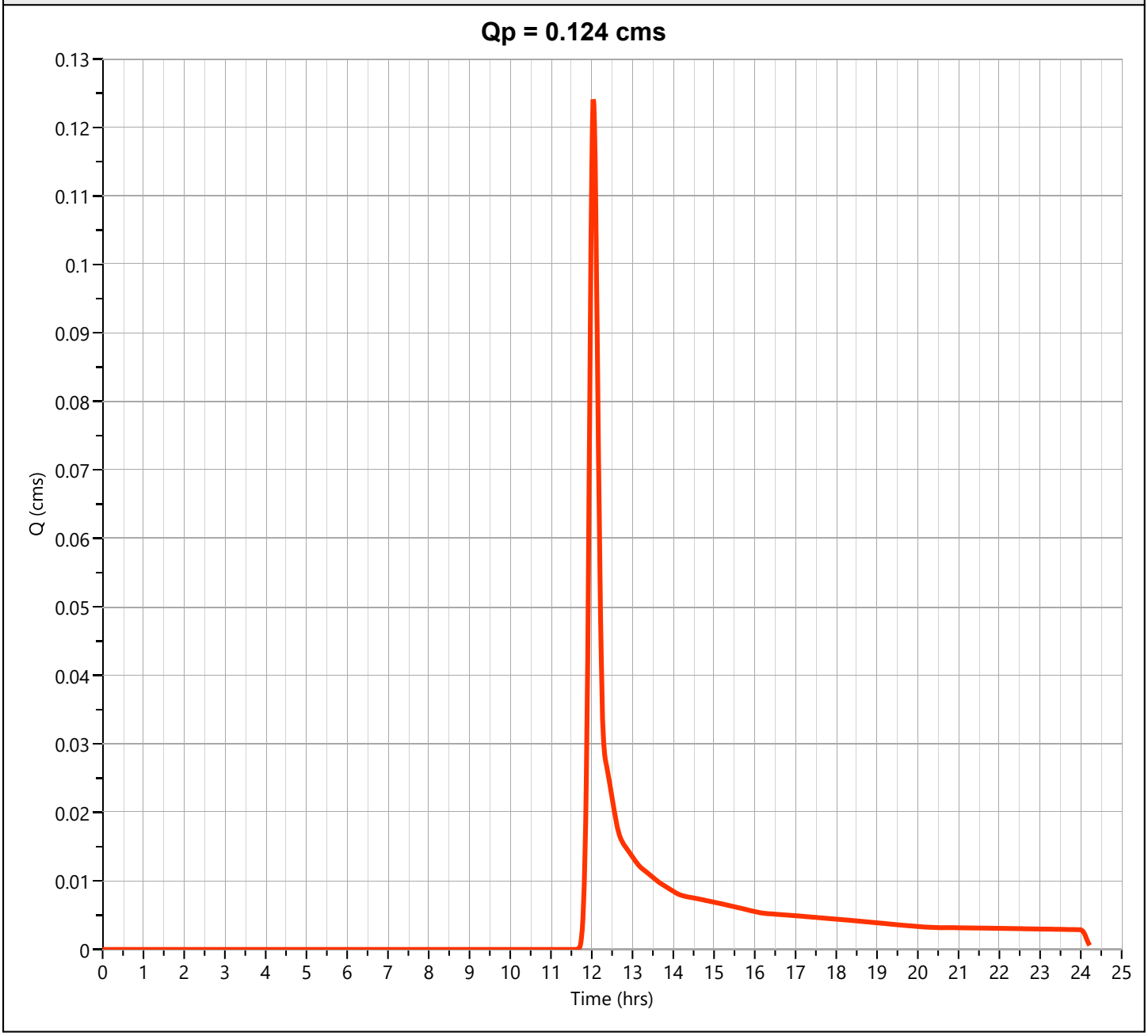
Hydrology Studio v 3.0.0.26

08-25-2022

13B

Hyd. No. 21

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.1240 cms
Storm Frequency	= 10-yr	Time to Peak	= 12.03 hrs
Time Interval	= 1 min	Runoff Volume	= 368 cum
Drainage Area	= 1.19 ha	Curve Number	= 49
Tc Method	= Kirpich	Time of Conc. (Tc)	= 13.3 min
Basin Slope	= 0.17 %	Hydraulic Length	= 201.56 m
Total Rainfall	= 161 mm	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 0.208



Hydrograph Report

Project Name:

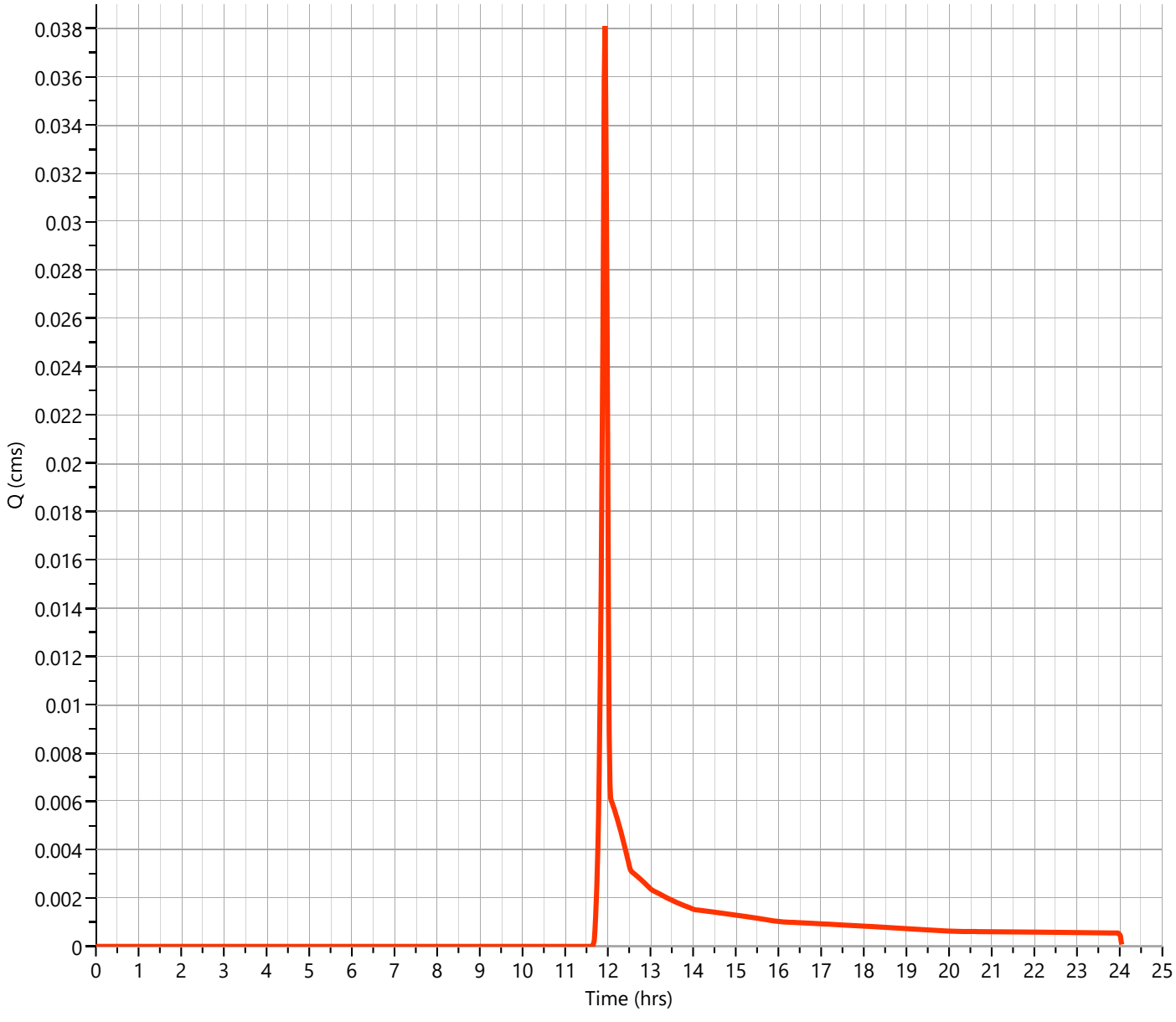
Hydrology Studio v 3.0.0.26

08-25-2022

13C

Hyd. No. 22

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.0381 cms
Storm Frequency	= 10-yr	Time to Peak	= 11.93 hrs
Time Interval	= 1 min	Runoff Volume	= 70.6 cum
Drainage Area	= 0.24 ha	Curve Number	= 49
Tc Method	= Kirpich	Time of Conc. (Tc)	= 1.57 min
Basin Slope	= 1.14 %	Hydraulic Length	= 32.49 m
Total Rainfall	= 161 mm	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 0.208



Hydrograph Report

Project Name:

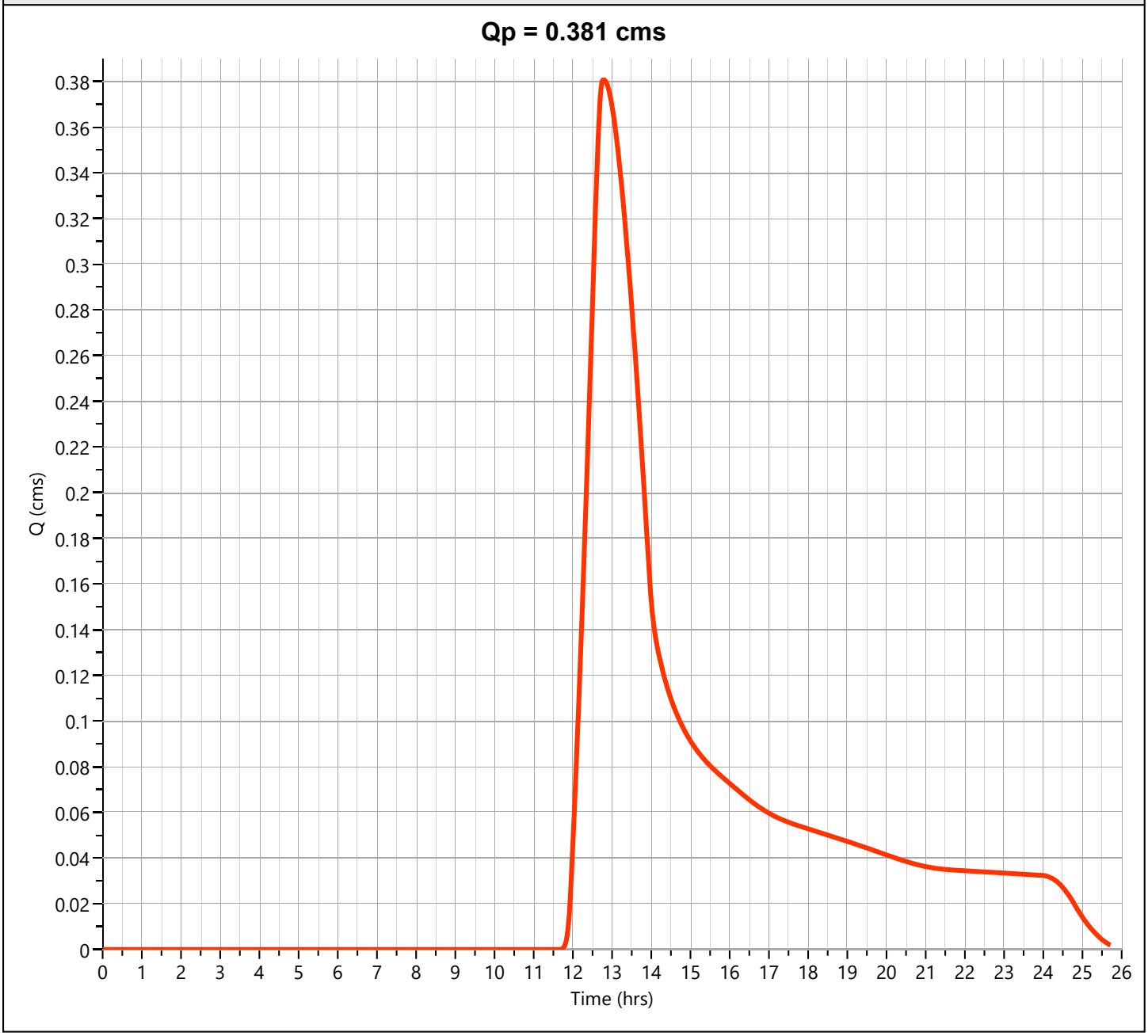
Hydrology Studio v 3.0.0.26

08-25-2022

13D

Hyd. No. 23

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.3810 cms
Storm Frequency	= 10-yr	Time to Peak	= 12.78 hrs
Time Interval	= 1 min	Runoff Volume	= 4,027 cum
Drainage Area	= 12.83 ha	Curve Number	= 49
Tc Method	= Kirpich	Time of Conc. (Tc)	= 80.34 min
Basin Slope	= 0.01 %	Hydraulic Length	= 505.18 m
Total Rainfall	= 161 mm	Design Storm	= Type II
Storm Duration	= 24 hrs	Shape Factor	= 0.208



Design Storm Report

Custom Storm filename:

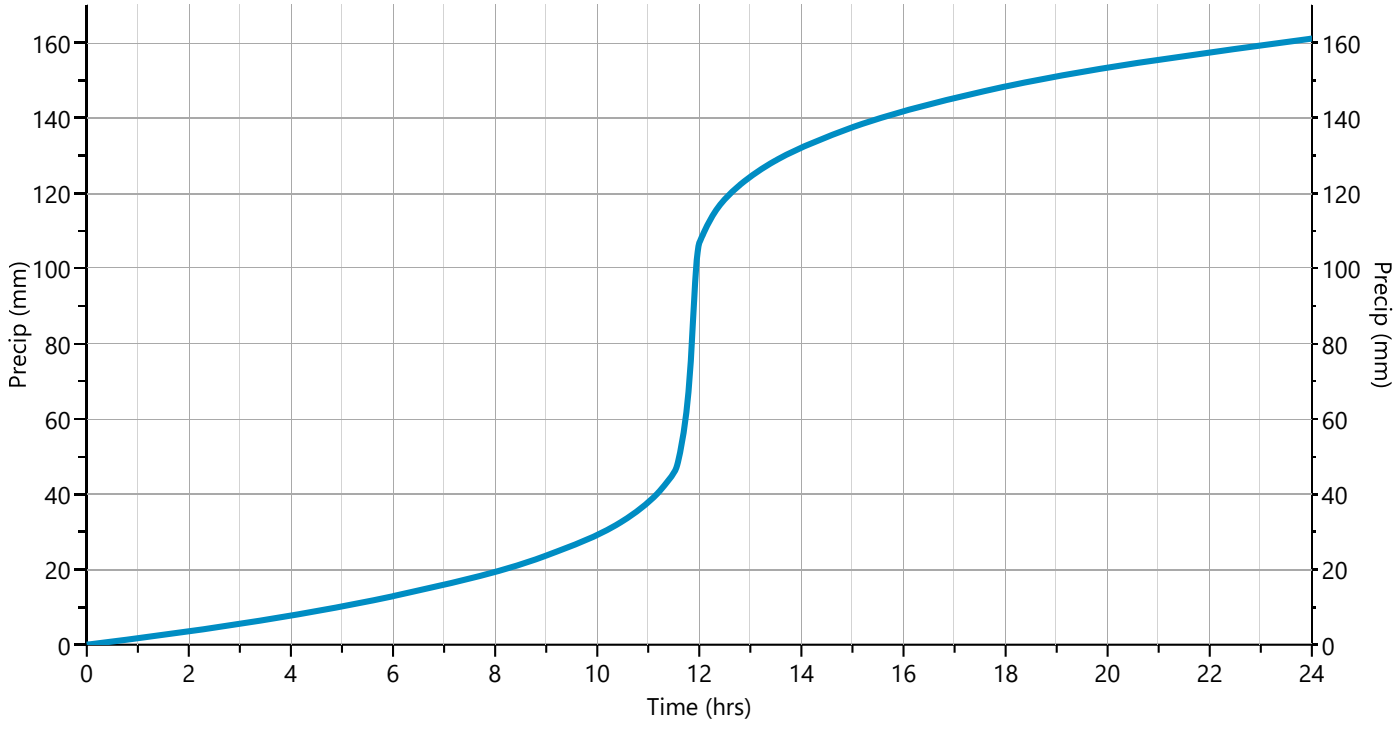
Hydrology Studio v 3.0.0.26

08-25-2022

Storm Distribution: NRCS/SCS - Type II, 24-hr

Storm Duration	Total Rainfall Volume (mm)								
	1-yr	2-yr	3-yr	5-yr	✔ 10-yr	25-yr	50-yr	100-yr	
24 hrs	0.000	98.247	0.000	136.061	161.098	192.731	216.198	239.492	

Incremental Rainfall Distribution, 10-yr									
Time (hrs)	Precip (mm)	Time (hrs)	Precip (mm)	Time (hrs)	Precip (mm)	Time (hrs)	Precip (mm)	Time (hrs)	Precip (mm)
11.42	0.299	11.60	0.905	11.78	2.354	11.97	2.217	12.15	0.453
11.43	0.303	11.62	1.011	11.80	2.648	11.98	1.546	12.17	0.443
11.45	0.307	11.63	1.117	11.82	2.943	12.00	0.875	12.18	0.433
11.47	0.311	11.65	1.223	11.83	3.238	12.02	0.553	12.20	0.422
11.48	0.316	11.67	1.329	11.85	3.533	12.03	0.524	12.22	0.412
11.50	0.320	11.68	1.435	11.87	3.827	12.05	0.514	12.23	0.402
11.52	0.376	11.70	1.541	11.88	4.122	12.07	0.504	12.25	0.392
11.53	0.481	11.72	1.647	11.90	4.417	12.08	0.494	12.27	0.382
11.55	0.587	11.73	1.753	**11.92**	**4.712**	12.10	0.484	12.28	0.371
11.57	0.693	11.75	1.859	11.93	3.081	12.12	0.473	12.30	0.361
11.58	0.799	11.77	2.043	11.95	2.887	12.13	0.463	12.32	0.351



Annexure - 5

Organogram of DSEPL

2 Operation and Maintenance

Dynamic Sun Energy Private Limited (DSEPL) has the target date of commissioning the Pabna 100MW (AC) Solar Park by March-2024 (expected). To maintain the good performance of the PV plant, need a proper maintenance schedule with an efficient way. DSEPL has a strong **Senior Management Team** (Technical Advisor-01, Plant Manager-01, Head of O & M-01, Operation Team Lead-02, Maintenance Team Lead-02, Head of Admin-01, Accounts Team-02, Audit Team-03, EHS Team-03), a skilled O&M Field Core Team(Maintenance Taem-73, 4 shifts of Operation Team-24X4=96), an experienced Admin & Others Team(Support Staff-10, Drivers-8, Security-215) who can operate and maintenance the whole PV power plant. DSEPL will also hire more than **100** PV Module Cleaners for cleaning the PV panels. In below shows organogram of DSEPL 100 MW (AC) solar power plant project.

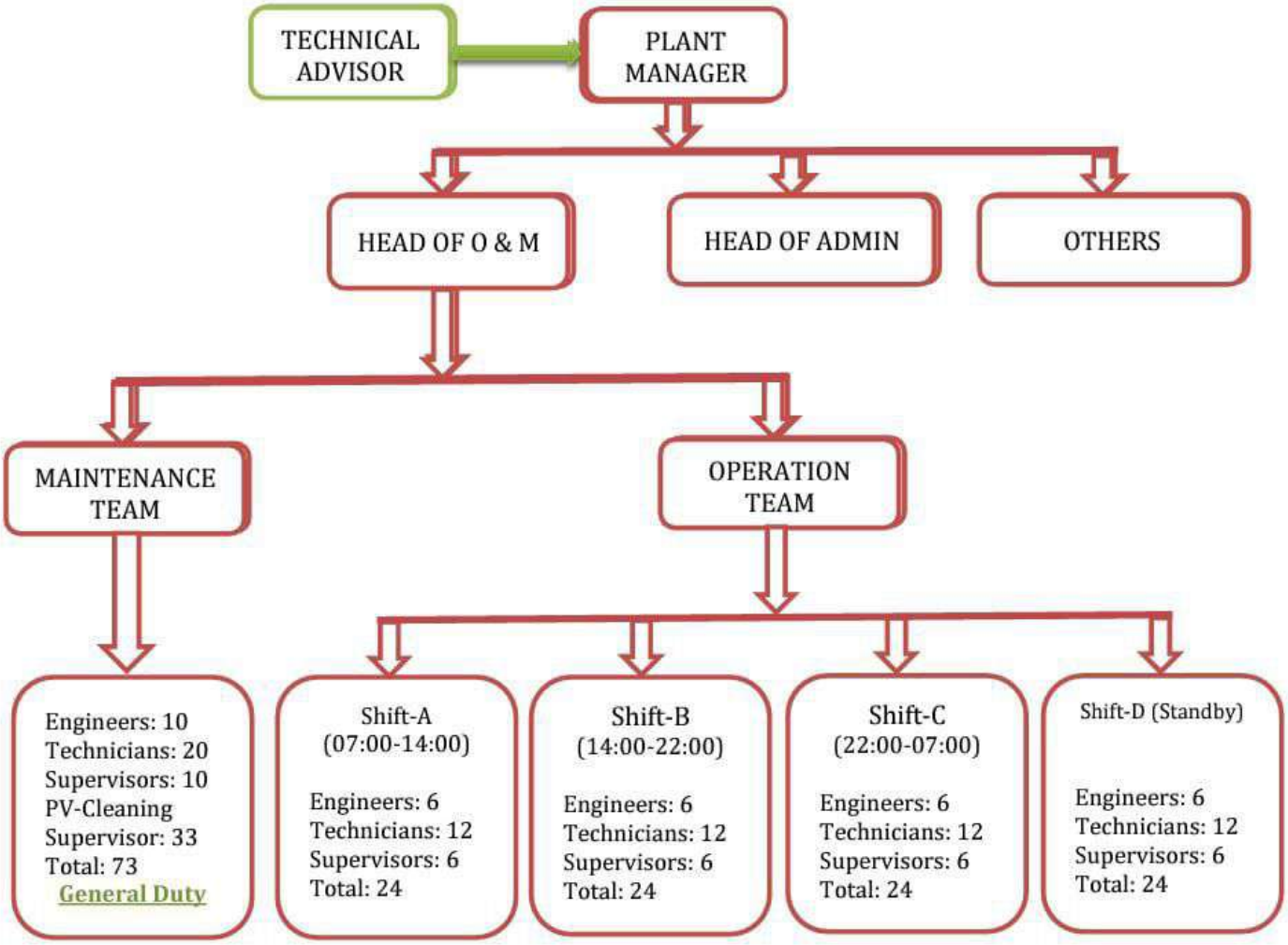


Figure 2.1: Organogram of DSEPL 100 MW Solar Power Plant

Annexure - 6

Land Acquisition Information

Annexure – 6 (a)

Land Acquisition Information: Power Plant

Dynamic Sun Energy Private Limited

100MW (AC) Solar Park

Bhobanipur, Hemayetpur, Pabna Sadar, Pabna

Land Require for DSEPL

SL	Name of Mouza	Name & Mobile No. of Leading Reprentative of Land Owners	Nature of Land	Amount of Requir (Acre)	Till Date Acquire/Direct Purchase	Under Process
1	Bhabanipur	Annexure-1	Non-Agricultural Char Land	377	Direct Purchase: 229 Acres	45 Acres
2	Bhabanipur	Annexure-2	Non-Agricultural Char Land		Bayna: 103 Acres	
3	Bhabanipur	Annexure-3	Non-Agricultural Char Land			

Dynamic Sun Energy Private Limited
100MW (AC) Solar Park
Bhobanipur, Hemayetpur, Pabna Sadar, Pabna

সংযুক্ত পাতা- ১; মোট ক্রয়কৃত জমির পরিমাণ- ২১৯.৫৬৪১৮২ একর

ক্রমিক নং	দলিল নং ও তারিখ	জমির পরিমাণ (একর)	দাতা/দাত্রীগণের নাম	মোবাইল নাম্বার
১	১১৪৮৬/০১-১০-২০১৮	০.৩১৬০৫	১.মোকাদ্দেস প্রামাণিক ২. আব্দুস সাত্তার ৩. সুফিয়া বেগম ৪. রুবিয়া খাতুন ৫. ছুম্মআ খাতুন	
২	১১৪৮৭/০২-১০-২০১৮	০.২২৩	১. আক্তার হোসেন মন্ডল ২. আব্দুল আজিজ মন্ডল ৩. নাজির মন্ডল ৪. আকেদা খাতুন	
৩	১১৫০৭/০৩-১০-২০১৮	০.৪৯	১. আবু তোহা ২. কাজী ইমদাদুল হক ৩. আব্দুল আজিজ, ৪. ফজলু ৫. তোফাজ্জেল মৃধা ৬. মোঃ মোশারফ হোসেন, ৭. আনেছা	
৪	১১৫০৮/০৩-১০-২০১৮	০.৮০৯	১.বিল্লাল হোসেন ২. আইনুল ইসলাম ৩, হেলাল উদ্দিন ৪. সেলিম উদ্দিন ৫. আবু দাউদ কানন ৬. ছালেহা খাতুন ৭. মাবিয়া খাতুন, ৮. রাহেলা খাতুন	
৫	১১৫০৯/০৩-১০-২০১৮	০.৪৩৩৭৫	১. রবিউল ইসলাম, ২. লালন হোসেন ৩. হিরা খাতুন ৪. জোসনা খাতুন	
৬	১১৫১০/০৩-১০-২০১৮	০.৬৬৪	১. কিরামত আলী ২. ইফনুস আলী ৩. বুলু খাতুন ৪. মরিয়ম খাতন ৫. রাজিয়া খাতুন ৬. আফাজদ্দিন ৭. সাবান আলী , ৮. ছালেহা খাতুন ৯. ইসরাফিল হোসেন, ১০. রুশিয়া খাতুন	
৭	১১৫১২/০৩-১০-২০১৮	১.১২	১. হাওয়া খাতুন	
৮	১১৫১১/০৩-১০-২০১৮	০.৫৮৮৭৫	১. মোঃ মোশারফ হোসেন	
৯	১১৫১৩/০৩-১০-২০১৮	২.৩০৬৪	১. সাইফুল ইসলাম, ২. নাসরিন ইসলাম	
১০	৯৪৯৫/১৯-০৮-২০১৮	০.৫৭৫৫	১. মো: নুরুল ইসলাম চুন্নু, ২. মোছা: পারুল বেগম, ৩. মো: আতিয়ার রহমান গং	মো: নুরুল ইসলাম চুন্নু- ০১৭১৯২৭১৬৯৩
১১	৭৭২৩/০৪-০৭-২০১৮	০.৯০৮২	১. মোঃ শাকিল বিশ্বাস ২. মোঃ ফজল বিশ্বাস, ৩. মোঃ একরাম বিশ্বাস	
১২	৭৭৭৯/০৫-০৭-২০১৮	০.৭১৮২	১. মোঃ শফিকুল ইসলাম ২. মোছাঃ লিপি বেগম	
১৩	৭৭৮০/০৫-০৭-২০১৮	১.৩৩	১. মোঃ হাসেম মোলা ওরফে হোসেন আলী মোল্লা ২.মোছাঃ মেরিনা খাতুন, ৩. মোছাঃ মাবিয়া খাতুন, ৪. মোছাঃ রাবেয়া বেগম	
১৪	৭৭৮১/০৫-০৭-২০১৮	০.৭২	১. মোছাঃ জবেদা খাতুন ২. হাওয়া খাতুন ৩. তহমিনা খাতুন	
১৫	৮০৬১/১২-০৭-২০১৮	০.২১৫	১. মোঃ আব্দুর রাজ্জাক, ২. রমেলা খাতুন ৩. বাবুল হোসেন ৪. দুলাল মন্ডল ৫. নাজমা খাতুন ৬. আসমা খাতুন , আমোক্তার ঃ মোঃ আতাহার মন্ডল	মোঃ আব্দুর রাজ্জাক- ০১৭৪৫৫২১৪৬১
১৬	৮০৬৬/১৫-০৭-২০১৮	০.৫০৯৩	১. মোঃ খাদিমূল মন্ডল ওরফে খাদিম মন্ডল	
১৭	৮৪০৮/২২-০৭-২০১৮	১.৮২৬২৩	১. আতোয়ার রহমান ওরফে আতিয়ার রহমান মৃধা ২. আব্দুল সাত্তার ৩. তহমিনা খাতুন , ৪. হামিদ ৫. রাশিদুল ৬. শাহিদা বেগম, , ৭. মোঃ আফজাল হোসেন ৮. সিরাজুল ইসলাম ৯. আজেলা খাতুন	

১৮	৮৪০৯/২২-০৭-২০১৮	২.৬৬৭	১. মোঃ মহব্বত আলী , ২. অবিরন নেছা , ৩.আব্দুল মান্নান ৪. জিন্নাহ বিশ্বাস ৫. আকমল হোসেন, ৬. বজলুর রহমান ৭. সুফিয়া খাতুন , ৮. মকবুল বিশ্বাস ৯. তোফাজ্জল হোসেন ১০. রাজিয়া খাতুন , ১১. বিল্লাল হোসেন , ১২. তফিজ আলী ফকির	
১৯	৮৪১০/২২-০৭-২০১৮	২.২০৮৫	১. মোঃ হেলাল উদ্দি মানিক	
২০	৮৪১১/২২-০৭-২০১৮	১.১৬৬২৫	১. মোঃ আকমল বিশ্বাস ২. দুখ বিশ্বাস ওরফে রমজান আলী, ৩. আকের আলী ৪. জিয়ার আলী ৫. কাজলী খাতুন, ৬. হানিফ বিশ্বাস ৭. মানু বিশ্বাস ৮. শুটকা বিশ্বাস	
২১	৮৪১২/২২-০৭-২০১৮	০.৭৪৮৯	১. হিসাব আলী, ২. ওয়াহেদ আলী , ৩. সহিদুল ইসলাম, ৪. আমানত আলী, ৫. ওবাইদুল ইসলাম	
২২	৮৪১৮/২২-০৭-২০১৮	০.৯৭০৪	১. মতিজান নেছা ২. ইনছানা খাতুন ৩. জহুরা খাতুন , ৪. মুনজিল ৫. খাইরুল ইসলাম ৬. নুরজাহান বেগম ৭.সুরজাহান খাতুন , ৮. আব্দুল খালেক ৯. আঞ্জেরা বেগম ১০. মাবিয়া বেগম ১১. মনোয়ারা বেগম ১২. মহেলা খাতুন ১৩. মর্জিনা খাতুন ১৪. তহমিনা বেগম	
২৩	৮৪১৭/২১-০৭-২০১৮	১.০৭৮	১. আয়ুব আলী প্রামাণিক ২. ইউনুছ আলী প্রমাণিক ৩. আব্দুর রাজ্জাক প্রামাণিক ৪. আব্দুস সালাম, ৫. মহিদুল ইসলাম আমোক্তার ১. ফজিবর রহমান, ২. আয়ুব আলী বিশ্বাস	আয়ুব আলী প্রামাণিক- ০১৭৮২০২৭৫৬২
২৪	৮৪৬৭/২২-০৭-২০১৮	০.৮৪৪২	১. আরমান আলী ব্যাপারী, , ২. মোঃ মোতালেব মালিথা, ৩. ফরিদা পারভীন	আরমান আলী ব্যাপারী- ০১৭৩৬৬১৫৯০৩
২৫	৮৮০২/২৯-০৭-২০১৮	১.৭২৬৩	১. শামসুর রহমান ২. শহিদুর রহমান ৩. আক্তার আরা ৪. রওশন আরা ৫. নাজমা রহমান, ৬. হুমায়ুন মুর্শীদ ৭. মাহাফুজুর রহমান, ৮. মাহাবুবুর রহমান ৯. শাহফুজুর রহমান চেন্ধুরী	
২৬	৮৮০৩/২৯-০৭-২০১৮	১.৮১৫	১. আমিনুর রহমান, ২. সোনা মিয়া , ৩. সুজ্জল মিয়া ৪. উজ্জল মিয়া, ৫. ডলি খাতুন ৬. লিলি খাতুন, ৭. আমেনা খাতুন ওরফে সাজেদা খাতুন ওরফে ইলাচ বিবি ৮. মোঃ শাহিনুর রহমান ৯. মোঃ সেলিমুর রহমান, ১০. হাবিবা খাতুন ১১. রিতা খাতুন ১২. শামীমা পারভীন, ১৩. মশিহুর রহমান ১৪. জান্নাতুল ফেরদৌস ১৫. মাহফজা খাতুন	

২৭	৮৭৪৫/২৫-০৭-২০১৮	১.০০১২	১.আশরাফ আলী ২. মোশারফ হোসেন ৩. মুঞ্জাম প্রামাণিক ৪. মাবিয়া খাতুন ৫. রাবিয়া খাতুন , ৬. আব্দুল খালেক ৭. ছালেহা বেগম ৮.মালেকা বেগম, ৯. হামিদুল ইসলাম ১০. ময়না খাতুন, ১১. হাসেম্ আলী শেখ	
২৮	৮৮৯৪/৩১-০৭-২০১৮	০.৮৭৮৮	১. মিরাজ সরদার ২. শাহজাহান সরদার ৩. রাজা সরদার ৪. মলিনা ৫. মহিরোন খাতুন ৬. ছকিনা খাতুন	
২৯	৮৯৪৮/০১-০৮-২০১৮	০.৫৭৬৮	১. হামিদুল ইসলাম ২. মুর্সিদ বিশ্বাস ৩. খলিল বিশ্বাস	হামিদুল ইসলাম- ০১৭২৮৪৫১৪৭৬
৩০	৮৯৯৬/০২-০৮-২০১৮	০.৬২	১. মনজেরা খাতুন ২. হালিমা খাতুন ৩. আনজারা খাতুন ৪. রাশিদা খাতুন, ৫. মনিরুল ইসলাম ৬. গোলাপী বেগম , ৭. দুলাল মোল্লা ৮. আনোয়ার মোল্লা ৯.রাজ্জাক মোল্লা ১০. আলতাব মোল্লা ১১. মোঃ মানিক মোল্লা ১২. আশাদুর রহমান ১৩. খুশি খাতুন ১৪. হাসি খাতুন ১৫. জয়মানিয়া, ১৬. রফিজ উদ্দিন মোল্লা ১৭. রাজিয়া বেগম ১৮. আমানত মোল্লা , ১৯. আলফাজ মোল্লা , ২০. আল্লেক মোল্লা ২১. বিউটি খাতুন ২২. রেশমা সুলতানা ২৩. রোকেয়া বেগম ২৪. নাছিমা বেগম, ২৫. হামিদা খাতুন, ২৬. নিকছার আলী মোল্লা ২৭. দাউদ মোল্লা ২৮. মজিবর মোল্লা ২৯. বাবুল মোল্লা ৩০. ঝন্টু মোল্লা ৩১. আমেনা খাতুন, ৩২. ফরিদা বেগম	
৩১	৯১০৭/০৬-০৮-২০১৮	০.৮২৪৫	১. ছুরাত আলী ২. হামিদা খাতুন ৩. কুসুম ৪. ফরিদা বেগম ৫. জহরুল ইসলাম ৬. মনিরুল ইসলাম ৭. ফারুক হোসেন ৮. শাহিদা খাতুন ৯. ওয়াসিম পিতাঃ সুরাব ১০. জহুরা খাতুন	ছুরাত আলী- ০১৭৪৬২০৫৪৪৯
৩২	৮৯৯৭/০৫-০৮-২০১৮	০.৯৫১৮	১. আয়েত মন্ডল ২. মতিয়ার মন্ডল ৩. মুনী মন্ডল ৪. জয়মানিয়া ৫. হামিদা খাতুন ৬. রুশিয়া খাতুন ৭. খাদিম মন্ডল ৮. তানজীর আহম্মেদ বারিক ৯. আজিজুল হাকিম ১০. রেহেনা বেগম ১১. পারুলী খাতুন সর্ব ১২. খোদেজা খাতুন, ১৩. নাজমুল আলী মন্ডল ১৪. রনি আলী মন্ডল, ১৫. নাজামা খাতুন , ১৬. আতাহার মন্ডল ১৭. আরজিনা খাতুন ১৮. মুসলিমা খাতুন , ১৯. রুশিয়া খাতুন , ২০. বজলু মন্ডল ২১. নিজাম উদ্দিন ২২. ফারুক হোসেন ২৩. রিনা খাতুন, ২৪. আমিরুল ইসলাম মালিথা ২৫. জামিরুল ইসলাম ২৬. শরিফুল ইসলাম ২৭. আনেছা খাতুন ২৮. বিলকিস খাতুন, ২৯. আক্কাস আলী মালিথা	

৩৩	৮৯৯৯/০৫-০৮-২০১৮	০.৯৫১৮	১. মোস্তাপ মন্ডল ২. নায়েব আলী মন্ডল ৩. শহিদুল ইসলাম ৪. রাশিদুল মন্ডল ৫. এলেজান ৬. খোদেজা বেগম ৭. সাইদুল ইসলাম ৮. নাজমুল হাসান ৯. জলি খাতুন ১০. জরিনা খাতুন ১১. ঝর্ণা খাতুন ১২. রেবেকা খাতুন ১৩. বুলু খাতুন ১৪. মিনি বেগম ১৫. চাইনা খাতুন ১৬. ছামিরন বেগম ১৭. নিকছার মন্ডল ১৮. আমানত মন্ডল ১৯. ইয়ারুল মন্ডল ২০. টুলু খাতুন ২১. ফুলজান বেগম ২২. বেলীজান নেছা	
৩৪	৯০১৯/০৯-০৮-২০১৮	০.৪১	১. আঃ মান্নান ২. এনামুল হক ৩. ছালমা ৪. নাজমা ৫. রাবিয়া খাতুন ৬. ফিরোজা খাতুন ৭. মিনারা খাতুন ৮.	
৩৫	৯১০৯/০৯-০৮-২০১৮	০.৬৪৮১	১. নফছার আলী বিশ্বাস ২. মাদার বিশ্বাস ৩. আবু বক্কার সিদ্দিক ৪. রমেছা খাতুন ৫. রুশিয়া খাতুন ৬. মনোয়ারা খাতুন ৭. মনিরুল ইসলাম ৮. আব্দুল গণি ৯. শেফালী খাতুন ১০. ফজিলা খাতুন ১১. রুপা খাতুন ১২. নুরজাহান ১৩. জিয়াউর রহমান ১৪. নার্গিস খাতুন ১৫. নাছিমা বেগম ১৬. তাসলিমা খাতুন ১৭. পারভীন ১৮. ফুলঝরি খাতুন ১৯. শান্তনা খাতুন ২০. চায়না খাতুন	
৩৬	৯১৫১/০৭-০৮-২০১৮	০.২৮৪৪২৫	১. রাশিদুল পিংঃ সদর উদ্দিন ২. রুশিয়া বেগম স্বামী মৃত সদর উদ্দিন	
৩৭	৯১৫২/০৭-০৮-২০১৮	১.৫৫৫	১. রজব আলী মন্ডল	রজব আলী মন্ডল - ০১৭৮১৯১১৫৩৫
৩৮	৯২১০/০৯-০৮-২০১৮	০.৫২	১. ৫. ভদ্দর প্রামানিক ৬. হাবিবুর রহমান ৭. জহুরা খাতুন ৮. জলি খাতুন, ৯. ইয়ারন বেগম ওরফে ইরনা খাতুন	
৩৯	৯২৩৮/১২-০৮-২০১৮	০.২৬	১. আব্দুল হামিদ রায়হান, ২. কাজী নুরজাহান বেগম ৩. মিনি বেগম ৪. মোহাম্মদ আলী মোস্তফা	
৪০	৯২১১/০৯-০৮-২০১৮	০.৮২৪	১. মুলাম আলী ২. আলম বিশ্বাস ৩. কালাম ৪. একাব্বার বিশ্বাস ৫. সন্টু বিশ্বাস ৬. দোলন ৭. সোহাগি খাতুন ৮. বুলবুলি বেগম	
৪১	৯২৩৯/১২-০৮-২০১৮	০.৩৪৮৮	১. আনোয়ার হোসেন ২. সরোয়ার হোসেন ৩ সাহারা বানু	
৪২	৯২৪০/১২-০৮-২০১৮	০.২২	১. আনোরা খাতুন, ২. অহেদ আলী ৩. আমানত আলী	
৪৩	৯২৪১/১২-০৮-২০১৮	১.৭১১১	১. আব্দুল কাদের ২. হাবিবুর রহমান ৩. রোকেয়া খাতুন ৪. রুশিনা খাতুন ৫. মমতা বেগম ৬. গেনি খাতুন ৭. আছিয়া খাতুন ৮. জামেনা খাতুন ৯. কফিল উদ্দিন মৃধা ১০. জামাল উদ্দিন ১১. কামাল উদ্দিন ১২. জালাল উদ্দিন ১৩. আলাল উদ্দিন ১৪. শাহানা বেগম	

৪৪	৯২৪২/১২-০৮-২০১৮	১.২৪	১.মগবুল হোসেন ২. আশরাফুল আলম ৩. মনিরুজ্জামান মনির ৪. আনোয়ার হোসেন ৫. জিল্লুর রহমান জিলন ৬. দেলোয়ার হোসেন ৭. লাকী খাতুন ৮. হাচিনা বেগম ৯. বিলকিস বানু ১০. নারগিস খাতুন ১১. সীমা খাতুন, ১২. কুসুম বেগম স্বামী	
৪৫	৯৪৭৭/১৯-০৮-২০১৮	০.৪১২৯	১. রফিক মন্ডল ২. শফি মন্ডল ৩. আব্দুর রশিদ মন্ডল ৪. হাকিম মন্ডল ৫. আমেনা বেগম ৬. লিপি খাতুন ৭. ফরিদা খাতুন ৮. নিলুফা খাতুন ৯. আবেদা খাতুন	
৪৬	৯৪৭৬/১৯-০৮-২০১৮	০.৬০০৭৫	বেগম, মমতাজ গং	
৪৭	৯৫২৫/২০-০৮-২০১৮	৩.৫৭৮৫	১. মোজাম্মেল হক বিশ্বাস ২. এস.এম মেসবাহুর রহমান ৩. সাইদুর রহমান ৪. মনিরুল্ল ইসলাম ৫. রবিউল হোসেন ৬. হাসিনা বেগম, ৭. মনোয়ারা খাতুন ৮. আনোয়ারা খাতুন ৯. আমেনা খাতুন ১০. রাবেয়া খাতুন ১১. ফরিদা ইয়াছমিন নাজমা ১২. সোহেল রানা আমজাদ ১৩. আনিস ১৪. হাবিবুর রহমান	
৪৮	৯৫২৬/২০-০৮-২০১৮	০.৬১৩৮	১. মো: হিসাব আলী	
৪৯	৯৫২৭/১৯-০৮-২০১৮	১.০০৮৮	১. রেহাজুল ইসলাম ২. রিপন ৩. রোকেয়া বেগম, ৪. আনোয়ার হোসেন ৫. সরোয়ার হোসেন ৬. সাহারা বানু ৭.আজিজুল হক ৮. শরিফুল ইসলাম	
৫০	৯৫৫০/২০-০৮-২০১৮	০.৮৩০৩	১. সামছুন নাহার ২. মমতাজ শিরিন ৩. সাহিদা পারভীন ৪. শামীমা জাহান ৫. শামছুল আলম ৬. সামসুল আগা ৭. শামসুল আমিন ৮. শামসুল আবেদীন ৯. শামসুল আরেফিন ১০. সাজেদা ইসলাম,আমোক্তারঃ ইসমাইল হোসেন	ইসমাইল হোসেন- ০১৭৩৪৯৬৯৫১৯
৫১	৯৫৫১/২০-০৮-২০১৮	০.২৯	১. মোছাঃ শখেলা খাতুন ওরফে ছকেনা বেগম	
৫২	৯৯১৬/৩০-০৮-২০১৮	০.২৮	১. আমিন উদ্দিন প্রামাণিক	আমিন উদ্দিন প্রামাণিক- ০১৭৬৩৪২৭৯৯৪
৫৩	৯৯১৭/৩০-০৮-২০১৮	০.৬১৯২	১. পলাশ মোল্লা ২. কওছের মোল্লা	
৫৪	১০২৪৩/০৬-০৯-২০১৮	০.২৪৯১	১. রাশিদুল	
৫৫	১০১৪২/০৪-০৯-২০১৮	০.৩৬	১. লাইমা খাতুন	
৫৬	১০২৭২/০৬-০৯-২০১৮	১.৪৪৯	১. দৌলত আলী প্রমাণিক ২. জুম্মত আলী প্রামাণিক , ৩. খলিল প্রামাণিক ৪. আব্দুর রহিম ৫. গফুর প্রামাণিক ৬. মাছুম প্রামাণিক , ৭. ইনামুল হক তানু ৮. রানু প্রামাণিক ৯. ফিরোজা খাতুন , ১০. তাছলিমা বেগম, আমোক্তার ঃ১. জালাল উদ্দিন মন্ডল ২. সাদেক মন্ডল, ৩. মাসুদ রানা	
৫৭	১০৩৪১/০৯-০৯-২০১৮	০.২৯৫		

৫৮	১০৩৪২/০৯-০৯-২০১৮	০.৫০৭২	১. মোঃ ইকবাল বিশ্বাস ২. মোছাঃ ঝর্ণা বেগম ৩. মোছাঃ রাবেয়া খাতন ওরফে রওশন আরা ৪. মোছাঃ জোসনা খাতুন ৫. মোছাঃ হুসনেআরা রোজিনা	
৫৯	১০৩৫০/০৯-০৯-২০১৮	১.০৫২৬৫	১. মোঃ আবুল হোসেন ২. মোঃ আবুল কাশেম কালু প্রামানিক ৩. মোঃ দিলদার প্রামাণিক ৪. মোছাঃ শহিদা বেগম ৫. মোছাঃ খোদেজা খাতুন, ৬. মোঃ আসাদুল প্রামানিক ৭. মোঃ	
৬০	১০৭৫৮/১৭-০৯-২০১৮	০.৩৬৬৭	১. মোঃ মতিয়ার রহমান ২. মোছাঃ মহেলা খাতুন ৩. মোছাঃ শাহীদা বেগম ৪. মোছা রেবেকা খাতুন ৫. মোছাঃ শেবেলা খাতুন ৬. মোছঃ শরজিনা ৭. মোছাঃ সকেলা বেগম ৮. মোছাঃ বেগম, ৯. মোছাঃ ওহিরুন নেছা	
৬১	১০৩৪৭/০৯-০৯-২০১৮	০.৬২১২	১. মোঃ লতিফ প্রামানিক ২. মোঃ আইয়ুব আলী প্রামানিক ৩. মোঃ ইউনুছ আলী ৪. মোঃ আব্দুর রাজ্জাক ৫. মোঃ আব্দুস সালাম ৬. ছালেহা খাতুন ৭. মোছাঃ সাকিনা খাতুন, ৮. মোঃ শফিকুল ইসলাম প্রামানিক ৯. মোঃ জাহাঙ্গীর আলম ১০. মোছাঃ সুফিয়া বেগম ১১. মোছাঃ পারুল আক্তার ১২. মোছাঃ রুপালী খাতুন ১৩. মোছাঃ লিপি, ১৪. মোছাঃ টকিনা খাতুন, ১৫. মোঃ আক্তার ১৬. মোঃ আব্দুস ছাত্তার ১৭. মোছাঃ নাজমা খাতুন ১৮. মোছাঃ বেলি খাতুন ১৯. মোছাঃ পারভীন খাতুন	
৬২	১০৯৩৩/২০-০৯-২০১৮	০.৪২১৩	১. মোঃ শহিদ ২. মোঃ শফিকুল ইসলাম ৩. মমতাজ, ৪. মিনারা, ৫. মোছাঃ আছিয়া খাতুন, আমোক্তার ঃ ১. মোঃ ফজিবর রহমান	
৬৩	১০৯৬৩/২০-০৯-২০১৮	০.৮৩৮৯	১. মোঃ মকবুল হোসেন পিংঃ মরহুম রফিজ উদ্দিন প্রামানিক ২. আশরাফুল আলম ঝন্টু ৩. মনিরুজ্জামান মনির ৪. আনোয়ার হোসেন ৫. জিল্লুর রহমান জিলন ৬. আশাদজ্জামান পিন্টু ৭. লাকী খাতুন সর্ব পিংঃ মরহুম আক্কাচ আলী ৮. মোছাঃ হাচিনা বেগম পিংঃ মরহুম হারেজ মোল্লা ৯. মোছাঃ বিলকিস বানু ১০. মোছাঃ নারগিস খাতুন ১১. মোছাঃ সীমা খাতুন সর্ব পিংঃ মরহুম ফজলু ১২. মোছাঃ কুসুম পিংঃ মরহুম দবির উদ্দিন	
৬৪	১০৯৫০/২০-০৯-২০১৮	০.৪০০৯	১. মোঃ ছুরাত আলী ২. মোঃ হামিদা খাতুন ৩. মোছাঃ কুসুম ৪. মোঃ ফরিদা বেগম , ৫. মোঃ জহরুল ইসলাম ৬. মোঃ মনিরুল ইসলাম ৭. মোঃ ফারুক হোসেন , ৮. মোছাঃ শাহিদা খাতুন , ৯. মোঃ ওয়াসিম , ১১. মোছাঃ জহুরা মন্ডল	মোঃ ছুরাত আলী- ০১৭৪৬২০৫৪৪৯
৬৫	৭১৯২/২১-০৬-২০১৮	১.২৬৫৭৫	১. মোঃ মাহফুজুর রহমান ২. মোঃ মোস্তাফিজুর রহমান ৩. গোলাম কিবরিয়া মোঃ মইনুর রহমান ৪. গোলাম কায়েস মোহাম্মদ মমিনুর রহমান ৫. এনামুল কবির সুজন ৬. মোঃ মোখলেসুর রহমান ৭. মিসেস রোকেয়া মাসুদ	

৬৬	৭১৯১/২১-০৬-২০১৮	১.৫৮	১, ইসমাইল হোসেন ওরফে হোসেন আলী বিশ্বাস	
৬৭	৭১৮৮/২১-০৬-২০১৮	০.৮৯৩২	১. মোঃ রুহুল ইসলাম ২. মোঃ রেহাজুল ইসলাম ৩. মোছাঃ পলি খাতুন ৪. মোঃ আছিয়া বেগম	
৬৮	৭৪৭৮/২৮-০৬-২০১৮	০.৯৪২৪	১. মোঃ আবুল কালাম আজাদ ২. মোঃ আতিয়ার রহমান ৩. মোঃ আবুল খায়ের ৪. মোঃ আবু তালেব ৫. মোছাঃ জাহেরা খাতুন ৬. মোছঃ আনোয়ারা খাতুন ৭. মোছাঃ মনোয়ারা খাতুন ৮. মোঃ ছাহেরা খাতুন ৯. মোছাঃ মাহিরন নেছা ১০. মোঃ সিরাজ মোল্লা ১১. মোঃ মিরাজ মোল্লা ১২. মোঃ আলমগির মোল্লা ১৩. মোছাঃ নাজমা খাতুন ১৪. মোছাঃ ছারেজান খাতুন রত্না ১৫. মোছাঃ রোকেয়া খাতুন ১৬. মোছাঃ রিমা খাতুন ১৭. মোছাঃ রাবেয়া খাতুন	
৬৯	৭৪০১/২৫-০৬-২০১৮	০.২২৫৫	১.মোছাঃ জাবেদা খাতুন ২. মোঃ কুদ্দুস আলী ৩. মোঃ নওয়াব আলী প্রামানিক ৪. মোঃ ছুরত আলী ৫. মোঃ জহিরুল ইসলাম ৬. মোঃ মনিরুল ইসলাম ৭. মোঃ ফারুক হোসেন ৮. মোছাঃ সাহিদা বেগম ৯. মোঃ ভদ্দর প্রামানিক ১০. মোঃ হাবিবুর রহমান ১১. মোছাঃ জহুরা খাতুন ১২. মোছাঃ ইয়ারন বেগম ১৩. মোঃ ওয়াসিম প্রামানিক ১৪. মোছাঃ জহুরা খাতুন	
৭০	৭৩২৬/২৫-০৬-২০১৮	০.৫৮৫	১. মোঃ পান্না খা ২. মোঃ হালিম খা ৩. মোঃ আব্দুল আণলীম খা ৪. মোছাঃ তহুরা খাতুন ৫. মোঃ মামুন খা ৬. মোঃ শামিম খা ৭. মোঃ আয়েশা খাতুন ৮. ইশরাত জাহান আশা ৯. মোছাঃ নাছিমা খাতুন ১০.	
৭১	৭১৯০/২১-০৬-২০১৮	৬.৯৬৫	১. মোছাঃ জাহানারা জাহান ২. জহুরা খাতুন	
৭২	৭১৮৯/২১-০৬-২০১৮	০.২৮৬	১. মোঃ আসাদুর রহমান ২. মোঃ শহীদুর রহমান ৩. মেহেদি হাসান ৪. মোঃ আলআমিন শুভ ৫. মোছাঃ আলেয়া বেগম	
৭৩	৭১৮৭/২১-০৬-২০১৮	১.০৬৫	১. আব্দুল গণি বিশ্বাশ	
৭৪	৬৯৭৪/১৪-০৬-২০১৮	১.১৭৬৫	১. মোঃ ইসমাইল বিশ্বাস ওরফে হোসেন আলী বিশ্বাস	
৭৫	৬৯৭৫/১৪-০৬-২০১৮	০.৯	মোছাঃ তাহমিন খাতুন	
৭৬	৯৫২৮/২০-০৮-২০১৮	০.৩৭২৮	১. মোছা: মনজেরা খাতুন, ২. মোছা: হালিমা খাতুন গং	
৭৭	৬৯৭৩/১৪-০৬-২০১৮	০.৬৬	মোঃ ওয়াজ মন্ডল	
৭৮	৬৯৭৬/১৪-০৬-২০১৮	০.৭২	১. মোঃ শাহজাহান আলী প্রাং ২. মোঃ পিয়ারুল ইসলাম ৩. মোছাঃ রিনা খাতুন ৪. মোছাঃ নাছিমা ৫. মোছাঃ মমতাজ বেগম ৬. মোছাঃ রাবেয়া খাতুন ৭. মোঃ রফিকুল ইসলাম রফিক ৮. মোঃ আরিফুল ইসলাম ৯. সাইফুল ইসলাম ১০. মোঃ বজলুর রহমান ১১. মোছাঃ বছিরন নেছা ১২. মোছাঃ হেনা খাতুন ১৩. মোছাঃ জেলে খাতুন (মুসলিমা খাতুন) ১৪. মোছাঃ শোকজান নেছা ১৫. মোঃ আলী আকবর	
৭৯	৬৯৫২/১২-০৬-২০১৮	০.৮৩২২	মোঃ রওমন আলী বিশ্বাস ২. মোঃ শহিদুল বিশ্বাস ৩. মোঃ শাবান বিশ্বাস	
৮০	৭৩২৮/২৫-০৬-২০১৮	০.৩০২৭	মোঃ নজরুল ইসলাম ২. মোছাঃ চম্পা খাতুন ৩. মোছাঃ আনজেরা খাতুন গেনি ৪. মোছাঃ জাহানারা খাতুন ৫. মোছাঃ খাদিজা খাতুন ৬. মোছাঃ আনেচা ওরফে আনিছা খাতুন ৭. মোছাঃ রমেলা খাতুন	

৮১	৭৩৮০/২৬-০৬-২০১৮	৩.৭০৬৯	১. মো: রাশেদুল ইসলাম , ২, মো: আব্দুর রহিম	
৮২	৯০৪৮/২৯-৮-২১	৩.৯৮	১. মো: রমজান আলী পিং: মো: আব্দুল কুদ্দুস প্রামানিক, ২. শাহানাজ পারভীন, পিতা- আব্দুল কুদ্দুস প্রামানিক	শাহানাজ পারভীন- ০১৭৭৪৯৪০২৬৬
৮৩	৯০৪৪/২৯-৮-২১	২.৩৬০৫	১. মো: ছলিম মালিথা	মো: ছলিম মালিথা- ০১৭৬৬৮৮৪০৭৮
৮৪	৯০৫৩/২৯-৮-২১	০.৪৫	১. মোছা: আম্বিয়া খাতুন	
৮৫	৯০৪৩/২৯-৮-২১	০.৫৪৩৫৮২	১. মো; আব্দুল হান্নান, ২. মোছা: মর্জিনা বেগম, ৩. মোছা: মাছলেনা বেগম, ৪. মোছা: নাজমা বেগম, ৫. মোছা: মনিরা বেগম, ৬. মোছা: মলিনা বেগম , ৭. মোছা: হাওয়া বেগম	মো; আব্দুল হান্নান- ০১৭১২০৪৮৫৪৬
৮৬	৯০৪৯/২৯-৮-২১	১.২৯০৬৪	১. হোসেন প্রামানিক ২. ইমান প্রামানিক ৩. মো: ছকাই প্রামানিক ৪. মো: গোলজার হোসেন ৫. মো: দাউদ প্রামানিক ৬. মো: হামিদুল ইসলাম ৭. মো: খায়রুল ইসলাম , ৮. মো: আনার প্রামানিক ৯. মো: জামির প্রামানিক ১০. মো: মিন্টু প্রামানিক ১১. আব্দুর রাজ্জাক ১২. মোছা: রমেলা বেগম ১৩. মোছা মরিয়ম খাতুন ১৪. মোছা: লাবনী বেগম	মো: গোলজার হোসেন- ০১৭৩৪২১৮০৯৪
৮৭	৯০৫২/২৯-৮-২১	০.২৯৬৬	মো; ইসলাম আলী (আমমোক্তার) ১. মো: জহিরুল হক ২. মোছা: তাহমিনা বেগম ৩. মোছা: তহুরা বেগম ৪. মোছা: তোহোমিনা খাতুন ৫. মোছা: লভলী খাতুন ৬. মোছা: রত্না খাতুন ৭. মোছা: জহুরা খাতুন	মো; ইসলাম আলী- ০১৭৬০২৬৫৮১০
৮৮	৯০৪৬/২৯-৮-২১	১.০৯৩২৫৫	আয়ুব আলী বিশ্বাস (আমমোক্তার) ১. মো: আমিন উদ্দিন প্রামানিক, ২. মো: আব্দুল আাজিজ প্রামানিক , ৩. মোছা: আইনুর নাহার ৪. গুল শানারা বেগম, ৫. মো: আমির খোসরু ৬. মোছা: পারভীন আক্তার ৭. মোছা: সোমা আক্তার	আয়ুব আলী বিশ্বাস- ০১২৯৩০৭৯৪৮
৮৯	৯০৫১/২৯-৮-২১	০.৬৬	মো; নুর ইসলাম (নুরুদ্দিন মন্ডল)	মো; নুর ইসলাম (নুরুদ্দিন মন্ডল) - ০১৭৭৯৮৭৭৫৫০
৯০	৯০৪৫/২৯-৮-২১	০.৩৩	মো; ইসমাইল হোসেন (আমমোক্তার) ১. মোছা: সামসুন নাহার ২. মমতাজ শিরিন ৩. সাহিদা পারভীন ৪. শামীমা জাহান ৫. মো: শামছুল আলম ৬. মো: সামসুল আগা ৭. মো: শামসুল আমিন ৮. মো: শামসুল আবেদীন ৯. মো: শামসুল আরেফিন ১০. সাজেদা ইসলাম	মো; ইসমাইল হোসেন- ০১৭৩৯৯৬৯৫১৯
৯১	৯০৫০/২৯-৮-২১	২.৫৪৭৭৭২	১. মো: রবিউল ইসলাম ২. মো: আব্দুল মান্নান ৩. মো: পান্না মালিথা ৪. মোছা: হাচিনা খাতুন, ৫. মো: মাহবুব হোসেন ৬. মো: শাহাবুদ্দিন ৭. মোছা: মাহমুদা খাতুন, ৮. মো: মিজানুর রহমান ৯. মো: বাচ্চু মালিথা ১০. মো: ইউসুফ মালিথা ১১. মো: জাহিদুল মালিথা ১২. মেছা: রিনা বেগম, ১৩. মো: ওবায়দুর রহমান ১৪. মোছা: জেসমিন রহমান, ১৫. মো: দেলোয়ার হোসেন.	মো: রবিউল ইসলাম- ০১৭১৮৩৭৪২৭৬
৯২	৯০৪৭/২৯-৮-২১	১.৯১৭৬	১. মো; ইয়ার আলী (আমমোক্তার) ১. মো: আব্দুল কুদ্দুস মৃধা ২. মো: সালাম মৃধা ৩. মোছা: বিউটি বেগম ৪. মোছা: ফিরোজা বেগম	মো; ইয়ার আলী- ০১৭১২৭১৭৮৪২

৯৩	৯৪১২/১২-৯-২১	০.৬৮১২৫	১. মো: মফিজ উদ্দিন প্রামানিক ২. মোছা: বেগম খাতুন, ৩. মো: জিল্লুর রহমান ৪. মো: রাজ্জাক শেখ ৫. মো: মাজদুল্লাহ শেখ ৬. মো: আমজাদ হোসেন ৭. মোছা: শাহিদা খাতুন ৮. মো: মলিদা খাতুন	
৯৪	৯৪১৩/১২-৯-২১	০.৫৫৮৪	১. মো: বজলু প্রামানিক	
৯৫	৯৪২১/১২-৯-২১	০.৬৯	১. মো: আবু কাশেম ২. মো: তরিকুল প্রামানিক ৩. মো: হাসানুজ্জামান ৪. মো: আল আমিন ৫. মোছা: আকেদা খাতুন	
৯৬	৯৪১০/১২-৯-২১	০.২৪৪৩৭৫	১. মো: তোফাজ্জল হোসেন	
৯৭	৯৪১১/১২-৯-২১	০.৭২৯৯৬	১. মো: সাইদুর রহমান ২. মো: মিজবার প্রামানিক ৩. মো: আসদুল ইসলাম ৪. মোছা: বিজলী খাতুন	
৯৮	৯৪১৬/১২-৯-২১	১.০৩২৫	১. মো: আলেফ আলী প্রামানিক ২. মো: হানিফ আলী প্রামানিক	
৯৯	৯৪১৯/১২-৯-২১	০.৫১২৪	১. মো: তোফাজ্জল হোসেন ২. মো: নাছির উদ্দিন জিন্নাহ ৩. মো: নকিব উদ্দিন ৪. সেলিনা বিশ্বাস , ৫. মো: মাহমুদ হোসেন ৬. মোছা: মারিয়া আক্তার ৭. মোছা: মারুফা আক্তার , ৮. মোছা: পারুল খাতুন	মো: তোফাজ্জল হোসেন- ০১৭১২০৪৮৫৪৬
১০০	৯৪১৮/১২-৯-২১	০.৪৩৫	মো: আব্দুল গনি বিশ্বাস	
১০১	৯৪১৭/১২-৯-২১	০.২৭০০৬	১. মো: কাদের শেখ ২. মো: আ: ছালাম শেখ ৩. মো: রেজাউল করিম ৪. মোছা: জোসনা খাতুন	
১০২	৯৪০৮/১২-৯-২১	০.২৭৫	১. মো: আকুল মালিথা ওরফে শাকুল মালিথা ২. মো: ইয়াকুব মালিথা ৩. মো: মনিরুদ্দিন মালিথা ওরফে মো: মনির উদ্দিন মালিথা	মো: আকুল মালিথা- ০১৭২৩১০৯১৮৭
১০৩	৯৪২০/১২-৯-২১	১.৬৩৬	মো: হাবিবুর রহমান	মো: হাবিবুর রহমান - ০১৭৭০৫৬৪৩৮৭
১০৪	৯৪২২/১২-৯-২১	১.৩৩৯৭	১. মো: রওশন আলী বিশ্বাস ২. মো: ছিদ্দিক বিশ্বাস ৩. মো: জহিরুল ইসলাম ৪. মো: শহিদুল ইসলাম ৫. মো: রাশিদুল ৬. মোছা: রেনু খাতুন ৭. মোছা: আমেনা খাতুন ৮. মোছা: রুশিয়া বেগম, ৯. মো: মুর্শিদ বিশ্বাস ১০. মো: সাবান বিশ্বাস ১১. মোছা: শাহিদা খাতুন	মো: রওশন আলী বিশ্বাস- ০১৭৪২১৮৪৩৫০
১০৫	৯৪১৫/১২-৯-২১	০.৩৩	মো: মোফাজ্জল আলী বিশ্বাস	
১০৬	৯৪১৪/১২-৯-২১	০.২০৪৮	১. মোছা: বিলকিছ খাতুন ২.মোছা: নার্গিস কাতুন ৩. মোছা: লাবনী খাতুন ৪.মোছা: শারমিন খাতুন	
১০৭	৯৪০৯/১২-৯-২১	৩.১০২৫	১. মো: ইজিবর রহমান, ২. মো: মুস্তাজ আলী ৩. মো: আব্দুস সাত্তার	
১০৮	৯৬৭০/১৩-৯-২১	৩.২৭৯০৬	শহিদ বিশ্বাস (আম-মোক্তার)	শহিদ বিশ্বাস- ০১৭১৮৯৬৪৮৭১
১০৯	৯৬৬৭/১৩-৯-২১	০.৪৪১০৪৮	মো: মোশারফ হোসেন গং	
১১০	৯৬৬৮/১৩-৯-২১	০.২৮১৪৮	জালাল উদ্দিন গং (আম-মোক্তার)	
১১১	৯৬৬৬/১৩-৯-২১	১.৩৮৪১৪	ইকবাল মালিথা গং	
১১২	৯৬৭৫/১৩-৯-২১	০.১৮৬৯৬	১.মো: শাকুল মালিথা ২.ইয়াকুব মালিথা ৩.মনির উদ্দিন মালিথা	
১১৩	৯৬৭১/১৩-৯-২১	০.২১৭৯৬৯	১. সুফিয়া খাতুন	
১১৪	৯৬৭৩/১৩-৯-২১	০.২৭১৫	১.মো: হাফিজুর রহমান	
১১৫	৯৬৭২/১৩-৯-২১	০.৪৯	মো: ফজিবর রহমান (আম-মোক্তার)	ফজিবর- ০১৭৮২০২৭৫৬২
১১৬	৯৬৭৪/১৩-৯-২১	০.৫২৬৮	১. মো: বাবুল হোসেন ইমন ২.মো: ফজিবর রহমান (আম-মোক্তার)	বাবু- ০১৭২৬২২৪৫২৪, ফজিবর- ০১৭৮২০২৭৫৬২
১১৭	৯৬৬৯/১৩-৯-২১	০.৯৮২৭৪	১.নুরুল ইসলাম চুন্নু	
১১৮	৯৯২৭/১৩-৯-২১	০.৪৭	আবুল কাশেম বিশ্বাস গং	
১১৯	১০৪১৩/২৬-৯-২১	০.৩৭০৬৭৫	মো: ছাইফুল (আম-মোক্তার)	মো: ছাইফুল- ০১৭৯৭৭০০৮৭৫
১২০	১০৪১০/২৬-৯-২১	০.৬৩৫৪৭	মো: মুলায়েম হোসেন গং	
১২১	১০৪১২/২০-৯-২১	০.৪৬৮	মো: তোফাজেল হোসেন গং	
১২২	১০৪০৯/ ২৬-৯-২১	০.২৩২৫	১.মো: আতিয়ার আলি ২.মো: মতিয়ার আলি	
১২৩	১০৪১৫/২৬-৯-২১	০.২৯১	১.বেবি আক্তার গং	
১২৪	১০৪১৪/২০-৯-২১	০.১২৯৫১৮	১.দুলাল মালিথা (আম-মোক্তার)	দুলাল মালিথা- ০১৭৩৪৬৬২৪৬৬

১২৫	১০৪১১/২৬-৯-২১	০.৭০৯৮	১.মো: রেজাউল মন্ডল, ২.মো: রমজান আলী,	
১২৬	১০৪১৭/২৬-৯-২১	০.০৮২৫	১. মো: আক্কেছ আলী প্রমানিক	
১২৭	১০৪১৮/২৬-৯-২১	০.৩০৮	আলাউদ্দিন শেখ গং	
১২৮	১০৪২২/২৬-৯-২১	০.৪৭৭৪১	আমিরুল ইসলাম প্রমানিক গং	
১২৯	১০৪২৩/২৬-৯-২১	০.৪২১১৪	মো: আজিজুল মন্ডল গং	
১৩০	১০৪২০/২৬-৯-২১	০.৩৮৯৮	আবুল কাশেম গং	
১৩১	১০৪১৬/২৬-৯-২১	০.২৩	১. মো: মনোয়ার	মো: মনোয়ার-
১৩২	১০৪১৯/২৬-৯-২১	০.২৬২৮	গোলাম মোস্তফা গং	গোলাম মোস্তফা- ০১৭৯৪০৫৩৯৮১
১৩৩	১০৪২১/২৬-৯-২১	০.৩৫৩২	জালাল প্রামাণিক গং	জালাল প্রামাণিক- ০১৭৯৪০৫৩৯৮১
১৩৪	১০৮০৮/২৭-৯-২১	০.৩৪	১.মো: আতর আলী	
১৩৫	১০৮০৬/২৭-৯-২১	০.৭৯৪০৪	১.মো: আব্দুল মান্নান	
১৩৬	১০৮০৭/২৭-৯-২১	০.৬৭	১. আয়ুব আলী, ২ মো: রেজাউল হক,	আয়ুব আলী- ০১৭৬১৬৭২৭২৫
১৩৭	১০৮১০/২৭-৯-২১	০.৪৫০২	জাহাঙ্গির আলম গং	
১৩৮	১০৮১১/২৭-৯-২১	০.৬৮৫৬	মো: আব্দুল গনি বিশ্বাস গং	
১৩৯	১০৮০৯/২৭-৯-২১	০.৭২৯১	মোছা: তহুরা খাতুন গং	
১৪০	১০৮১২/২৭-৯-২১	০.৮৫৫৬	মো: হাবিবুর রহমান বেপারী গং	হাবিবুর রহমান - ০১৭৩১৩৪০০১০
১৪১	১০৮১৩/২৭-৯-২১	০.১৯৮৭৮৭	মো: আবুল কাশেম গং	
১৪২	১১২৪৩/০৪-১০-২১	০.৩৭	মো: মোসলেম উদ্দিন গং	মোসলেম উদ্দিন- ০১৮২৯৮১১২৮৬
১৪৩	১১২৪২/০৪-১০-২১	০.৩৮৯৬১	মো: আবদুস সালাম	
১৪৪	১১৬৩৩/১১-১০-২১	০.১৯৫	মো: বজলু বিশ্বাস গং	
১৪৫	১১৬৩২/১১-১০-২১	০.৩৮৮৫	মো: সামিদুর রহমান (নিঠু বিশ্বাস) (আমমোক্তার)	
১৪৬	১১৬৩১/১১-১০-২১	০.৩৪৫	মো: নাসিদুল মন্ডল (আমমোক্তার)	নাসিদুল মন্ডল- ০১৭৩১৮১১২০৩৪
১৪৭	১১৬৩৪/১১-১০-২১	০.৭৩৩৭	মো: নিরব গং	
১৪৮	১২০২৬/১৮-১০-২১	০.১৪৭৫	মো: সাইদুল গং	
১৪৯	১২০২৮/১৮-১০-২১	০.৫৯৮৬৫	মো: আবদুস সাত্তার গং	আবদুস সাত্তার- ০১৭১২২৮৭২৮১
১৫০	১২০২৭/১৮-১০-২১	০.৩৬	আমির হামজা গং	
১৫১	১৩৮৩৩/২২-১১-২১	০.২৩২৩৯	১. মো: মোতালেব মালিথা, ২. মো: শরিফুল ইসলাম, ৩. মো: তারেক রহমান, ৪. মো: সাদ্দাম মালিথা, ৫. মো: আলেয়া মালিথা,	মো: মোতালেব মালিথ- ০১৭৭৩৯৫১৬৩৫
১৫২	১৩৮৩০/২২-১১-২১	০.৪৪৫	১. মো: বারিক মালিথা, ২. মো: আরিফ মালিথা, ৩. মো: ইসহাক মালিথা, ৪. মোছা: মিলি খাতুন,	মো: বারিক মালিথা- ০১৭৫৩৪৯৮৫৭৩
১৫৩	১৩৮৩২/২২-১১-২১	১.০৩৪১৮	১. মো: জামাল উদ্দিন, ২. মো: নজরুল ইসলাম, ৩. মো: সরোয়ার হোসেন, ৪. মো: সামছুল হক,৫. মো: কাদের হোসেন, ৬. মো: কামাল উদ্দিন, ৭. মোছা: শামিমা আক্তার, ৮. মোছা: জহুরা খাতুন,৯. মো: রাশিদা বেগম, ১০. মোছা: রুপালি বেগম,১১, মো: সেফালী খাতুন	
১৫৪	১৩৮২৮/২২-১১-২১	০.১৯৪২	১. মোছা: পারভীন খাতুন	
১৫৫	১৩৮২৭/২২-১১-২১	০.২৮৭৪৮	১. মো: আবু বক্কর, ২. মো: আতিয়ার রহমান, ৩. মমতা, ৪. মোছা: রেনুকা খাতুন	
১৫৬	১৩৮২৯/২২-১১-২১	০.৪৯৫	১. মোছা: বুলু খাতুন	
১৫৭	১৩৮৩১/২২-১১-২১	০.৮৯১৮৫	১. মো: আব্দুর রশিদ, ২. মো: ফজিবর রহমান	ফজিবর- ০১৭৮২০২৭৫৬২
১৫৮	১৪৭৭৫/১৩-১২-২১	০.৩৩৪২	১. মো: মোক্কাদেস প্রামানিক, ২. মো:আব্দুস সাত্তার প্রামানিক	
১৫৯	১৫১৫৭/২২-১২-২১	০.৬৫৭৩	মিজানুর রহমান গং	
১৬০	১৫১৬৮/২২-১২-২১	০.১০২৩২	আমির হামজা প্রমানিক গং	
১৬১	১৫৩২২/২৯-১২-২২	০.২২৫৭	মো: রবিউল ইসলাম	
১৬২	৭৮৬/১৬-০১-২২	৩.৮৪	পিয়ারন নেছা গং	

১৬৩	৯৮২/১৯-০১-২২	০.২১২৪	সদর উদ্দিন	
১৬৪	১৫৩৫/৩০-০১-২২	০.২৭৩৭৫	মো: গোলাম মোস্তফা	মো: গোলাম মোস্তফা - ০১৭৮১৯১১৫৩৫
১৬৫	১৫৩৬/৩০-০১-২২	০.৬৩৭	১. মো: নায়েব আলী ২. মো: আকুল আলী, ৩. ইয়াকুব আলী, ৪. মোছা: সোহাগী	
১৬৬	১৫৩৭/৩০-০১-২২	০.৪১১১	রাশেদুল ইসলাম	
১৬৭	২৭০৫/২৩-০২-২২	০.২৪৪৪৭	১. মো: কিনু মন্ডল, ২. মো: শাহাদাত হোসেন, ৩. মো: ইসরাত আলী গং	
১৬৮	২৬৭২/২৩-০২-২২	০.২৮৫৫৭	১. মো: মাহাফুজুর রহমান, ২. মো: তানজিলুর রহমান	
১৬৯	২৬৭৩/২৩-০২-২২	০.১১১৩	মো: সাজাহান (বগা)	
১৭০	৩২৬৬/০৩-০৩-২২	০.১৮৯২৮	১. মো: গোলাম কবির, ২. মো: ইসমাইল হোসেন বিশু, ৩. মো: সিদ্দীক আলী, ৪. মোছা: রাবোয়া বেগম।	
১৭১	৩২৬৫/০৩-০৩-২২	০.৫৩৮৩৩	১. মো: মোজাম্মেল হক, ২. মো: হাফিজুল রহমান মিঠু, ৩. মো: জসিম উদ্দিন, ৪. মো: মনিরুল ইসলাম, ৫. মো:	মো: মোজাম্মেল হক- ০১৭৩১৩২৬২৮৬
১৭২	৩২৬৪/০৩-০৩-২২	১.১১	আমমোক্তার দাতা: মো: আলাউদ্দিন মালিথা, (সাবেক ইউনিয়ন পরিষদ চেয়্যারমান), হেমায়েতপুর, পাবনা।	
১৭৩	৩৬৩৫/১০-০৩-২২	১.০১৫৭	মেছা: ইয়ারন বেগম গং	
১৭৪	৩৬৩৬/১০-০৩-২২	০.৩২৩	আমমোক্তার দাতা: মো: নাসিদুল মন্ডল	মো: নাসিদুল মন্ডল- ০১৭৩১৮১২০৩৪
১৭৫	৪৭৫৪/০৪-০৪-২২	০.২২৮২	মো: আমিন উদ্দিন প্রমানিক	
১৭৬	৮২৬৮/২৩-০৬-২২	১৩.২৭১৯	জনাব গোলাম ফারুক প্রিন্স এমপি মাননীয় সাংসদ পাবনা-৫ পিং- আবু তালেব খন্দকার জাতীয় পরিচয়পত্র- ১০০ ৮২০ ৮৪৭০	
১৭৭	৮৬৭৯/০২-০৭-২২	০.৪০	মিসেস সাহানারা ইকবাল	মিসেস সাহানারা ইশবাল- ০১৬৩০৭২৭২৯৯
১৭৮	৯৪৩২/১৭-০৭-২২	০.৪৫	১. মো: সাইফুল ইসলাম, ২. মো: মন্টু প্রামানিক, ৩. মোছা: শাহিদা খাতুন, ৪. মোছা: ফরিদা খাতুন, ৫. মোছা: ফজিলা	
১৭৯	৯৪৩১/১৭-০৭-২২	০.৪৮৬৯২	১. মো: মতিয়ার রহমান মুলাম, ২. মো: ইজাফ সরদার, ৩. মো: অনিক, ৪. মো: জাকিন সরদার, ৫. মোছা: চেকজান, ৬. মো: রুবেল ইসলাম, ৭. মো: রোহান সরদার, ৮. মোছা: আজমিরা খাতুন, ৯. মোছা: ফারহানা খাতুন, ১০. মোছা: রুবিয়া, ১১. মো: আব্দুল হালিম, ১২. মো: আলিম, ১৩. মো: মাছুম খান, ১৪. মো: মামুন খান, ১৫. মোছা: রুবি খান, ১৬. মোছা: রহিমা খাতুন, ১৭. মোছা: ছনিয়া খাতুন।	
১৮০	৯৪৩০/১৭-০৭-২২	০.০৯২৩৪	১. মো: ফজলুল হক, ২. মো: আহসান হাবিব, ৩. মোছা: আয়ন্নুহার, ৪. মো: খাদেমুল ইসলাম	
১৮১	১০৪৮২/০৩-০৮-২২	০.৭৬৫৩৬	১. মো: সুলতান আলী বিশ্বাস, ২. মো: মোশারফ হোসেন বিশ্বাস	
১৮২	১০৪৮৩/০৩-০৮-২২	১.৮৬	১. মো: শওকত আলী, ২. মোছা: আঞ্জুয়ারা বেগম	

১৮৩	১০৪৮৪/০৩-০৮-২২	০.২৪০৬	১. মো: আব্দুল্লাহ শেখ, ২. ডা: মো: আসলাম উদ্দিন, ৩. মো: লিয়াকত আলী, ৪. মো: রফিকুল ইসলাম, ৫. শেখ সুলতান মাহমুদ, ৬. শেখ মো: আইনুল হক, ৭. মো: নুরজাহান, ৮. মো: তাছলিমা, ৯. মো: উষা বেগম পক্ষে আমমোক্তার দাতা: মো: নাজিম মন্ডল	মো: আব্দুল্লাহ শেখ- ০১৭৫৪১৭৯৮০৫
১৮৪	১১৬৫৪/২৪-০৮-২০২২	০.৬৫	মো: তানজিমুল ইসলাম	
১৮৫	১২৪৭৫/১১-০৯-২০২২	১.২২	১. মো: ফারুক মন্ডল, ২. মো: শাহাদাত মন্ডল	
১৮৬	১২৪৭৭/১১-০৯-২০২২	২.৭৭	মো: আতিয়ার রহমান, ২. মো: মতিয়ার রহমান গং মোট দাতা ১১ জন	মো: আতিয়ার রহমান- ০১৭২১৬৫৬৬২৭
১৮৭	১২৪৭৬/১১-০৯-২০২২	০.৪৩৩৪	মো: আতিয়ার রহমান	মো: আতিয়ার রহমান- ০১৭২১৬৫৬৬২৮
১৮৮	১২৫৮১/১৩-০৯-২০২২	০.৫২৬৮	কেরামত আলী বিশ্বাস উচ্চ বিদ্যালয় এর পক্ষে মো: সাইফুল ইসলাম (সভাপতি, ম্যানেজিং কমিটি)	সাইফুল ইসলাম-
১৮৯	১২৬০০/১৩-০৯-২০২২	৮.৬৬২	১. মো: আব্দুল মজিদ	মো: আব্দুল মজিদ
১৯০	১২৬৯৮/১৫-০৯-২০২২	০.১৩৭৫	১. ইয়ারুন গং	
১৯১	১২৬৯৯/১৫-০৯-২০২২	০.৯২৪১৭৫	১. মো: ছরেন গং	
১৯২	১২৭৮৬/১৮-০৯-২০২২	০.৩২০২	১. মো: ইমরান হোসেন তমাল	মো: ইমরান হোসেন তমাল- ০১৭৮৯৪৮০৯৮৯
১৯৩	১৩৩৭৫/২৭-০৯-২০২২	০.২০৭	মো: খবির উদ্দিন গং	
১৯৪	১৩৪৫৪/২৮-০৯-২০২২	০.৬৯	মো: আনোয়ার হোসেন গং	
১৯৫	১৪০৫১/১২-১০-২০২২	০.১১২৫	হোসেন আলী বিশ্বাস গং	
১৯৬	১৪১৬৯/১৬-১০-২০২২	০.০৮৯৩	মো: ইসমাইল	মো: ইসমাইল- ০১৭৩৪৯৬৯৫১৯
১৯৭	১৪৪৬৪/১৮-১০-২০২২	০.১৫৩৭	মো: মিরাজ মালিথা গং	
১৯৮	১৪৯৬৯/২৬-১০-২০২২	০.৩৩	মোছা: ফরিদা	
১৯৯	১৭৪৪৪/১৩-১২-২০২২	০.৯২	আমির হামজা গং	আমির হামজা- ০১৭২১৩৪৯৬৯৫
২০০	১৯৪৪/০৭-০২-২০২৩	৩.৯৫১৮	মো: শফিকুল ইসলাম খান	মো: শফিকুল ইসলাম খান-
২০১	৭৩২৯/০৫-০৬-২০২২	০.৬৫২৩৮	১. মো: সহিদুল হাসান, ২. মো: আজাদুল ৩. মোছা: রোজিনা খাতুন, ৪. মো: ইবাদত বিশ্বাস	
২০২	৭৫৩৯/০৮-০৬-২০২২	১.১৪৪৪৬	১. মো: ছাদ্দাম আলী, ২. মোছা: সিমা খাতুন	
২০৩	৭৮৫৩/১৪-০৬-২০২২	০.৭৩৪৮	১. মো: আমিন উদ্দিন প্রামানিক ২. মো: আলিম প্রামানিক, ৩. মো: শিপন আলী, ৪. মোছা: বাসনা খাতুন	
২০৪	৮৩৭০/২৫-০৬-২০২২	০.৩৯	১. রাজিয়া আক্তার বানু ২. মো: রাজীব খান চৌধুরী , ৩. মো: শাহাজাহান খান চৌধুরী, ৪. শহিদ খান উভয় ৫. রকিব উর রহমান	
২০৫	৮৩৭১/২৫-০৬-২০২২	১.০৬৮২	১. মেজবার রহমান ২. নিজাম মোল্যা	
২০৬	৬৬৯৪/২৪-০৫-২০২৩	০.৬৪৯৮৬	মো: জমির প্রামানিক, ২. মো: কামাল প্রামানিক, উভয় পিতা: ছলেমান প্রামানিক। আমমোক্তার দাতা: মো: শহীদ বিশ্বাস, পিতা: মৃত নফছার বিশ্বাস	
২০৭	৬৬৯২-২৪/০৫/২০২৩	০.৯০	মো: চাঁদ আলী, পিতা: হুজুর আলী গং। আমমোক্তার দাতা: মো: শহীদ বিশ্বাস, পিতা: মৃত নফছার বিশ্বাস	
২০৮	৬৬৯৫-২৪/০৫/২০২৩	০.৮৫১৫৫	মোছা: রেখা খাতুন, পিতা: মো: খলিলুর রহমান। আমমোক্তার দাতা: মো: শহীদ বিশ্বাস, পিতা: মৃত নফছার বিশ্বাস	
২০৯	৬৬৯৩-২৪/০৫/২০২৩	১.১৭২	১. মো: এক্কেন মন্ডল, পিতা: আছের মন্ডল গং। আমমোক্তার দাতা: মো: শহীদ বিশ্বাস, পিতা: মৃত নফছার বিশ্বাস	
২১০	৬৬৯৭-২৪/০৫/২০২৩	৩.১৮৫৯	১. মো: আব্দুল হামিদ, পিতা: মরহুম হায়দার আলী প্রামানিক	
২১১	৬৬৯০-২৪/০৫/২০২৩	২.১৫৭৫	মো: সিরাজুল ইসলাম, পিতা: চাঁদ আলী	

২১২	৬৬৯৬-২৪/০৫/২০২৩	২.৮৬১	১. মোক্তার বিশ্বাস, ২. মো: মনির উদ্দিন বিশ্বাস, ৩. মো: খলিল বিশ্বাস, ৪. মো: হামিদুল বিশ্বাস, ৫. মো: মুর্সিদ বিশ্বাস, ৬. মোছা: পারুল বেগম. ৭. মো: নুরুল ইসলাম চুন্নু সর্ব পিতা: আপ্তাব উদ্দিন বিশ্বাস	
২১৩	৬৬৯১-২৪/০৫/২০২৩	০.৮৩	মো: আব্দুল গণি বিশ্বাস, পিতা: মোয়াজ্জেম হোসেন বিশ্বাস	
২১৪	৭০৬৭- ৩১/০৫/২০২৩	১.০	মো: বজলু ব্যাপারী, পিতা: কপছার ব্যপারী	
২১৫	৭০৬৬-৩১/০৫/২০২৩	০.৬৬০৮	ওসমান প্রামানিক, পিতা: সামছুদ্দিন গং। আমমোক্তার দাতা মো: শহীদ বিশ্বাস, পিতা: মৃত নফছার বিশ্বাস	
২১৬	৭০৬৮-৩১/০৫/২০২৩	০.২৮০৭	মোছা: নারগিছ বেগম, স্বামী: মো: সিরাজ শেখ	
২১৭	৭০৬৫-৩১/০৫/২০২৩	০.৩৪৬২৯৯	মো: ওমর আলী, পিতা: মোকবুল প্রামানিক গং। আমমোক্তার দাতা মো: শহীদ বিশ্বাস, পিতা: মৃত নফছার বিশ্বাস	
২১৮	৭০৬৯- ৩১/০৫/২০২৩	২.৩৭৯	মো: বজলু মালিথা, পিতা: তানিরউদ্দিন মালিথা গং	
২১৯	৭০৭০-৩১/০৫/২০২৩	০.৪৬৫৮	মো: আব্দুল আজিজ বিশ্বাস ওরফে মো: আজিজ বিশ্বাস, পিতা: মোয়াজ্জেম হোসেন বিশ্বাস ওরফে মাজান বিশ্বাস	
২২০	৭০৭২-৩১/০৫/২০২৩	১.০৪২৫	মো: জলিল বিশ্বাস পিতা: মোয়াজ্জেম বিশ্বাস গং	
২২১	৭০৭১- ৩১/০৫/২০২৩	১.৩৬	মো: মোক্তার বিশ্বাস, পিতা: আপ্তাব উদ্দিন বিশ্বাস গং	
২২২	৭০৭৩- ৩১/০৫/২০২৩	১.০৩৫	মো: রওশন আলী বিশ্বাস, পিতা: সদর উদ্দিন বিশ্বাস গং	
২২৩	৬/৭/২০২৩	০.৮৩৯৮	মো: তিজারুল ইসলাম, পিতা: নাহের বিশ্বাস গং	
২২৪	৬/৭/২০২৩	০.২৪৭৫	মো: মজনু বিশ্বাস, পিতা: মুনছের বিশ্বাস গং	
২২৫	৬/৭/২০২৩	১.২৬৮৮৯	ডা: মোশারফ হোসেন, পিতা: সুলতান বিশ্বাস গং	
২২৬	৬/১৯/২০২৩	০.৬৫৪১	মো: শহিদ বিশ্বাস (আম-মোক্তার)	
২২৭	৬/১৯/২০২৩	০.৩৬৫	মো: শহিদ বিশ্বাস (আম-মোক্তার)	
২২৮	৬/১৯/২০২৩	১.৫২০৬	মো: ফজিবর রহমান (আম-মোক্তার)	
২২৯	৬/১৯/২০২৩	০.৫৮৯৬৯৪	মো: ফজিবর রহমান (আম-মোক্তার)	
২৩০	৬/১৯/২০২৩	২.০৮১৪	মো: ছাইফুল (আম-মোক্তার)	
২৩১	৬/১৯/২০২৩	০.৪৯৭৭৬	মো: নজরুল ইসলাম	
২৩২	৬/১৯/২০২৩	০.২৭৮২৬	মো: মনির উদ্দিন বিশ্বাস গং	
২৩৩	৬/১৯/২০২৩	১.০০৬৭৩৮	মো: আব্দুল গণি বিশ্বাস	
২৩৪	৬/১৯/২০২৩	২.৩২৫৩৮	মো: রওশন আলী বিশ্বাস	
২৩৫	৬/১৯/২০২৩	১.০০	বিলকিস বেগম	
২৩৬	৬/২০/২০২৩	২.৩২৫৩৮	মোছা: রুশিয়া গং	
২৩৭	৭/৯/২০২৩	০.২৯	মো: মনিরুল ইসলাম মালিথা	
২৩৮	৭/৯/২০২৩	১.৫৫৯৫	মো: শহিদ বিশ্বাস	
২৩৯	৭/৯/২০২৩	০.১৫	মো: ইব্রাহিম আলী বিশ্বাস	
২৪০	৭/২৩/২০২৩	১.৬৪	মো: আলম ব্যাপারী গং	
২৪১	৭/২৩/২০২৩	১.৮৩	মো: কবিরুল ইসলাম লিয়া গং	
২৪২	৭/২৩/২০২৩	১.২১	মোছা: আমেনা খাতুন আমমোক্তার	
২৪৩	৮/১/২০২৩	০.৪৬২৪	মো: জাহেদুল হক	
	মোট জমির পরিমাণ=	**২২৯.০৩৩৪১২**	**২২৯.০৩৩৪১২**	

Dynamic Sun Energy Private Limited
100MW (AC) Solar Park
Bhobanipur, Hemayetpur, Pabna Sadar, Pabna

সংযুক্ত পাতা- ২; মোট বায়নাকৃত জমির পরিমাণ- ১০২.৭৬২৯ একর

ক্রমিক নং	তারিখ	জমির পরিমাণ (একর)	দাতা/দাত্রীগণের নাম	মোবাইল নাম্বার
১	১২/১৪/২০২১	০.২০৭৫	ইসলাম আলী	
২	১২/১৪/২০২১	০.২৪	মো: মোজ্জাম্মেল আলী প্রামানিক ওরফে মো: মুজাম প্রামানিক	
৩	১/২০/২০২২	১	নুরুল ইসলাম গং	
৪	২/১/২০২২	১.০১৪৫	মো: জাহাঙ্গীর আলম পিং- মৃত ইফসুফ প্রামানিক	
৫	২/১/২০২২	০.৪৬৬৭	মো: আ: করিম মোল্লা গং	
৬	২/১১/২০২২	১	আব্দুর করিম	
৭	২/১৩/২০২২	০.১৬৫	মো: মফিজুল মন্ডল	
৮	২/১৬/২০২২	০.৩৫৭৫	মো: মোন্তাজ আলী প্রামানিক	
৯	২/১৮/২০২২	০.৮৬	মো: হুমায়ূন কবির (ছালেহীন)	
১০	২/২৩/২০২২	০.২৬৫৭	ইবাদত মন্ডল	
১১	৩/২/২০২২	০.৫	মো: হুমায়ূন কবির (ছালেহীন)	
১২	৩/৮/২০২২	০.৬	পিয়ারন নেছা	
১৩	৩/১৯/২০২২	০.৬৬৫	আবু সোলাইমান তারেক	
১৪	৩/২৪/২০২২	০.৬৬৫	আব্দুল মান্নান	
১৫	৪/৪/২০২২	০.১৬	নায়েব আলী	
১৬	৪/১৭/২০২২	০.৬৮	মো: আলতাফ হোসেন	
১৭	৪/১৭/২০২২	০.৮৩	মো: সেকেন প্রামানিক গং	
১৮	৫/১০/২০২২	০.৬৫	মন্টু সরদার	
১৯	৬/৪/২০২২	০.২৭	মো: আাবু বক্কার প্রামাণিক	
২০	৬/৬/২০২২	০.১৫	মো: শাহাব উদ্দীন	
২১	৬/৭/২০২২	০.৩৪৫	মো: সুলতান বিশ্বাস	
২২	৮/৪/২০২২	০.৮২১৩	মোছাঃ রোকেয়া খাতুন	
২৩	৮/৪/২০২২	০.৪২	মো: আউব আলী	
২৪	৯/২৭/২০২২	০.১২২৪	মো: খবির উদ্দীন	
২৫	৯/২৭/২০২২	০.৬২	মোঃ ইসরাইল হোসেন গং	
২৬	১০/৫/২০২২	৬.০০১	মোঃ আব্দুর রাজ্জাক ব্যাপারী গং	
২৭	১০/১৭/২০২২	০.৩৫	মো: ইচাই বিশ্বাস	
২৮	১০/১৮/২০২২	০.৪৪৯৬	মো: শহিদুল ইসলাম গং	
২৯	১০/২৪/২০২২	০.২৬১৭	মো: আজিজ মৃধা	

৩০	১০/২৬/২০২২	০.১৯৬৩	মো: আব্দুল কুদ্দুস প্রামানিক	
৩১	১০/২৬/২০২২	০.৫৪	মো: ইসমাইল হোসেন	
৩২	১২/৫/২০২২	০.১৯	মো: নজরুল ইসলাম	
৩৩	১২/৫/২০২২	০.৪৬	মো: আক্কাছ আলী প্রামানিক	
৩৪	১২/৫/২০২২	০.৫৩	মন্টু সরদার	
৩৫	১২/১১/২০২২	০.৪৯৪৭	মো: আশরাফ আলী	
৩৬	১২/১৪/২০২২	৮.৮	মো: ছাত্তার ব্যাপারী গং	
৩৭	১২/২০/২০২২	৬.৫৭	নফছার আলী গং	
৩৮	১২/২২/২০২২	৫.৯২	সাজাহান আলী গং	
৩৯	১২/২৮/২০২২	০.৬২৫	মো: শহিদ বিশ্বাস	
৪০	১২/৩০/২০২২	৩.৮৮	মো: শহিদ বিশ্বাস	
৪১	১/২/২০২৩	১.৮৯৫৫৮	মো: সিরাজুল ইসলাম	
৪২	১/৭/২০২৩	০.৪৮	মোসা: ফিরোজা বেগম গং	
৪৩	১/১০/২০২৩	১.৮৯৬৫৮	মো: হাকিম প্রামানিক গং	
৪৪	১/১৮/২০২৩	৭.২০২৯	মো: সুজন শেখ	
৪৫	১/২৫/২০২৩	২.১১০২৯৪	মো: ফজিবর রহমান	
৪৬	২/৭/২০২৩	২.৩৮	মো: লতিফ মালিথা গং	
৪৭	২/১০/২০২৩	১.০৫	মো: বোরহান উদ্দিন	
৪৮	২/১৬/২০২৩	৪.৭৫	হাসান জামান জাকির গং	
৪৯	২/২৮/২০২৩	৯.৭৬	মো: ছলিম মালিথা গং	
৫০	৩/২/২০২৩	৪.২৮	শাহাদাত প্রামানিক গং	
৫১	৩/১০/২০২৩	৪.৯৯	জকু প্রামানিক গং	
৫২	৩/১৬/২০২৩	৩	রওশন আলী খা গং	
৫৩	৩/২৮/২০২৩	২.৫৬	করিম আলী গং	
৫৪	৪/১৫/২০২৩	৪.৬১	সাইদুর রহমান গং	
৫৫	৪/২৪/২০২৩	১.৮৭	মমিনুল ইসলাম গং	
৫৬	৫/২/২০২৩	০.৯	আব্দুল হামিদ গং	
৫৭	৫/১০/২০২৩	০.৬৮৩৬৪৬	কেরামত আলী মন্ডল গং	
	মোট	১০২.৭৬২৯		

Dynamic Sun Energy Private Limited
100MW (AC) Solar Park
Bhobanipur, Hemayetpur, Pabna Sadar, Pabna

সংযুক্ত পাতা- ৩; জমি ক্রয় পরিকল্পনা (জমির পরিমাণ- ৬৮.২০ একর)

ক্র,	সম্ভাব্য রেজিষ্ট্রেশন এর তারিখ	জমির পরিমাণ (একর)	দাতা/দাত্রীগনের নাম ও মোবাইল	মন্তব্য
১	৮/৫/২০২৩	২.৬	মো: হামিদুল বিশ্বাস গং, ০১৭২৮৪৫১৪৭৬	
২	৮/৫/২০২৩	২.৯	দাখিল উদ্দিন গং	
৩	৫/১০/২০২৩	২.০০	মো: ফজিবর রহমান গং, ০১৭৮২০২৭৫৬২	
৪	৮/১০/২০২৩	১০.৫	মো: আতিয়ার রহমান গং	
৫	৮/১২/২০২৩	২.১	মো: বজলুর রহমান গং	
৬	৮/১২/২০২৩	৮.৪৫	মো: আব্দুর রাজ্জাক ব্যাপারী গং, ০১৭১৯২৫৩৫৭১	
৭	৮/১৫/২০২৩	৬.২৮৩	বাবুল হোসাইন ইমন গং, ০১৭২৬২২৪৫২৪	
৮	৮/২০/২০২৩	৬.৫১	মো: শহিদ বিশ্বাস গং, ০১৭১৮৯৬৪৮৭১	
৯	৮/২০/২০২৩	৬.৬	আতাহার মন্ডল গং, ০১৭৪৫৫২১৪৬১	
১০	৮/২৩/২০২৩	৮.১৫	বজলু বিশ্বাস গং	
১১	৮/২৩/২০২৩	২.১২	মো: মোশারফ গং,	
১২	৮/২৫/২০২৩	৪.১৯	জহুরল বিশ্বাস গং	
১৩	৮/২৫/২০২৩	৪.৭০৬	মুন্তাজ প্রামানিক গং	
১৪	৮/২৫/২০২৩	১.১	হাজী মুক্তার বিশ্বাস গং	
	মোট	৬৮.২০		

Annexure – 6 (b)

Land Acquisition Information: Tower Footing

Amount of Land Required for Tower Footing (Decimal)

SI. NO	Tower No.	Tower Type	Name of Mouza	Nature of Land	LENGTH(mm) A+B.Wt	WIDTH(mm) B+B.Wl	AREA(SFT) Length * Width	Area in Decimal	Till date Acquire/ Direct Purchase/ RoW Cleared	Under Process	Remarks
1	Gantry	Gantry SS	Bhabanipur	Inside Project					N/A		No Issue
2	TT-01/0	1DT6+0 (with Aux-x-arm) (Terminal)	Bhabanipur	Inside Project	8320.220	7344.150	657.728	1.510	N/A		No Issue
3	TT-01/1	1DL+6	Bhabanipur	Paddy Field	5901.000	3486.000	221.423	0.508	RoW Cleared		
4	T-1/0	1DT6+3	Bhabanipur	Paddy Field	9135.220	7882.150	775.057	1.779	RoW Cleared		
5	T-1/1	1D1+9	Ratanpur	Paddy Field	5737.000	4855.000	299.809	0.688	RoW Cleared		
6	T-1/2	1DL+4.5	Ratanpur	Paddy Field	5746.000	3387.000	209.484	0.481	RoW Cleared		
7	T-1/3	1DL+6	Ratanpur	Paddy Field	5901.000	3486.000	221.423	0.508	RoW Cleared		
8	T-2/0	1D25+1.5	Ratanpur	Paddy Field	7640.770	6690.960	550.295	1.263	RoW Cleared		
9	T-2/1	1D1+9	Ratanpur	Paddy Field	5737.000	4855.000	299.809	0.688	RoW Cleared		
10	T-2/2	1DL+6	Bhagiratpur	Paddy Field	5901.000	3486.000	221.423	0.508	RoW Cleared		
11	T-2/3	1DL+9	Bhagiratpur	Paddy Field	6212.000	3683.000	246.265	0.565	RoW Cleared		
12	T-2/4	1DL+9	Char-Pratabpur	Paddy Field	6212.000	3683.000	246.265	0.565	RoW Cleared		
13	T-2/5	1DL+3	Char-Pratabpur	Paddy Field	5590.000	3288.000	197.840	0.454	RoW Cleared		
14	T-2/6	1DL+3	Char-Pratabpur	Paddy Field	5590.000	3288.000	197.840	0.454	RoW Cleared		
15	T-3/0	1DT6+3	Char Pratappur	Banana/weet Pumpkins	9135.220	7882.150	775.057	1.779	RoW Cleared		
16	T-3/1	1DL+6	Charkudulia	Banana	5901.000	3486.000	221.423	0.508	RoW Cleared		
17	T-3/2	1DL+6	Charkudulia	Breans/Wheat	5901.000	3486.000	221.423	0.508	RoW Cleared		
18	T-3/3	1DL+3	Charkudulia	Banana/Wheat/Eggplant	5590.000	3288.000	197.840	0.454	RoW Cleared		
19	T-3/4	1DL+6	Charkudulia	Banana/Wheat/Eggplant	5901.000	3486.000	221.423	0.508	RoW Cleared		
20	T-3/5	1DL+6	Charkudulia	Wheat	5901.000	3486.000	221.423	0.508	RoW Cleared		
21	T-3/6	1DL+3	Charkudulia	Wheat	5590.000	3288.000	197.840	0.454	RoW Cleared		
22	T-3/7	1DL+3	Charkudulia	Wheat/vegetables	5590.000	3288.000	197.840	0.454	RoW Cleared		
23	T-3/8	1DL+3	Charkudulia	Wheat/Eggplant	5590.000	3288.000	197.840	0.454	RoW Cleared		
24	T-3A/0	1D25+9	Charkudulia	Banana/Wheat/Eggplant	8993.130	7705.980	745.948	1.712	RoW Cleared		
25	T-3A/1	1DL+9	Charkudulia	Wheat/weet Pumpkins	6212.000	3683.000	246.265	0.565	RoW Cleared		
26	T-3A/2	1DL+6	Charkudulia	Wheat/Tree	5901.000	3486.000	221.423	0.508	RoW Cleared		
27	T-3A/3	1DL+4.5	Charkudulia	Blank	5746.000	3387.000	209.484	0.481	RoW Cleared		
28	T-3A/4	1DL+6	Kamalpur	Banana/Wheat	5901.000	3486.000	221.423	0.508	RoW Cleared		
29	T-3A/5	1DL+3	Kamalpur	Wheat	5590.000	3288.000	197.840	0.454	RoW Cleared		
30	T-3A/6	1DL+4.5	Kamalpur	Wheat	5746.000	3387.000	209.484	0.481	RoW Cleared		
31	T-3A/7	1DL+6	Kamalpur	Wheat/vegetables	5901.000	3486.000	221.423	0.508	RoW Cleared		
32	T-4/0	1D25+3	Kamalpur	Lentils	7865.770	6859.960	580.808	1.333	RoW Cleared		
33	T-4/1	1DL+9	Kamalpur	Wheat	6212.000	3683.000	246.265	0.565	RoW Cleared		
34	T-4/2	1DL+9	Kamalpur	Brick Field	6212.000	3683.000	246.265	0.565	RoW Cleared		
35	T-4/3	1DL+6	Kamalpur	Lentils/Wheat/Pepper	5901.000	3486.000	221.423	0.508	RoW Cleared		
36	T-4/4	1DL+6	Kamalpur	Radish	5901.000	3486.000	221.423	0.508	RoW Cleared		
37	T-4/5	1DL+6	Dadapur	Wheat//Eggplant	5901.000	3486.000	221.423	0.508	RoW Cleared		
38	T-4/6	1DL+6	Dadapur	Radish	5901.000	3486.000	221.423	0.508	RoW Cleared		
39	T-5/0	1DT6+9	Dadapur	Paddy Field	10564.220	8960.150	1018.879	2.339	RoW Cleared		
40	T-6/0	1D1+12	Dadapur	Paddy Field	6030.000	5045.000	327.453	0.752	RoW Cleared		
41	T-6/1	1DL+6	Kaikunda	Jute/Tin	5901.000	3486.000	221.423	0.508	RoW Cleared		
42	T-6/2	1DL+9	Kaikunda	Paddy/vegetables	6212.000	3683.000	246.265	0.565	RoW Cleared		
43	T-6/3	1D1+12	Kaikunda	Lychee/Date/Jute/Mango	6030.000	5045.000	327.453	0.752	RoW Cleared		
44	T-7/0	1D25+9	Kaikunda	Jute	8993.130	7705.980	745.948	1.712	RoW Cleared		

45	T-8/0	1DT6+6 (Terminal)	Kaikunda	Jute	9849.220	8421.150	892.778	2.050	RoW Cleared		
46	T-8AR	1DH-P	Kaikunda	Jute	5150.000	5150.000	285.486	0.655	RoW Cleared		
47	T-8BR	1DH-P	Kaikunda	Jute	5150.000	5150.000	285.486	0.655	RoW Cleared		
48	T-8AL	1DH-P	Kaikunda	Jute	5150.000	5150.000	285.486	0.655	RoW Cleared		
49	T-8BL	1DH-P	Kaikunda	Jute	5150.000	5150.000	285.486	0.655	RoW Cleared		
50	T-9/0	1DT6+9 (Terminal)	Bilkeda Grass	Jute	10564.220	8960.150	1018.879	2.339	RoW Cleared		
51	T-10/0	1DT6+9 (Terminal)	Bilkeda Grass	Paddy/Jute	10564.220	8960.150	1018.879	2.339	RoW Cleared		
52	T-10AR	1DH-P	Bilkeda Grass	Paddy/Jute	5150.000	5150.000	285.486	0.655	RoW Cleared		
53	T-10BR	1DH-P	Bilkeda Grass	Paddy/Jute	5150.000	5150.000	285.486	0.655	RoW Cleared		
54	T-10AL	1DH-P	Bilkeda Grass	Paddy	5150.000	5150.000	285.486	0.655	RoW Cleared		
55	T-10BL	1DH-P	Bilkeda Grass	Paddy	5150.000	5150.000	285.486	0.655	RoW Cleared		
56	T-11/0	1DT6+0 (Terminal)	Bilkeda Khas	Paddy Field	8320.220	7344.150	657.728	1.510	RoW Cleared		
57	T-11/1	1DL+3	Bilkeda Khas	Paddy Field	5590.000	3288.000	197.840	0.454	RoW Cleared		
58	T-11/2	1DL+1.5	Sahapur	Paddy Field	5466.000	3209.000	188.803	0.433	RoW Cleared		
59	T-11/3	1DL+3	Sahapur	Paddy Field	5590.000	3288.000	197.840	0.454	RoW Cleared		
60	T-11/4	1DL+3	Sahapur	Paddy Field	5590.000	3288.000	197.840	0.454	RoW Cleared		
61	T-11/5	1DL+9	Sahapur	Paddy Field	6212.000	3683.000	246.265	0.565	RoW Cleared		
62	T-12/0	1DT6+9	Sahapur	Paddy Field	10564.220	8960.150	1018.879	2.339	RoW Cleared		
63	T-12/1	1DL+9	Sahapur	Garden	6212.000	3683.000	246.265	0.565	RoW Cleared		
64	T-13/0	1DT6+9	Sahapur	Garden	10564.220	8960.150	1018.879	2.339	RoW Cleared		
65	T-13/1	1D1+12	Sahapur	House	6030.000	5045.000	327.453	0.752	RoW Cleared		
66	T-14/0	1DT6+9	Sahapur	Paddy Field	10564.220	8960.150	1018.879	2.339	RoW Cleared		
67	T-14/1	1DL+9	Sahapur	Paddy Field	6212.000	3683.000	246.265	0.565	RoW Cleared		
68	T-14/2	1DL+6	Sahapur	Paddy Field	5901.000	3486.000	221.423	0.508		Under Negotiation	
69	T-14/3	1DL+4.5	Maniknagar	Paddy Field	5746.000	3387.000	209.484	0.481	RoW Cleared		
70	T-15/0	1DT6+6	Maniknagar	Paddy Field	9849.220	8421.150	892.778	2.050	RoW Cleared		
71	T-15/1	1DL+9	Maniknagar	Garden	6212.000	3683.000	246.265	0.565	RoW Cleared		
72	T-16/0	1DT6+9	Maniknagar	Garden	10564.220	8960.150	1018.879	2.339	RoW Cleared	Under Negotiation	
73	T-16/1	1DL+9	Maniknagar	Garden	6212.000	3683.000	246.265	0.565		Under Negotiation	
74	T-16/2	1D1+12	Maniknagar	Garden	6030.000	5045.000	327.453	0.752	RoW Cleared		
75	T-17/0	1DT6+9	Joynagar	Paddy Field	10564.220	8960.150	1018.879	2.339	RoW Cleared		
76	T-17/1	1DL+9	Joynagar	Paddy Field	6212.000	3683.000	246.265	0.565	RoW Cleared		
77	T-18/0	1QT6+9	Joynagar	Litchi Garden	10564.220	8960.150	1018.879	2.339	RoW Cleared		
78	T-18/1	1Q15+15M	Joynagar	Litchi Garden	10564.220	8960.150	1018.879	2.339	RoW Cleared		
79	T-19/0	1D25+9	Joynagar	Litchi Garden	8993.130	7705.980	745.948	1.712	RoW Cleared		
80	T-20/0	1DT6-S	Joynagar	Grid	11245.000	11445.000	1385.305	3.180	Inside PGCB Grid Substation Area	No Issue	
								76.425			

Annexure - 7

Water Balance Calculation

Dynamic Sun Energy Private Limited

Bhabanipur, Hemayetpur, Pabna Sadar, Pabna

Date: 10.08.2023

Water Balance Calculation Sheet

Total Water Consumption (m3/month)

Water Consumption for PV Panels Cleaning			
Parameter	**Calculation**	**Number**	**Unit**
Total No. of PV Panel		274,243.00	Pcs
Water Consumption/Cycle		5.00	Liter
No. of Cycle/Month		2.00	Cycle
Water Consumption/Month for each PV Panel	5 X 2	10	Liter/month
Water Consumption for Overall PV Panel Cleaning	274243 X 10	2742430	Liter/month
	2742430 / 1000	2742.43	m3/month
	2742.43 / 30	91.41	m3/day
Water Consumption for PV Panels Cleaning (abstracted from Rainwater Harvesting ponds)		**91.41**	**m3/day**
		2742.3	**m3/month**

Rainwater Harvesting Reservoir Area Information		
Parameter	**Calculation**	**Number**
No. of Reservoir		7.00
Volume of each Reservoir	25 X 65 X 2	3,250.00
Toatl volume of Reservoir	**3250 X 7**	**22750.00**
Area of each Reservoir	25 X 65	1,625.00
Total Area of Reservoir	**1625 X 7**	**11,375.00**

Rainwater Harvesting from the Outside Field/Runnoff Area			
Parameter	**Calculation**	**Number**	**Unit**
Total Area without Reservoir		1425948	m2
15% of Total Area without Reservoir	1425948 X 15%	213892.2	m2

Water Consumption for Domestic Uses during Construction Phase			
Parameter	**Calculation**	**Number**	**Unit**
Total No. of Residential Workers		200	Persons
Water Consumption rate by Residential Worker		180	Liter/day
	180 / 1000	0.18	m3/day
Water Consumption by Residential Worker	200 X 0.18	36	m3/day
Water Consumption by residential workers (abstracted from Ground water)		**36**	**m3/day**
		1080	**m3/month**
Total No. of Non-residential Workers		500	Persons
Water Consumption rate by Non-residential Worker		100	Liter/day
	100 / 1000	0.1	m3/day
Water Consumption by Residential Worker	400 X 0.1	50	m3/day
Water Consumption by Non-residential Workers (abstracted from Ground water)		**50**	**m3/day**
		1500	**m3/month**
Toatl Ground water abstraction during Constrction phase		**86**	**m3/day**
		2580	**m3/month**

Water Consumption for Domestic Uses during Operation Phase			
Parameter	**Calculation**	**Number**	**Unit**
Water Consumption rate by Residential Worker	180 / 1000	0.18	m3/day
Water Consumption by Residential Worker	200 X 0.18	36	m3/day
Water Consumption by residential workers (abstracted from Ground water)		**36**	**m3/day**
		1080	**m3/month**
Total No. of Non-residential Workers		350	Persons
Water Consumption rate by Non-residential Worker		100	Liter/day
	100 / 1000	0.1	m3/day
Water Consumption by Residential Worker	400 X 0.1	35	m3/day
Water Consumption by Non-residential Workers (abstracted from Ground water)		**35**	**m3/day**
		1050	**m3/month**
Toatl Ground water abstraction during Operation phase		**71**	**m3/day**
		2130	**m3/month**

Rainwater Harvesting in the Reservoir, X				Rainwater Harvesting from the Outside Field (Rnuoff Area), Y			Total Rainwater Harvesting, X + Y = M	Total Rain Water Consumption, N	Water Balance	Reserved Rainwater
Month	**Pabna District's Monthly Average Rainfall, mm**	**Total Area of Reservoir, m2**	**Rainfall Quantity, m3/month**	**15% of Total Area Without Reservoir, m2**	**Rainfall Quantity, m3/month**	**After percolation and infiltration, 50% rest of water can be extracted, m3/month**	**From Reservoir + From Outside Field, m3/month**	**For PV Panel Cleaning Use, m3/month**	**Rainwater Harvesting - Water Consumption, m3/month**	**Status of the Rainwater Harvesting Ponds**
Apr	68.910	11,375.000	783.9	213,892.200	14,739.312	7,369.656	8,153.507	2,742.30	5,411.21	Partially filled
May	126.470	11,375.000	1,438.6	213,892.200	27,050.947	13,525.473	14,964.070	2,742.30	12,221.77	Partially filled
Jun	178.980	11,375.000	2,035.9	213,892.200	38,282.426	19,141.213	21,177.110	2,742.30	22,750.00	Totally filled
July	289.000	11,375.000	3,287.4	213,892.200	61,814.846	30,907.423	34,194.798	2,742.30	22,750.00	Totally filled
Aug	215.840	11,375.000	2,455.2	213,892.200	46,166.492	23,083.246	25,538.426	2,742.30	22,750.00	Totally filled
Sep	250.840	11,375.000	2,853.3	213,892.200	53,652.719	26,826.360	29,679.665	2,742.30	22,750.00	Totally filled
Oct	72.720	11,375.000	827.2	213,892.200	15,554.241	7,777.120	8,604.310	2,742.30	22,750.00	Totally filled
Nov	Negligible	11,375.000	-	213,892.200	-	-	-	2,742.30	20,007.70	Partially filled
Dec	Negligible	11,375.000	-	213,892.200	-	-	-	2,742.30	17,265.40	Partially filled
Jan	Negligible	11,375.000	-	213,892.200	-	-	-	2,742.30	14,523.10	Partially filled
Feb	Negligible	11,375.000	-	213,892.200	-	-	-	2,742.30	11,780.80	Partially filled
Mar	Negligible	11,375.000	-	213,892.200	-	-	-	2,742.30	9,038.50	Partially filled

Note: 05
This is least minimum calculation for rainwater but for practical scenario, the amount of rain water may be more than the calculation shown. For this, several flap gates will be installed along the dyke so that extra water can be discharged to the adjacent canal but no water from outside can move in through it.

Note: 04
The Water Balance shows that the reservoirs will be in full capacity during the monsoon period. If no rain occurs during dry period (Nov. to Mar.), the PV panel cleaning will not be hampered. As, the reservoirs' capacity is almost 1.7 times higher than the demand during the dry period. So, no ground water extraction is needed for PV panel cleaning process.

Note 01:
Rainfall Quantity Measurement Formula = Average Rainfall (m) X Area (m2) = Collecter Rainwater in m3

Note 02:
During both construction and operation phase 200 officials and workers will be residential. During construction phasethere will be labour camp for residential workers and during operation phase threre will be dormitory for officials and workers. During construction phase non-residential worker will be 500 who live nearby the project area. Camps and during operation phase non-residential worker will be 350 who live nearby the project area.

Note: 03
Underground tanks are used for ground water reservior purpose. Water is pumped to the over head tanks and used for domestic use only. 1 m3/hr capacity water treatment plant for drinking water has been installed inside the project.

Annexure - 8

Analytical Test Reports

Annexure – 8 (a)

Surface Water Quality Test Reports

AECL LABORATORY ANALYSIS REPORT
SURFACE WATER QUALITY TEST REPORT

Project Name : **ESIA of 100 MW ac Solar Power Plant Project, Pabna**
Project Location : **Bhabanipur, Hemayetpur, Pabna Sadar, Pabna**

Description of Sample : Surface Water
Sample Collector : AECL Monitoring Team
Sampling date : 14th April, 2023
Reporting date : 25th April, 2023

Description of analysis

Name of the Parameter	Concentration present		DoE (Bangladesh) Standard *	WHO Standard	Unit	Method of analysis
	SW 1 (23°56'46.51"N, 89° 9'48.79"E)	SW 2 (23°57'32.71"N, 89°10'54.21"E)				
Temperature	26.5	27	20-30	-	°C	Mercury filled thermometer
pH	6.9	6.8	6.5-8.5	6-9	-	pH Meter
TDS	137	113	1000	-	mg/l	TDS Meter

Comment: All the parameters do conform to the standards.

Md. Faisal Bin Mahmud
Sr. Chemist

Md. Saiful Islam
Chief Operating Officer

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Test Report

Number: BGDT23058252

Date: 21 May, 2023

Factory/ Applicant:

Factory/ Applicant Name	:	ADROIT ENVIRONMENT CONSULTANTS LTD.
Address	:	HOUSE-01, ROAD-16, SECTOR-07, UTTARA-1230, DHAKA, BANGLADESH
ATTN:	:	MR. FAISAL MAHAMUD
Sample Description:	:	Two (02) Bottles of Submitted Samples Said to be (A) SW1 (Surface Water) & (B) SW2 (Surface Water)
No. Of Sample	:	02
Reference No.	:	AECL_100MW_SOLAR/2023/05/11
Date Of Sampling/Time	:	14th April 2023
Discharge Type:	:	-
Sample	:	(A) SW1 (Surface Water) & (B) SW2 (Surface Water)
Ref	:	- Factory Location: Pabna Sadar, Pabna - Factor Name: Dynamic Sun Energy Private Ltd. - Address: Pabna Sadar, Pabna
Sample Received/Test Started	:	11 May, 2023

Remark:
Sample Collection (Sampling) Done By The Factory / Applicant.

Authorized By
For ITS Labtest Bangladesh Ltd.

Mohammad Neyamul Hasan
Country Business Line Leader, Softlines

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Test Report

Number: BGDT23058252

Conclusion:

Requirements On	Result	
	Sample (A)	Sample (B)
Biological Oxygen Demand (BOD)	*	*
Dissolved Oxygen (DO)	*	*
Total Suspended Solids (TSS)	*	*
Electrical Conductivity (EC)	*	*
Total Coliform	*	*
Phosphate	*	*
Fecal Coliform	*	*
Nickel (Ni)	*	*
Iron (Fe)	*	*
Aluminium (Al)	*	*

Note : M = Meet Applicant Requirement
F = Exceeded Applicant Requirement
# = No Comment
- = Did Not Perform
N/A = Not Applicable
* = See Result
C = Conform Label

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Test Report

Number: BGDT23058252

Tests Conducted (As Requested By The Applicant)

Sl. No.	Parameters	Test method	Reporting Limit	Unit	Result	
					Sample (A)	Sample (B)
1	BOD_5	SM 5210B (23rd Edition), SM 5210D (23rd Edition) & USEPA 405.1 :1974	8	mg/L	ND	ND
2	DO	USEPA 360.1 :1971, SM 4500-O (23rd Edition)	N/A	mg/L	7.9	7.8
3	TSS	USEPA 160.2 :1971, SM 2540D (23rd Edition)	5	mg/L	20	ND
4	EC	USEPA 120.1 :1982	20	µS/cm	306	282
5	Total Coliform	ISO 9308-1 :2014, USEPA 9132 :1986	1	CFU/ 100 mL	118	84
6	Phosphate	USEPA 365.2 :1978, USEPA 365.3 :1978, SM 4500-P E (23rd Edition)	3	mg/L	ND	ND
7	Fecal Coliform	SM 9222 (23rd Edition), Membrane Filtration	1	CFU/100 mL	42	36
8	Nickel (Ni)	USEPA 200.8 :1994, ISO 17294-2 :2016, ISO 1185 :2007	0.1	mg/L	ND	ND
9	Iron (Fe)		0.1	mg/L	1.4	ND
10	Aluminium (Al)		0.1	mg/L	0.7	ND

Remark:
mg/L = milligram per litre
µS/cm = microSiemens per centimetre
CFU/mL= Colony Forming Unit per milliLitre
ND = Not Detected (less than reporting limit)
N/A = Not Applicable

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Test Report

Number: BGDT23058252

PICTURE

==== END OF THE TEST REPORT ====

This report is made solely on the basis of instructions and/or information and materials supplied by you (the Client), It is not intended to be a recommendation for any specific course of action. Intertek shall not accept a duty of care or any other responsibility to any person other than the Client in respect of this report and only accepts liability to the Client insofar as that which is expressly contained in the terms and conditions governing the provision of services to you. Intertek makes no warranties or representations either express or implied with respect to this report save as provided for in those terms and conditions. We have aimed to conduct the Review on a diligent, truthful and careful basis and we do not accept any liability to you for any direct or in-direct loss arising out of or in connection with this report, in contract, tort, by statute or otherwise, except in the event of our gross negligence or wilful misconduct.

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ENVIRONMENTAL ENGINEERING LABORATORY

BRTC
Bureau of Research, Testing & Consultation

BUETCE 04 22 40

BRTC No. : **1102-91241 /22-23/CE; Dt: 16/5/2023**

Ref. No.: AECL/Lab/2023/05/070; Dt: 15/5/2023

Sent by : Shahriar Ebn Bashar, Assistant Consultant (EIA)

Company Address : Adroit Environment Consultants Ltd., House # 1, 2nd Floor, Road # 16, Sector # 7, Uttara, Dhaka-1230

Project : NA

Sample Id : SW-1 **Location:** Hemayetpur, Pabna Sadar, Pabna

Date of Test : 16/5/2023 - 27/5/2023 **Source:** Surface Water

TEST REPORT (PHYSICAL/ CHEMICAL/ BACTERIOLOGICAL ANALYSIS OF WATER SAMPLE)

Sl. No.	Water Quality Parameters	Unit	Concentration Present	Bangladesh Standard for Drinking Water (ECR'23)	WHO Guideline Values, 2004	Method of analysis	Minimum Detection Limit (MDL)
1	Chemical Oxygen Demand (COD) : Dichromate	mg/l	11	4	---	SM 5220 D	0.2
2	Sulphate (SO4)	mg/l	<MDL	250	250	SM 4500-SO4 E	7
3	Nitrate - Nitrogen (NO3 - N)	mg/l	0.4	45	50	SM 4500-NO3-N E	0.1
4	Chromium (Cr)	mg/l	0.006	0.05	0.05	SM 3111 B	0.001
5	Lead (Pb)	mg/l	0.017	0.01	0.01	SM 3111 B	0.01
6	Cadmium (Cd)	mg/l	<MDL	0.003	0.003	SM 3111 B	0.001
7	Zinc (Zn)	mg/l	0.18	5	3-5	SM 3111 B	0.02
8	Copper (Cu)	mg/l	<MDL	1.5	2	SM 3111 B	0.014
9	---	---	---	---	---	---	---
10	---	---	---	---	---	---	---

a. Health based guideline, b. Guideline based on other considerations

Comments : 1. Sample was supplied by CLIENT
2. Sample was received in unsealed condition.

Important Notes: Samples as supplied to us have been tested in our laboratory. BRTC does not have any responsibility as to the representative character of the samples required to be tested. It is recommended that samples are sent in a secure and sealed cover/pack

Countersigned *by*:

Prof. Dr. Hasib Mohammed Ahsan
Test-In-Charge, Dept. of Civil Engineering, BUET

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Test Performed *by*:

Rowshan Mamtaz 28/5/23

Dr. Rowshan Mamtaz
Professor, Dept. of Civil Engineering, BUET

Department of Civil Engineering BUET, Dhaka-1000, Bangladesh

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY (BUET)

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ENVIRONMENTAL ENGINEERING LABORATORY

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Bureau of Research, Testing & Consultation

BUETCE 04122441

BRTC No. : **1102-91241 /22-23/CE; Dt: 16/5/2023** **Ref. No.:** AECL/Lab/2023/05/070; Dt: 15/5/2023

Sent by : Shahriar Ebn Bashar, Assistant Consultant (EIA)

Company Address : Adroit Environment Consultants Ltd., House # 1, 2nd Floor, Road # 16, Sector # 7, Uttara, Dhaka-1230

Project : NA

Sample Id : SW-2 **Location:** Hemayetpur, Pabna Sadar, Pabna

Date of Test : 16/5/2023 - 27/5/2023 **Source:** Surface Water

TEST REPORT (PHYSICAL/ CHEMICAL/ BACTERIOLOGICAL ANALYSIS OF WATER SAMPLE)

Sl. No.	Water Quality Parameters	Unit	Concentration Present	Bangladesh Standard for Drinking Water (ECR'23)	WHO Guideline Values, 2004	Method of analysis	Minimum Detection Limit (MDL)
1	Chemical Oxygen Demand (COD) : Dichromate	mg/l	5	4	---	SM 5220 D	0.2
2	Sulphate (SO4)	mg/l	8	250	250	SM 4500-SO4 E	7
3	Nitrate - Nitrogen (NO3 - N)	mg/l	0.6	45	50	SM 4500-NO3-N E	0.1
4	Chromium (Cr)	mg/l	<MDL	0.05	0.05	SM 3111 B	0.001
5	Lead (Pb)	mg/l	0.013	0.01	0.01	SM 3111 B	0.01
6	Cadmium (Cd)	mg/l	<MDL	0.003	0.003	SM 3111 B	0.001
7	Zinc (Zn)	mg/l	0.06	5	3-5	SM 3111 B	0.02
8	Copper (Cu)	mg/l	<MDL	1.5	2	SM 3111 B	0.014
9	---	---	---	---	---	---	---
10	---	---	---	---	---	---	---

a. Health based guideline, b. Guideline based on other considerations

Comments : 1. Sample was supplied by CLIENT
2. Sample was received in unsealed condition.

Important Notes: Samples as supplied to us have been tested in our laboratory. BRTC does not have any responsibility as to the representative character of the samples required to be tested. It is recommended that samples are sent in a secure and sealed cover/pack

Countersigned by:

Prof. Dr. Hasib Mohammed Ahsan
Test-In-Charge, Dept. of Civil Engineering, BUET

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Test Performed by:
Rowshan Mamtaz 28/5/23

Dr. Rowshan Mamtaz
Professor, Dept. of Civil Engineering, BUET

Department of Civil Engineering, BUET, Dhaka-1000, Bangladesh

Annexure – 8 (b)

Ground Water Quality Test Reports

AECL LABORATORY ANALYSIS REPORT
GROUND WATER QUALITY TEST REPORT

Project Name : **ESIA of 100 MW ac Solar Power Plant Project, Pabna**
Project Location : **Bhabanipur, Hemayetpur, Pabna Sadar, Pabna**

Description of Sample : Ground/Drinking Water
Sample Collector : AECL Monitoring Team
Sampling date : 14th April, 2023
Reporting date : 25th April, 2023

Description of analysis

Name of the Parameter	Concentration present		DoE (Bangladesh) Standard *	WHO Standard	Unit	Method of analysis
	GW 1 (23°58'2.51"N, 89°10'9.16"E)	GWQ2 (23°57'52.98N, 89°9'23.24"E)				
Temperature	22	23	20-30	-	°C	Mercury filled thermometer
pH	7.0	7.1	6.5-8.5	6.5-9.5	-	pH Meter
TDS	372	353	1000	1000	mg/l	TDS Meter

Comment: All the parameters do conform to the standards.

Md. Faisal Bin Mahmud
Sr. Chemist

Md. Saiful Islam
Chief Operating Officer

CERT. NO. 05.020.23 BAB BANGLADESH ACCREDITATION BOARD Accredited for ISO/IEC 17020:2012

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Test Report

Number: BGDT23058255

Date: 21 May, 2023

Factory/ Applicant:

Factory/ Applicant Name	:	ADROIT ENVIRONMENT CONSULTANTS LTD.
Address	:	HOUSE-01, ROAD-16, SECTOR-07, UTTARA-1230, DHAKA, BANGLADESH
ATTN:	:	MR. FAISAL MAHAMUD
Sample Description:	:	Two (02) Bottles of Submitted Samples Said to be (A) GW1 (Ground Water) & (B) GW2 (Ground Water)
No. Of Sample	:	02
Reference No.	:	AECL_100MW_SOLAR/2023/05/11
Date Of Sampling/Time	:	14th April 2023
Discharge Type:	:	-
Sample	:	(A) GW1 (Ground Water) & (B) GW2 (Ground Water)
Ref	:	- Factory Location: Pabna Sadar, Pabna - Factor Name: Dynamic Sun Energy Private Ltd. - Address: Pabna Sadar, Pabna
Sample Received/Test Started	:	11 May, 2023

Remark:
Sample Collection (Sampling) Done By The Factory / Applicant.

Authorized By
For ITS Labtest Bangladesh Ltd.

Mohammad Neyamul Hasan
Country Business Line Leader, Softlines

ITS Labtest Bangladesh Ltd.
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Test Report

Number: BGDT23058255

Conclusion:

Requirements On	Result	
	Sample (A)	Sample (B)
Total Coliform	*	*
Phosphate	*	*
Fecal Coliform	*	*
Nickel (Ni)	*	*
Iron (Fe)	*	*
Aluminium (Al)	*	*

Note : M = Meet Applicant Requirement
= No Comment
N/A = Not Applicable
C = Conform Label
F = Exceeded Applicant Requirement
- = Did Not Perform
* = See Result

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Test Report

Number: BGDT23058255

Tests Conducted (As Requested By The Applicant)

Sl. No.	Parameters	Test method	Reporting Limit	Unit	Result	
					Sample (A)	Sample (B)
1	Total Coliform	ISO 9308-1 :2014, USEPA 9132 :1986	1	CFU/ 100 mL	Absent	Absent
2	Phosphate	USEPA 365.2 :1978, USEPA 365.3 :1978, SM 4500-P E (23rd Edition)	3	mg/L	ND	ND
3	Fecal Coliform	SM 9222 (23rd Edition), Membrane Filtration	1	CFU/100 mL	Absent	Absent
4	Nickel (Ni)	USEPA 200.8 :1994, ISO 17294-2 :2016, ISO 1185 :2007	0.1	mg/L	ND	ND
5	Iron (Fe)		0.1	mg/L	ND	ND
6	Aluminium (Al)		0.1	mg/L	ND	ND

Remark:
mg/L = milligram per litre
µS/cm = microSiemens per centimetre
CFU/mL= Colony Forming Unit per milliLitre
ND = Not Detected (less than reporting limit)
N/A = Not Applicable

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Test Report

Number: BGDT23058255

PICTURE

==== END OF THE TEST REPORT ====

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ENVIRONMENTAL ENGINEERING LABORATORY

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BRTC No. : **1102-91241 /22-23/CE; Dt: 16/5/2023** **Ref. No.:** AECL/Lab/2023/05/070; Dt: 15/5/2023

Sent by : Shahriar Ebn Bashar, Assistant Consultant (EIA)

Company Address : Adroit Environment Consultants Ltd., House # 1, 2nd Floor, Road # 16, Sector # 7, Uttara, Dhaka-1230

Project : NA

Sample Id : GW-1 **Location:** Hemayetpur, Pabna Sadar, Pabna

Date of Test : 16/5/2023 - 27/5/2023 **Source:** Ground Water

TEST REPORT (PHYSICAL/ CHEMICAL/ BACTERIOLOGICAL ANALYSIS OF WATER SAMPLE)

Sl. No.	Water Quality Parameters	Unit	Concentration Present	Bangladesh Standard for Drinking Water (ECR'23)	WHO Guideline Values, 2004	Method of analysis	Minimum Detection Limit (MDL)
1	Arsenic (As)	mg/l	<MDL	0.05	0.01	SM 3113 B	0.001
2	Total Hardness (as CaCO3)	mg/l	440	600	500	SM 2340 C	0.2
3	Total Alkalinity (as CaCO3)	mg/l	393	---	---	SM 2320 B	1
4	Sulphate (SO4)	mg/l	45	250	250	SM 4500-SO4 E	7
5	Nitrate - Nitrogen (NO3 - N)	mg/l	3.2	45	50	SM 4500-NO3-N E	0.1
6	Chromium (Cr)	mg/l	<MDL	0.05	0.05	SM 3111 B	0.001
7	Lead (Pb)	mg/l	0.027	0.01	0.01	SM 3111 B	0.01
8	Cadmium (Cd)	mg/l	0.01	0.003	0.003	SM 3111 B	0.001
9	Zinc (Zn)	mg/l	0.04	5	3-5	SM 3111 B	0.02
10	Copper (Cu)	mg/l	<MDL	1.5	2	SM 3111 B	0.014

a. Health based guideline, b. Guideline based on other considerations

Comments : 1. Sample was supplied by CLIENT
2. Sample was received in unsealed condition.

Important Notes: Samples as supplied to us have been tested in our laboratory. BRTC does not have any responsibility as to the representative character of the samples required to be tested. It is recommended that samples are sent in a secure and sealed cover/pack

Countersigned *by*:

Prof. Dr. Hasib Mohammed Ahsan
Test-In-Charge, Dept. of Civil Engineering, BUET

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RBAgK4gD4

Test Performed *by*:

Rowshan Mamtaz 28/5/23

Dr. Rowshan Mamtaz
Professor, Dept. of Civil Engineering, BUET

Department of Civil Engineering BUET, Dhaka-1000, Bangladesh

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY (BUET)

DEPARTMENT OF CIVIL ENGINEERING

Mobile: 01819 557 964; PABX: 55167100 Ext. 7226; http://brtctest.ce.buet.ac.bd/

ENVIRONMENTAL ENGINEERING LABORATORY

BRTC
Bureau of Research, Testing & Consultation

BUETCE 04 22 43

BRTC No. : 1102-91241 /22-23/CE; Dt: 16/5/2023 **Ref. No.:** AECL/Lab/2023/05/070; Dt: 15/5/2023

Sent by : Shahriar Ebn Bashar, Assistant Consultant (EIA)

Company Address : Adroit Environment Consultants Ltd., House # 1, 2nd Floor, Road # 16, Sector # 7, Uttara, Dhaka-1230

Project : NA

Sample Id : GW-2 **Location:** Hemayetpur, Pabna Sadar, Pabna

Date of Test : 16/5/2023 - 27/5/2023 **Source:** Ground Water

TEST REPORT (PHYSICAL/ CHEMICAL/ BACTERIOLOGICAL ANALYSIS OF WATER SAMPLE)

Sl. No.	Water Quality Parameters	Unit	Concentration Present	Bangladesh Standard for Drinking Water (ECR'23)	WHO Guideline Values, 2004	Method of analysis	Minimum Detection Limit (MDL)
1	Arsenic (As)	mg/l	<MDL	0.05	0.01	SM 3113 B	0.001
2	Total Hardness (as CaCO3)	mg/l	460	500	500	SM 2340 C	0.2
3	Total Alkalinity (as CaCO3)	mg/l	485	---	---	SM 2320 B	1
4	Sulphate (SO4)	mg/l	<MDL	250	250	SM 4500-SO4 E	7
5	Nitrate - Nitrogen (NO3 - N)	mg/l	2.6	45	50	SM 4500-NO3-N E	0.1
6	Chromium (Cr)	mg/l	<MDL	0.05	0.05	SM 3111 B	0.001
7	Lead (Pb)	mg/l	0.027	0.01	0.01	SM 3111 B	0.01
8	Cadmium (Cd)	mg/l	0.01	0.003	0.003	SM 3111 B	0.001
9	Zinc (Zn)	mg/l	0.03	5	3-5	SM 3111 B	0.02
10	Copper (Cu)	mg/l	<MDL	1.5	2	SM 3111 B	0.014

a. Health based guideline, b. Guideline based on other considerations

Comments : 1. Sample was supplied by CLIENT
2. Sample was received in unsealed condition.

Important Notes: Samples as supplied to us have been tested in our laboratory. BRTC does not have any responsibility as to the representative character of the samples required to be tested. It is recommended that samples are sent in a secure and sealed cover/pack

Countersigned by:

Prof. Dr. Hasib Mohammed Ahsan
Test-In-Charge, Dept. of Civil Engineering, BUET

32

Jj2Nb7CmC

Test Performed by:
Rowshan Mamtaz
25/5/23

Dr. Rowshan Mamtaz
Professor, Dept. of Civil Engineering, BUET

Dept. of Civil Engg. BUET, Dhaka-1000, Bangladesh

Annexure – 8 (c)

Ambient Air Quality Test Report

AECL LABORATORY ANALYSIS REPORT
AMBIENT AIR QUALITY TEST REPORT

Project Name : **ESIA of 100 MW ac Solar Power Plant Project, Pabna**
Project Location : **Bhabanipur, Hemayetpur, Pabna Sadar, Pabna**

Description of Sample : Ambient Air
Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team).
Sampling date : **15th – 16th April, 2023**
Reporting date : 25th April, 2023

Description of analysis

SN	*Parameters*	Method	Test Duration (hours)	Unit	23°57'48.2"N 89°10'39.9"E (L1)	23°58'2.89"N 89°10'4.99"E (L2)	23°57'58.9"N 89°09'30.5"E (L3)	23°57'34.86"N 89°9'38.89"E (L4)	24°1'14.62"N 89°4'43.28"E (L5)	24°5'21.83"N89°5'25.96"E (L6)	Bangladesh (DoE) Standard	IFC /World Bank Standard
1	**$PM_{2.5}$**	Gravi metric	24	µg/m³	31.11	33.52	32.72	28.41	27.61	25.73	65	75
2	**PM_{10}**	Gravi metric	24	µg/m³	65.73	61.66	64.68	52.39	50.33	51.48	150	150
3	**SPM**	Gravi metric	8	µg/m³	105.84	105.18	103.4	87.8	82.94	80.21	200	NF
4	**SO_2**	West-Geake	24	µg/m³	12.44	13.83	10.20	8.73	7.12	6.36	365	125
5	**NO_x**	Jacob and Hochheiser	1	µg/m³	10.83	11.49	9.15	6.53	5.35	5.09	NF	200
6	**CO**	CO/O_3 Meter	1	ppm	1	1	2	1	1	1	35	NF

(NF – not found, DoE – Department of Environment.), *1-hour standard Not Found

Note: *This monitoring report was usually accomplished by - Respirable Dust Sampler (Model-Envirotech India APM-460BL) and Fine Particulate Sampler (Model- Envirotech India AAS-127BL).*

1. Fine Particulate Matter ($PM_{2.5}$).
2. Respirable Dust Content (PM_{10}).
3. Suspended Particulate Matter (SPM).
4. Oxides of Nitrogen (NO_X).
5. Oxides of Sulfur (SO_2).
6. Carbone Mono-Oxide (CO).

Comment: *From the aforementioned results it is discernible that, all the parameters are inside the allowable limits.*

Md. Faisal Bin Mahmud
Sr. Chemist

Md. Saiful Islam
Chief Operating Officer

Annexure – 8 (d)

Ambient Noise Quality Test Report

AECL LABORATORY ANALYSIS REPORT
AMBIENT NOISE QUALITY TEST REPORT

Project Name : **ESIA of 100 MW ac Solar Power Plant Project, Pabna**
Project Location : **Bhabanipur, Hemayetpur, Pabna Sadar, Pabna**

Description of Sample : Ambient Noise
Sample Collector : Adroit Environment Consultants Ltd. (Monitoring team)
Sampling date : **15th - 16th April, 2023**
Reporting date : 29th April, 2023

Description of analysis

SN.	Site Location	Site Condition	Concentration present (LA_{eq}) dBA.			
			Day Time		Night Time	
			Minimum	Maximum	Minimum	Maximum
01	East side of the site, (Location # 01) 23°57'44.76"N 89°10'41.40"E	Pre-construction Stage	36.6	40.7	27.5	31.6
02	North side of the site, (Location # 02) 23°58'2.89"N 89°10'5.24"E	Pre-construction Stage	32.4	38.6	25.3	28.5
03	South side of the site, (Location # 03) 23°57'23.06"N 89° 9'57.29"E	Pre-construction Stage	30.9	33.4	25.4	26.9
04	West side of the site, (Location # 04) 23°57'55.02"N 89° 9'23.66"E	Pre-construction Stage	35.9	41.8	27.6	30.2
05	Near Dadapur Purba para, (Location # 04) 24° 1'14.57"N 89° 4'44.41"E	Pre-construction Stage	38.6	44.1	30.2	35.8
06	Residential area near Rajshahi-Kushtia Highway, (Location # 04) 24° 5'21.41"N 89° 5'25.46"E	Pre-construction Stage	30.2	36.3	25.3	28.7
DoE (Bangladesh) Standard for Mixed area (mainly residential area, and also simultaneously used for commercial and industrial purposes)			**60**		**50**	
IFC/International Standard for Residential; institutional; educational			**55**		**45**	

Note: *This noise data was usually accomplished by – CEM Sound Level Meter (Model – DT 8850)*

Comment: According to the Department of Environment (ECR'1997), the standard for ambient noise level in the industrial zone is 75 and 70 decibels at day & night time respectively. The results were found within the limit as per DoE Standards.

Md. Faisal Bin Mahmud
Sr. Chemist

Md. Saiful Islam
Chief Operating Officer

Annexure – 8 (e)

Soil Quality Test Report

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
কৃষি মন্ত্রণালয়
মৃত্তিকা সম্পদ উন্নয়ন ইনস্টিটিউট
বিভাগীয় গবেষণাগার, ঢাকা
মৃত্তিকা ভবন, কৃষি খামার সড়ক, ঢাকা-১২১৫

প্রাপকঃ

জনাব মোঃ মোছাদ্দেকুর রহমান খান
এড্রয়েট এনভায়রনমেন্ট কনসালটেন্ট
হাউজ নং- ১, রোড- ১৬
সেক্টর- ৭, উত্তরা, ঢাকা।

প্রেরিত মৃত্তিকা নমুনার বিশ্লেষিত ফলাফল

ক্রমিক নম্বর	ল্যাব নম্বর	উপাদানের নাম						
		পিএইচ	জিংক	কপার	লেড	ক্যাডমিয়াম	ক্রোমিয়াম	নিকেল
		(pH)	সহজলভ্য		মোট			
			(ppm)					
১.	৭১৬২	৭.৫	০.৪০	২.০৪	১৭.১৪	০.১২	৪.২৬	১.৫৯

১৪/০৬/২০২৬
(ড. মাসুদা বেগম)
উর্ধ্বতন বৈজ্ঞানিক কর্মকর্তা
ফোন ঃ ০২-৪১০২৫০৬৬।

Annexure – 9

Methodology of Identification and Prediction of Impacts

1.1 PREDICTION OF IMPACTS

Prediction of impacts is essentially an objective exercise to determine what could potentially happen to the environment as a consequence of the project and its associated activities. The nature and types of impacts that has been addressed in this EIA is defined in the below.

1.1.1 Extent and location

This indicates the spatial area that may be affected by the project activities or its associated facilities.

Table 1.1: Impact Extent from the project location

Impact Elements	Criteria	Ranking
Extent	• Entire country	National
	• District level	Regional
	• Project site & its immediate vicinity (within 5 km radius)	Local

1.1.2 Duration

This measures the lifetime/ existence/ continuation of the impact.

Table 1.2: Duration of Impact

Impact Elements	Criteria	Ranking
Duration	• Spread over the lifecycle of the project	Long term
	• Spread across several phases of the project lifecycle	Medium term
	• Only during particular activities or a phase of the project lifecycle	Short term

1.1.3 Scale

3 type of scale of impact is considered i.e.; High/ Medium/ Low.

Table 1.3: Scale of Impact

Impact Elements	Criteria	Ranking
Scale	• Irreversible damage to natural environment and/or likely difficult or may not to revert back to earlier stage with mitigation; • Major changes in comparison to baseline conditions and / or likely to regularly or continually exceed the standard;	High
	• Reversible damage to natural environment but likely to easily revert back to earlier stage with mitigation; • Perceptible change from baseline conditions but well within acceptable norms.	Medium
	• Effect is within the normal range of natural variation; • No perceptible or readily measurable change from baseline conditions;	Low

1.1.4 Magnitude:

This is calculated as extent + duration + Scale. The magnitude combines the impact characteristics of Extent, Duration and Scale and is a multiplicative factor of these three criteria set but mostly dependent on impact scale and extent. Sometimes the magnitude is determined based on consultant's previous experience.

Table 1.4: Assessing Magnitude of Impact

Extent	Duration	Impact Scale	Magnitude
Local	Short term	None	Negligible
Regional	Short term	None	Negligible
National	Short term	None	Negligible
Local	Medium term	None	Negligible
Regional	Medium term	None	Negligible
National	Medium term	None	Negligible
Local	Long term	None	Negligible
Regional	Long term	None	Negligible
National	Long term	None	Negligible
Local	Short term	Low	Minor
Regional	Short term	Low	Minor
Local	Medium term	Low	Minor
Local	Short term	Medium	Minor
National	Short term	Low	Minor
Local	Long term	Low	Minor
Local	Short term	High	Minor
Regional	Medium term	Low	Minor
Regional	Short term	Medium	Minor
Local	Medium term	Medium	Minor
National	Medium term	Low	Moderate
National	Short term	Medium	Moderate
Regional	Long term	Low	Moderate
Regional	Short term	High	Moderate
Local	Long term	Medium	Moderate
Local	Medium term	High	Moderate
Regional	Medium term	Medium	Moderate
National	Long term	Low	Moderate
National	Short term	High	Moderate
Local	Long term	High	Moderate
National	Medium term	Medium	Major
Regional	Long term	Medium	Major
Regional	Medium term	High	Major

Extent	Duration	Impact Scale	Magnitude
National	Long term	Medium	Major
National	Medium term	High	Major
Regional	Long term	High	Major
National	Long term	High	Major

Annexure - 10

Drinking Water Quality Test Report of Submersible Pump System

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY (BUET)

DEPARTMENT OF CIVIL ENGINEERING

Mobile: 01819 557 964, PABX: 55167100 Ext. 7226, http://envtest.ce.buet.ac.bd/

ENVIRONMENTAL ENGINEERING LABORATORY

BRTC No. : 1102-99435 /23-24/CE; Dt: 31/8/2023 Ref. No.: Letter, Dt: 31/8/2023

Sent by : Md. Abdul Alim, DGM, Head of Civil & Compliance, Dynamic Sun Energy (Pvt.) Limited

: Bhabanipur, Hemayetpur, Pabna

Project : Testing of Water Sample

Sample Id : -

Location : Bhabanipur, Hemayetpur, Pabna

Date of Test : 31/8/2023 - 4/9/2023

Source : Drinking Water

TEST REPORT (ROUTINE DRINKING WATER PARAMETERS)

Sl. No.	Water Quality Parameters	Unit	Concentration Present	Bangladesh Standard for Drinking Water (ECR'23)	WHO Guideline Values 2004	Method of analysis	Minimum Detection Limit (MDL)
1	pH	-	6.50	6.5-8.5	6.5-8.5	SM 4500-H+ B	0
2	Color	Pt-Co	2	15	15	SM 2120 C	0.01
3	Turbidity	NTU	0.14	5	5	SM 2130 B	0.01
4	Total Hardness as CaCO3	mg/L	14	500	200	SM 2340 C	0.2
5	Chloride (Cl)	mg/L	5	250	250	SM 4500-Cl- B	5
6	Total Dissolved Solids (TDS)	mg/L	25	1000	1000	SM 2540 C	5
7	Manganese (Mn)	mg/L	<MDL	0.4	0.4a, 0.1b	PAN Method	0.005
8	Arsenic (As)	mg/L	<MDL	0.05	0.01	SM 3113 B	0.001
9	Iron (Fe)	mg/L	<MDL	0.3-1.0	0.3	SM 3111 B	0.02
10	Total Coliform(TC)	CFU/100 ml	0	0	0	SM 9221 E	0
11	Fecal Coliform (FC)	CFU/100 ml	0	0	0	SM 9222 D	0

a. Health based guideline, b. Guideline based on other considerations.

Comments : 1. The routine parameters analyzed are within the acceptable limits set for drinking water in ECR 2023 and the supplied sample may be considered suitable for drinking purpose.

2. Sample was supplied by CLIENT

3. Sample was received in unsealed condition.

Countersigned by :

Prof. Dr. Hasib Mohammed Ahsan
Test-In-Charge, Dept. of Civil Engineering, BUET

Test Performed by :

09/09/23

Dr. Md. Abdul Jalil
Professor, Dept. of Civil Engineering, BUET

Important Notes: Samples as supplied to us have been tested in our laboratory. BRTC does not have any responsibility as to the representative character of the samples required to be tested. It is recommended that samples are sent in a secure and sealed cover/packet/container under signature of the competent authority. In order to avoid fraudulent fabrication of test results, it is recommended that all test reports are collected by duly authorized person, and not by the Contractor/Supplier.

Annexure – 11

Detail of Septic Tank

Dynamic Sun Energy Private Limited

Bhabanipur, Hemayetpur, Pabna Sadar, Pabna

Design of Septic & Soak Well for 100 MW (ac) Solar Power Plant at Pabna

Assumptions from Available Data:			
1	Water Supply	180.00	Litr/day/person
2	No. of Persons	150.00	Nos
3	Sewage Generation	80.00	%
4	Detention Period	18.00	Hours
5	Cleaning Period	1.00	Year
6	Length: Width	4:01	Ratio
7	Depth of Liquid	1.80	Mtr
8	Sludge Deposit	30.00	Ltr/person/year
9	Minimum Free Board	300.00	mm

Septic Tank Calculation:			
1	Total Waste Entering Septic Tank	21,600.00	Litr/day
2	Detention Period	18	Hours
3	Capacity of Tank Required	16,200.00	Litrs
4	Capacity Required for Sludge Accumulation	4,500.00	Litr/year
5	Total Capacity Required	20,700.00	Litrs
6	Plan Area of Septic Tank	11.50	Sq. Mtr
7	Width of Tank	2.30	Mtr
8	Length of Tank	5.00	Mtr
9	Total Depth of Tank +0.5mtr Excluding the slope	2.30	Mtr

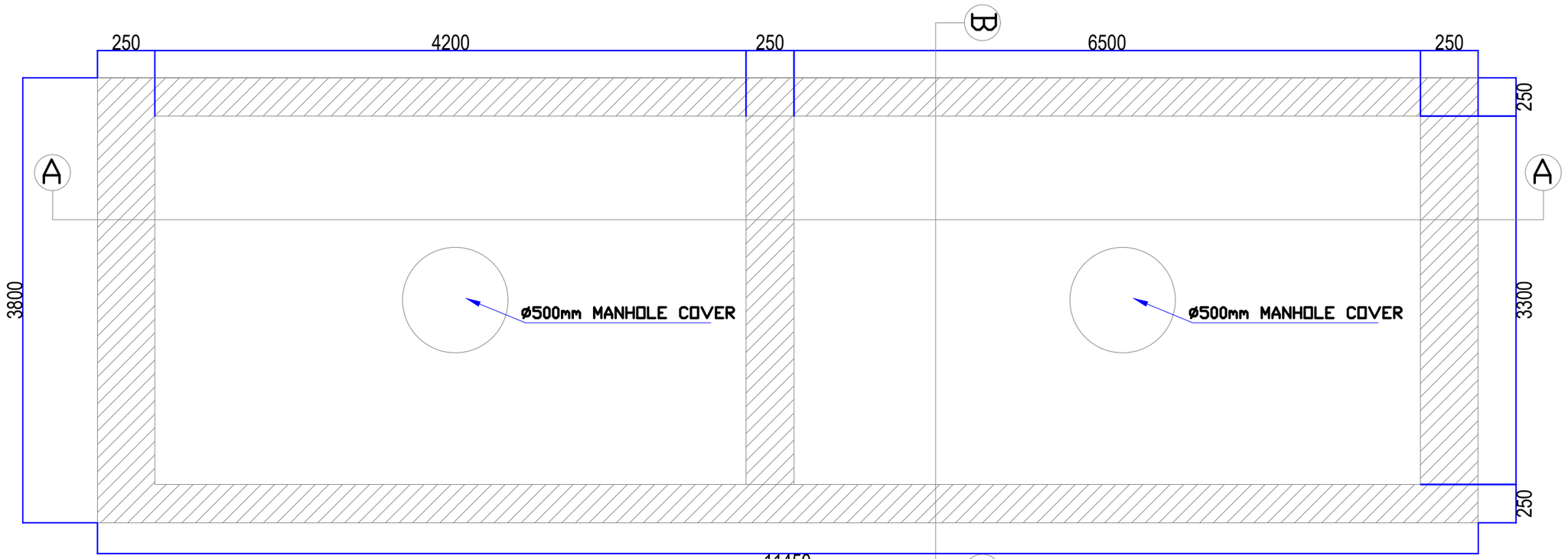
Soak Pit Design Calculation:			
1	Waste Water Discharge from Septic Tank	21,600.00	Litr/day
2	Percolation Rate	6,210.00	Litr/Cu Mtr/day
3	Vol of Filter Media	3.48	Cu Mtr
4	Depth Taken	3.50	Mtr
5	Area of Soak Pit	0.99	Mtr
6	Dia of Soak Well Required	1.04	Mtr

We are doubling the capacity of Septic Tank since we cannot have soak pit in the present soil conditions at site.

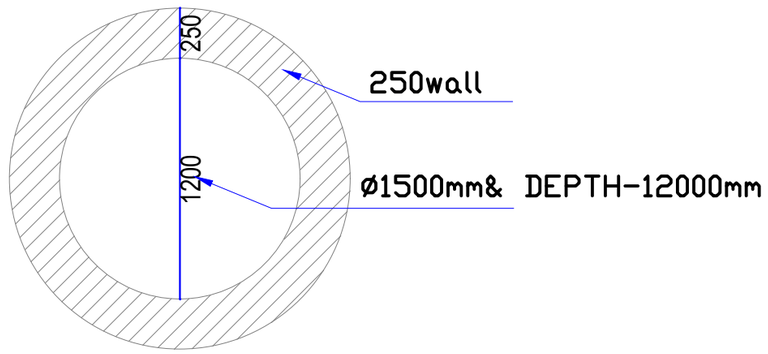
As per IS: 2470 Part-1-1985

Recommended size of septic tank for 100MW (ac) Solar Power Plant

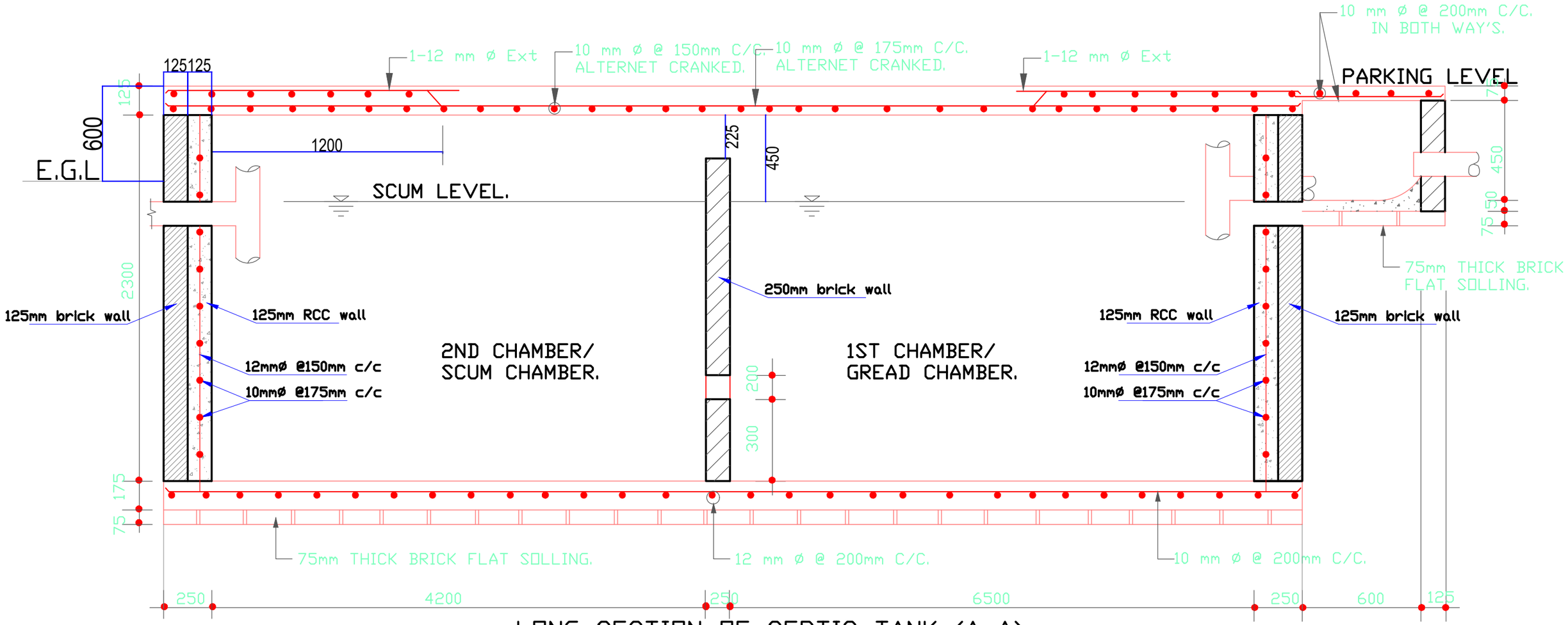
No. of User	**Length**	**Width**	**Liquid Depth**	**Liquid Depth**
Nos.	Mtr	Mtr	Mtr	Mtr
300	10.7	3.3	1.4	1.7
Capacity in Litr			**49434.00 Litr**	**60027.00 Litr**
			Sludge Widthdrawl once in a Year	Sludge Widthdrawl once in 2 Year



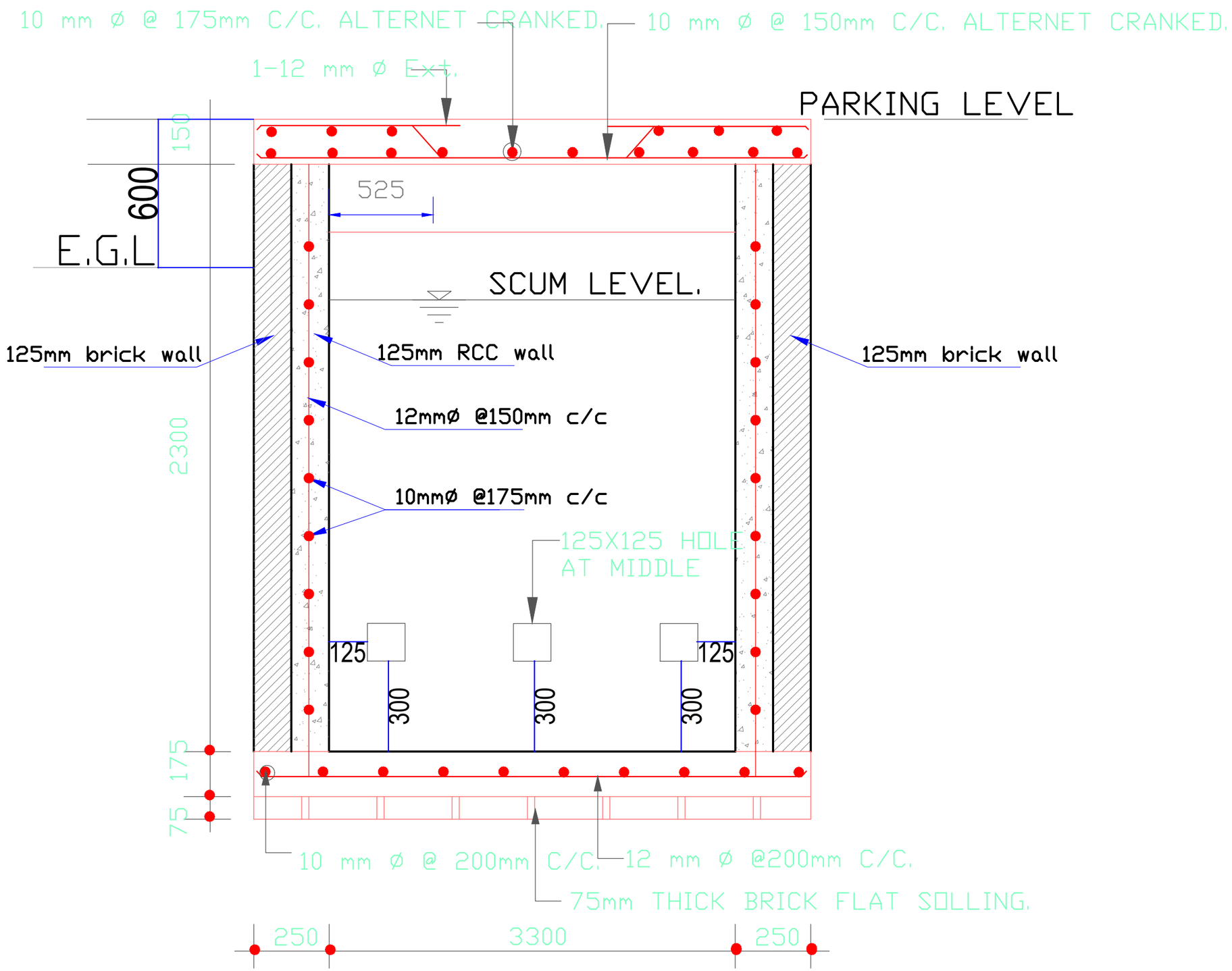
PLAN OF SEPTIC TANK



PLAN OF SOAKWEL



LONG SECTION OF SEPTIC TANK (A-A)



CROSS SECTION OF SEPTIC TANK (B-B)

Annexure – 12

Tube well Installation Permission from Upazila Office

Alhaj Md. Mosharrof Hossain
Chairman

Date :

Ref :

প্রাপক,

ব্যবস্থাপনা পরিচালক
ডায়নামিক সান এনার্জি প্রাইভেট লিমিটেড
ভবানীপুর, হিমায়েতপুর, পাবনা সদর, পাবনা।

বিষয়: উপজেলা আইন মোতাবেক পানির উৎস/কুপ খনন/নলকুপ স্থাপনের অনুমতি প্রসঙ্গে।

সূত্র: আপনার আবেদন পত্র তাং- ০৭/০৫/২০২৩ইং।

উপযুক্ত বিষয় ও সূত্রের প্রেক্ষিতে উপজেলা পরিষদ আইন-২০০৯ এর আলোকে উপজেলা এলাকায় বানিজ্যিক উন্নয়ণ ও অগ্রগতি বিবেচনা করে ডায়নামিক সান এনার্জি প্রাইভেট লিমিটেড প্রতিষ্ঠানটিকে ০-৪ (চার) ইঞ্চি ডায়পাইপের ০৫ (পাঁচ) টি নলকুপ ব্যবহারের জন্য নিম্ন বর্ণিত শর্তে অনুমোদন করা হলো।

শর্তাবলী:

- ❖ সরকারী বিধি বিধান অনুসরণ করে পানি উত্তোলন করিতে হবে।
- ❖ সংশ্লিষ্ট প্রতিষ্ঠানকে কর পরিশোধ করিতে হবে।
- ❖ উত্তোলিত পানি নিয়ম নীতি মোকাবেক ড্রেন/ক্যানেলে অবমুক্ত করিতে হবে।
- ❖ জলাবদ্ধতা সৃষ্টি হয় এমন কোন কার্যক্রম পরিচালনা করা যাবে না।
- ❖ কোন শর্ত ভঙ্গ হলে এই অনুমিত পত্র বাতিল বলিয়া গন্য হবে।

৮/৫/২০২৩

মো: মোশারোফ হোসেন
চেয়ারম্যান
উপজেলা পরিষদ, পাবনা সদর, পাবনা।

আলহাজ্ব মোঃ মোশাররফ হোসেন
চেয়ারম্যান
উপজেলা পরিষদ, পাবনা সদর, পাবনা।

Annexure – 13

MoU between DSEPL and Shimla Hospital & Diagnostic Center

খছ ৭৯৯৩৩৯৫

Agreement on Medical Service

Dynamic Sun Energy Private Limited.

Bhabanipur, Hemaetpur, Pabna Sadar, Pabna..... 1st Party

Versus

Shimla Hospital and Diagnostic Center.

Shimla Tower, Thana More, Shalgaria, Pabna Sadar, Pabna .....2nd Party

The 1st party is a Solar Power Company who would like to provide proper medical facilities to its employees in case of emergencies. The 2nd party is registered non-government hospital who is providing medical service to the peoples of the country. The 1st party approaches to the 2nd party for emergency medical facilities for the employees of the factory.

This agreement has been signed between the two parties on this terms and conditions:

Terms & Conditions:

1. That the 1st party will send its employee by a medical pass to the hospital and second will provide all necessary treatment to the employee.

2. The second party will provide all emergency medical services to the 1st party upon getting Information of any kind of industrial accident, fire accident, natural disaster etc.

3. That the 2nd party will provide ambulance to the 1" party end to pick up the 1st party employees in case of emergencies.

4. The 1st party can use hospital bed for the employees.

5. That the 2nd party will provide priority treatment to the 1st party employees.

"দেশপ্রেমের শপথ নিন, দুর্নীতিকে বিদায় দিন"

খছ ৭৯৯৩৩৯৬

6. That the 2nd party will provide stretcher, Oxygen cylinder and other medical equipment if necessary to save lives of the 1st party.

7. That the 2nd party will submit actual bills to the 1st party of the service provides for.

8. That the 1st party generates a small quantity of medical wastes which requires disposal by a qualified waste disposer; in this case 2nd party offers medical waste disposal services and is qualified to dispose of the wastes generated by the 1st party.

9. All the treatment cost will base per attached price list and the 2nd party will provide the mentioned discount. Without x-ray. If there is any service need to provide by the 2nd party which is not available in the attached price list, 2nd party will negotiate the price with 1st party prior to provide the service.

10. This Type of services 2nd party will provide to 1st party those are listed below:
(a) Outdoor service (b) Indoor service (c) Emergency service (d) Specialized Consultancy (e) Operation (f) Others service (g) Digital X-ray (h) All pathology Test (i) ECG (j) USG (Whole abdomen) (k) USG other to (l) Nebulization (m) Oxygen (n) Suction (o) Vaccination (p) Medical Check-up (q) Physiotherapy (r) Laparoscopic (s) Baby Incubator (t) Dental unit (u) Endoscopy (v) Eye Unit (w) Hearing Aid Unit (x) EEG,ETT (y) Hormone Test (z) CT Scan (aa) MRI (ab) OPG (ac) Hemo Dialysis etc.

11. The discount opportunity of 2nd party according to this under flowing commandment:

খছ ৭৯৯৩৩৯৭

12. Special discount offers Dynamic Sun Energy Private Ltd. Employees (Local Patient).

SL No	Types of Service	Discount	Rate for Company
01	Medical officer Fee	30%	
01.2	(Not Applicable other Consultant		
02	All Pathology Test	15% To 20%	
03	All Radiology Test	10% To 15%	
04	ECG/ETT/EEG	10% To 15%	
05	ECHO (Colour Doplar)	10% To 15%	
06	USG (4D Color)	10% To 15%	
07	Cabin/G-Bed Charge	10%	
08	Ambulance Service	10%	
09	Operation (Major/Minor)	Negotiable	

13. This agreement is signed on 15/05/2023 and will continue for a period up to 14/05/2025.

14. No discount will be applicable for the foreign services holders. The bill will increase by up to 25% in the case of treatment of foreign patients. As a reason for this increase, the company will provide services under special privilrges in the treatment of foreign patients.

15. Additional service:

- 24 hours Hospital Open.
- 24 hours Pharmacy Open.
- 24 hours Ambulance service.

Signature of 1st Party	Signature of 2nd Party
MD. ROBIUL ISLAM General Manager	**(Md. Abul Hossain)** Chairman, Shimla Hospital and Diagnostic Center.

"দেশপ্রেমের শপথ নিন, দুর্নীতিকে বিদায় দিন"

Annexure – 14

Detail of STP

DESIGN CALCULATION FOR PSTP of 'DYNAMIC SUN ENERGY PRIVATE LIMITED

Capacity = 15 KLD

PROCESS: BIOLOGICAL STP BY MBBR TECHNOLOGY

1. WASTEWATER GENERATION CALCULATION

S/L No.	Total Manpower (Person)	Wastewater Generation (L/ Capita/Day)	Wastewater Generation (Litre / Day)	Waste Water Generation (m^3 / Day)	Designed STP Capacity- 10% Safety (m^3/day)
1.	300	40	12000	12	15

As per "Bangladesh National Building Code"

Part-8, Page-8-202

2. INLET AND OUTLET WATER PARAMEMETERS

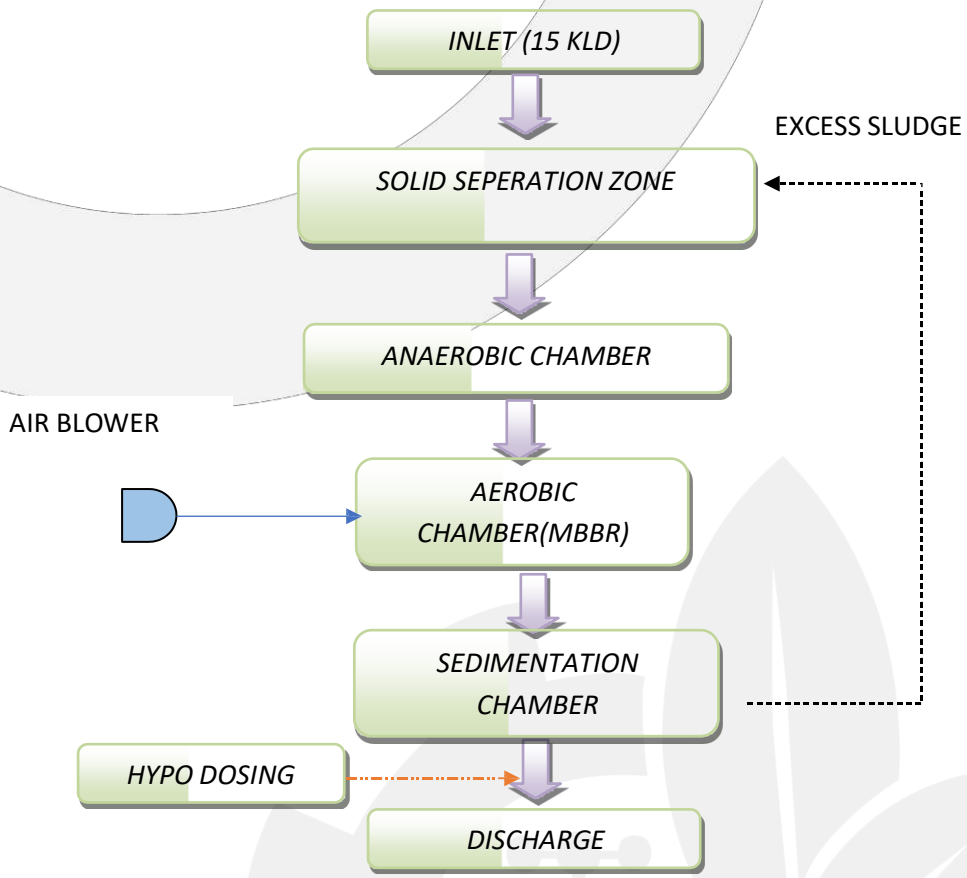
S/L No.	Water Quality Parameters	Unit	Inlet Water Considered Pollution Load	Outlet Parameters
1.	pH	-	6-9	6.5-8.5
2.	Chemical Oxygen Demand (COD)	mg/l	850	<100
3.	Biochemical Oxygen Demand (BOD)	mg/l	300	<30
4.	Total Suspended Solid (TSS)	mg/l	200	<50
5.	Nitrate	mg/l	100	<50
6.	Phosphate	mg/l	150	<15

ECR -2023 Standard:

তফসিল-৩
পয়ঃনির্গমন মানমাত্রা
(বিধি ৩২ দ্রষ্টব্য)

ক্রমিক নং	স্থিতিমাপ	একক	উপস্থিতির সর্বোচ্চ সীমা পিএইচ ব্যতীত
(১)	(২)	(৩)	(৪)
১।	উষ্ণতা (Temp)	ডিগ্রি সেন্টিগ্রেড	৩০
২।	পিএইচ (pH)	-	৬-৯
৩।	বিওডি$_5$ ২০° সেন্টিগ্রেড (BOD_5 at 20°C)	মি.গ্রা./লি.	৩০
৪।	সিওডি (COD)	মি.গ্রা./লি.	১২৫
৫।	প্রলম্বিত কঠিন বস্তু (SS)	মি.গ্রা./লি.	১০০
৬।	তৈল ও গ্রিজ (Oil & Grease)	মি.গ্রা./লি.	১০
৭।	নাইট্রেট (NO_3)	মি.গ্রা./লি.	৫০
৮।	ফসফেট (PO_4)	মি.গ্রা./লি.	১৫
৯।	সার্বিক কলিফর্ম (Total Coliform)	সিএফইউ/১০০ মি. লি.	১০০০

3. PROCESS CHART



SOLID SEPERATION CHAMBER SIZING

Solid Separation Chamber Sizing, (D×H) = (2 m × 1.7 m)

Design Basis:

Volume of the chamber = (0.785× 2^2 m × 1.7 m))

= 5.34 m^3

Retention Time (RT) = (5.34 m^3 ÷15 m^3/day)

= 0.356 day= 8.5 hr

Free Board = 0.3 m

ANAEROBIC CHAMBER SIZING

Anaerobic Chamber Sizing, (D×H) = (2 m × 1.5 m)

Design Basis:

Volume of the chamber = (0.785× 2^2 m × 1.5 m))

= 4.71 m^3

Liquid Retention Time (RT)= (4.71 m^3 ÷ 15 m^3/day)

= 0.314 day= 7.5 hr

Freeboard= 0.3 m

BIOLOGICAL OXIDATION (MBBR):

型号 (Model)		XLB-01(PE01)	XLB-02(PE02)	XLB-03(PE03)	XLB-04(PE04)	XLB-05(PE05)	XLB-06(PE06)
规格 (Spec.)	mm	φ12*9	φ11*7	φ10*7	φ16*10	φ25*12	φ25*12
孔数(Hole Numbers)	pcs	4	4	5	6	19	19
有效表面积 (Efficient surface)	m2/m3	>800	>900	>1000	>800	>650	>650
比重 (Density)	g/cm3	0.96-0.98	0.96-0.98	0.96-0.98	0.96-0.98	0.96-0.98	1.02-1.05
堆积个数 (Packing numbers)	pcs/m3	>630000	>830000	>850000	>260000	>97000	>97000
孔隙率 (Porosity)	%	>85	>85	>85	>85	>80	>80
建膜投配率 (dosing ratio)	%	15-67	15-68	15-70	15-65	15-65	15-65
挂膜时间 (membrane-forming time)	days	3-15	3-15	3-15	3-15	3-15	3-15
硝化效率 (nitrfication efficiency)	gNH4-N/m3.d	400-1200	400-1200	400-1200	400-1200	400-1200	400-1200
BOD氧化效率 (BODs oxidation efficiency)	gBOD5/m3.d	2000-10000	2000-10000	2000-10000	2000-10000	2000-10000	2000-10000
COD氧化效率(COD oxidation efficiency)	gCOD/m3.d	2000-15000	2000-15000	2000-15000	2000-15000	2000-15000	2000-15000
适用温度 (Applicable temperature)	℃	5-60	5-60	5-60	5-60	5-60	5-60
使用寿命 (Life-span)	year	>15	>15	>15	>15	>15	>15

MBBR TANK VOLUME:

Where,

MBBR Media Specific Surface Area: 650 m2/m3

MBBR Size: 12 mm × 25 mm

Void: 80%

Fill: 15%-65%

BOD LOADING RATE AT MBBR TANK:

BOD Loading Rate: $= Q \times S_o$

$= 15\ m^3/day \times (240\ g/m^3)$ (20% BOD removal by anaerobic treatment)

= 3,600 g/day

REQUIRED MBBR MEDIA TOTAL SURFACE AREA:

Considering BOD Removal 90 %, SALR = 7.5 $g/m^2/Day$

Required Media Surface Area= BOD Loading Rate / SALR

= 3,600 g/day ÷ 7.5 $g/m^2/Day$

= 480 m^2

TOTAL VOLUME OF MBBR MEDIA:

MBBR Media Specific Surface Area = 650 m^2/m^3

Total Volume of MBBR Media = (Required MBBR Media Total Surface Area) ÷ (Media Specific Surface Area)

= 480 m^2 ÷ 650 m^2/m^3

= 0.74 m^3 ≈ 0.8 m^3

REQUIRED MBBR TANK VOLUME:

Required Tank Volume = (Total Volume of MBBR Media) ÷ (Carrier Fill %)

= 0.8 m^3 ÷ 19 %

= 0.8 m^3 ÷ 0.19

= 4.21 m3

LIQUID VOLUME IN TANK:

Liquid Volume in Tank = Required Tank Volume - [Required Carrier Volume × (1 - Carrier % Void Space)]

= 4.21 m^3 - [0.8 m^3 × (1-81%)]

= 4.21 m^3 - [0.8 m^3 × (1-0.81)]

= 4.21 m^3 - [0.8 m^3 × 0.19]

= 4.21 m^3 – 0.15 m^3

= 4.06 m^3

AEROBIC CHAMBER SIZING

Aerobic Chamber Sizing, (D×H) = (2 m × 1.3 m)

Design Basis:

Volume of the chamber = (0.785× 2^2 m × 1.3 m))

= 4.08 m^3

HYDRAULIC RETENTION TIME (HRT) OF MBBR TANK:

MBBR Tank HRT = (Liquid Volume in Tank $m^{3)}$ ÷ (Flow Rate, Q)

= 4.08 m^3 ÷ 15 m^3/day

= 0.27 day= 6.5 hr

STANDARD NAME	STANDARD VALUE	DESIGN VALUE	DESIGN CONFORMITY	REMARKS
"Waste Water Engineering Treatment & Reuse" by Metcalf & Eddy (Fourth Edition) Page - 955	3.5 – 4.5 hr	6.5 hr	Yes	

As per "Waste Water Engineering Treatment and Reuse" by Metcalf & Eddy (Fourth Edition)

Page – 955, Table 9-15

CALCULATED AIR

$$Actual\ Oxygen\ Requirement = \frac{BOD * Flow\ rate * 1.8}{1000}$$

AOR = (240 g/m3 X 15 m3/day X 1.8) ÷ 1000

=6480 g/day ÷ 1000 Kg O2 / day

= 6.48 Kg O_2 / day

$$Standard\ Oxygen\ Requirement = \frac{AOR}{0.50}$$

Standard Oxygen Requirement SOR = (AOR ÷ 0.5) Kg O_2 / day

= 6.48 / 0.5 Kg O_2 / day

=12.96 Kg O_2 / day

SOTE = 20 %

$$SOTE = \left(\frac{SOR}{Q}\right) * \left(\frac{1}{\rho}\right) * \left(\frac{1}{23.17\%}\right)$$

20 % = (12.96 kg/day ÷ Q) × (1 ÷ 1.27 Kg/m3) × (1 ÷ 23.17 %)

Or 0.2 = (12.96 ÷ Q) × 0.787 × 4.35 (kg/day ÷ Kg/m3)

Or Q = 221.83 m3/day ÷ 24 hr / day

Or Q = 9.24 m3/hr

Supplied Submersible Jet Aerator Capacity= 10 m3/hr (1W+1S)

SEDIMENTATION CHAMBER (PLAIN TYPE):

Sedimentation chamber Sizing, (D×H) = (2 m × 1.5 m)

Design Basis:

Volume of the chamber = (0.785× 2^2 m × 1.5 m)

= 4.71 m^3

Liquid Retention Time (RT)= (4.71 m^3 ÷ 15 m^3/day)

= 0.314 day= 7.5 hr

Freeboard= 0.3 m

BIO SLUDGE LOADING IN CLARIFIER

$$\text{Sludge Loading Rate} = \frac{3000\frac{g}{m3} \times 15\frac{m3}{day}}{1000\frac{g}{1}kg}$$

=45 Kg/day (100 % Dry)

I. Surface overflow rate (SOR)

SOR = 15 m^3/day/ 3.14 m^2

=4.77 m^3/m^2/day

STANDARD NAME	STANDARD VALUE	DESIGN VALUE	DESIGN CONFORMITY	REMARKS
"Waste Water Engineering Treatment & Reuse" by Metcalf & Eddy (Fourth Edition) Page - 398	24 – 32 m^3/m^2/day	4.77 m^3/m^2/day	Yes	

As per "Waste Water Engineering Treatment and Reuse" by Metcalf & Eddy (Fourth Edition)

Page – 398, Table 5-20

II. Hydraulic retention time (HRT)

HRT = (0.785× 2^2 m × 1.5 m) ÷ 15 m^3/day

= 4.71 m^3 ÷ 15 m^3/day

= 0.314 day = 7.5 hr

STANDARD NAME	STANDARD VALUE	DESIGN VALUE	DESIGN CONFORMITY	REMARKS
"Waste Water Engineering Treatment & Reuse" by Metcalf & Eddy (Fourth Edition) Page - 398	1.5 – 2.5 hr	7.5 hr	Yes	

As per "Waste Water Engineering Treatment and Reuse" by Metcalf & Eddy (Fourth Edition)

Page – 398, Table 5-20

SLUDGE MANAGEMENT

Plant Data:

STP Capacity: 15 KLD

BOD Load: 300 mg/L

Sludge can be dewatered yearly or can be Cleaned Along with Septic Tank Seepage can be managed by sludge drying bed.

1. PROCESS DESCRIPTION

A. SCREENING

The principal role of screening is to remove the materials like plant, debris, fibre and other large particles from the flow stream that could damage subsequent process equipment, reduce overall treatment process reliability and effectiveness, or contaminate waterways. Coarse screen followed by fine screen are employed to remove different size of solid waste effectively.

B. SEDIMENTATION AND SEPARATION CHAMBER:

- Separation chamber separates larger matter (like plastic pieces, sachets etc.)
- Heavier particles settle in the 1st chamber due to higher density.

C. ANAEROBIC CHAMBER:

- The first stage of the biological process; consists of on which the anaerobic bacteria grow.
- Anaerobic bacteria decompose the organic matter (BOD & COD) – almost 50 to 60% degradation.
- Anaerobic bacteria do not require oxygen for their survival and growth (hence, no blower required).

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Web: www.greengenesisbd.com, Hotline: +880 1700 665555

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Block-Ka, Sector 6, Mirpur,
Dhaka-1212, Bangladesh.

Nawabpur Office:
92,Nawabpur Road, Dhaka
(Waiz Machinery Market)
Cell- 01713 468048

Warehouse:
Aragaon Road,
Belma, Ashulia-1341,
Dhaka, Bangladesh.

D. **AEROBIC CHAMBER:**

- The second stage of the biological process; consists of media on which the aerobic bacteria grow.
- Aerobic bacteria decompose the residual BOD & COD.
- Aerobic bacteria require oxygen (blower is provided).
- Air is supplied to the chamber by a diffuser for efficient oxygen transfer.

E. **SEDIMENTATION CHAMBER**

- In this chamber, the sludge along with the microorganism is settled down the treated water from the aerobic zone is stored.
- Sludge is transferred to solid separation zone and by sludge recirculation pump.
- The treated water after aerobic treatment sent to the treated water tank for discharge.
- In the outlet line, NaOCl dosing system is provided for disinfection of the treated water.

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1. SCOPE OF SUPPLY-(SEWAGE TREATMENT PLANT- 15 KLD)

S/L. No	Items	Specification	Unit	Qnty.
1.	*FRP Unit*	Capacity: 15 KLD Size: 2000 mm (D) x 6000 mm (L) MOC: FRP Brand: GGEL	set	1
2.	*Sewage Lifting Pump*	Capacity: 5 m3/hr Head: 7 m H Power: 0.5 HP/ 0.37 kW Brand: Grampus Origin: Taiwan	set	2
3.	*Sludge Transfer Pump*	Capacity: 5 m3/hr Head: 7 m H Power: 0.5 HP/ 0.37 kW Brand: Grampus Origin: Taiwan	set	1
4.	*Aeration System*	Per hr O_2 Capacity: 0.06 – 0.1 kg/hr Motor: 1 HP/0.75 kW Origin: China/Taiwan	set	2
5.	*MBBR Biochips*	MOC: HDPE/PP Diameter: 25 mm Length: 12 mm Brand: GGEL Origin: China	m3	0.8
6.	*Hypo Dosing pump*	Capacity: 5 LPH Pressure: 8 bar Power: 14 W Brand: Seko Origin: Italy Dosing Tank: 200 L MOC: Plastic	Set	1
7.	*Interconnecting Pipe and Fittings and Cables*	MOC: PVC/uPVC Cables as per design requirement	Lot	1
8.	*Control Panel*	Major Item Magnetic Contact Circuit Breaker Overload Relay Timer Major Equipment: Mitsubishi/Schneider/Siemens Assembling: GGEL	Lot	1

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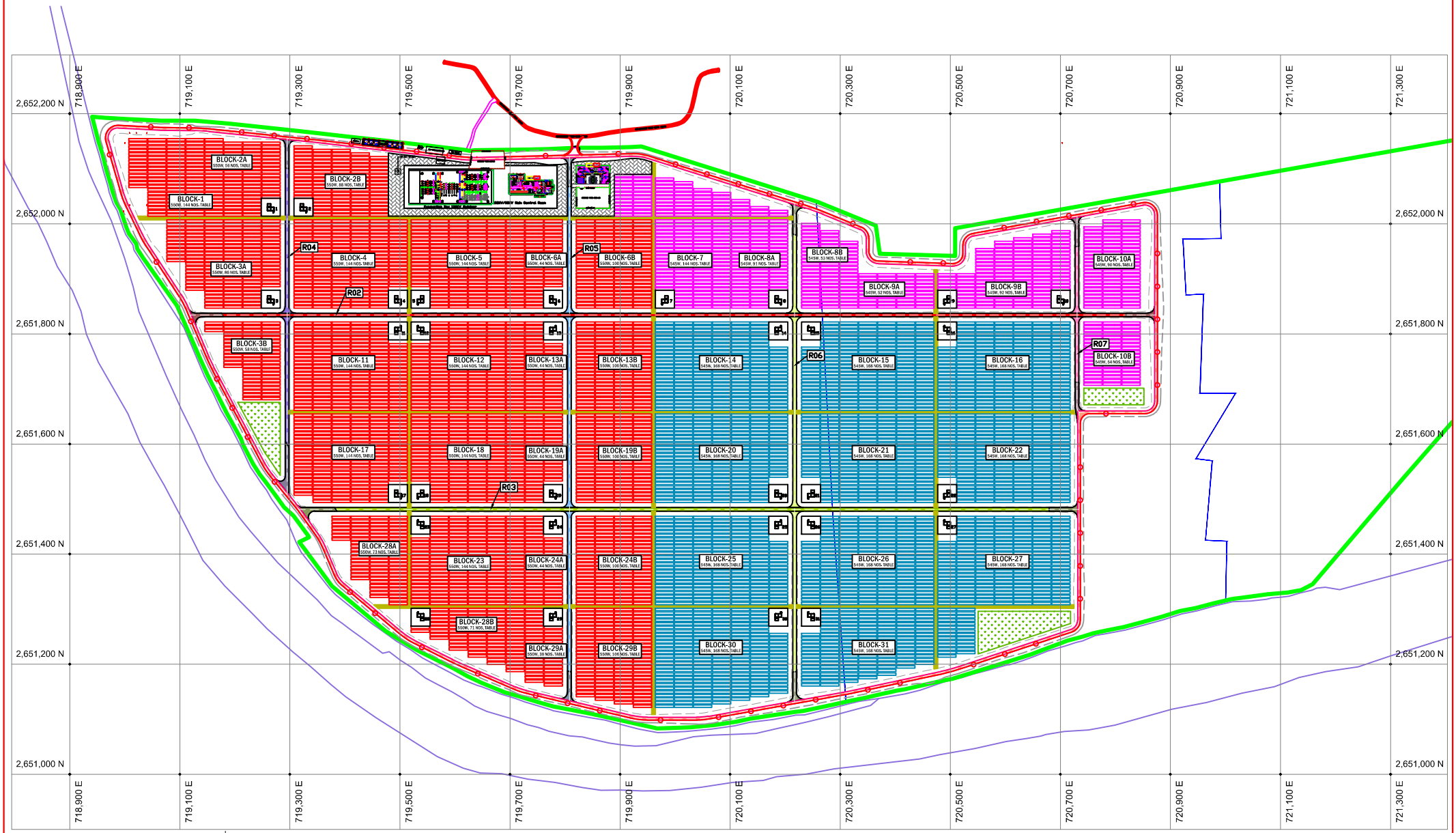
15 KLD SEWERAGE TREATMENT TANK
DRAWING & DESIGN CALCULATION

FOR

DYNAMIC SUN ENERGY PRIVATE LTD.

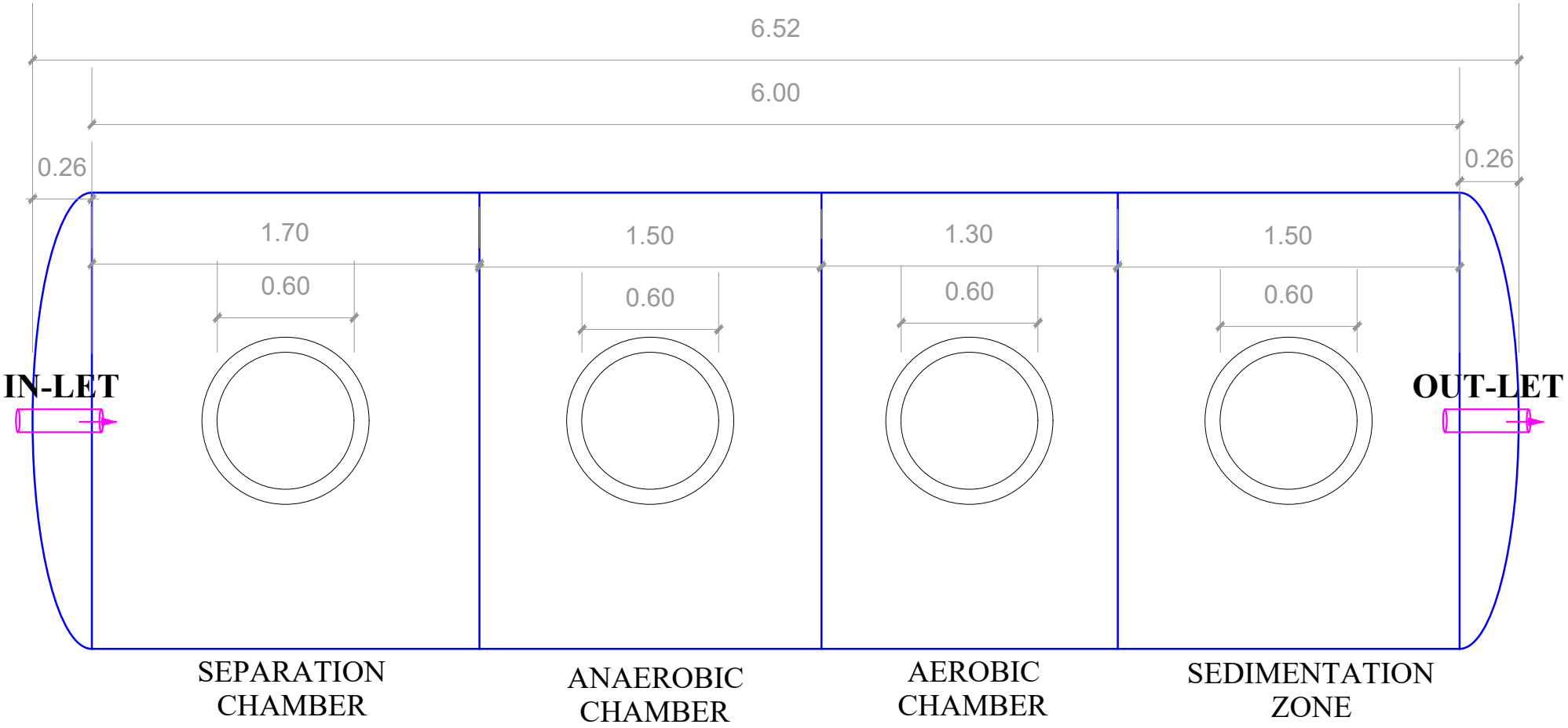
SUBMITTED BY

GREEN GENESIS ENGINEERS LIMITED

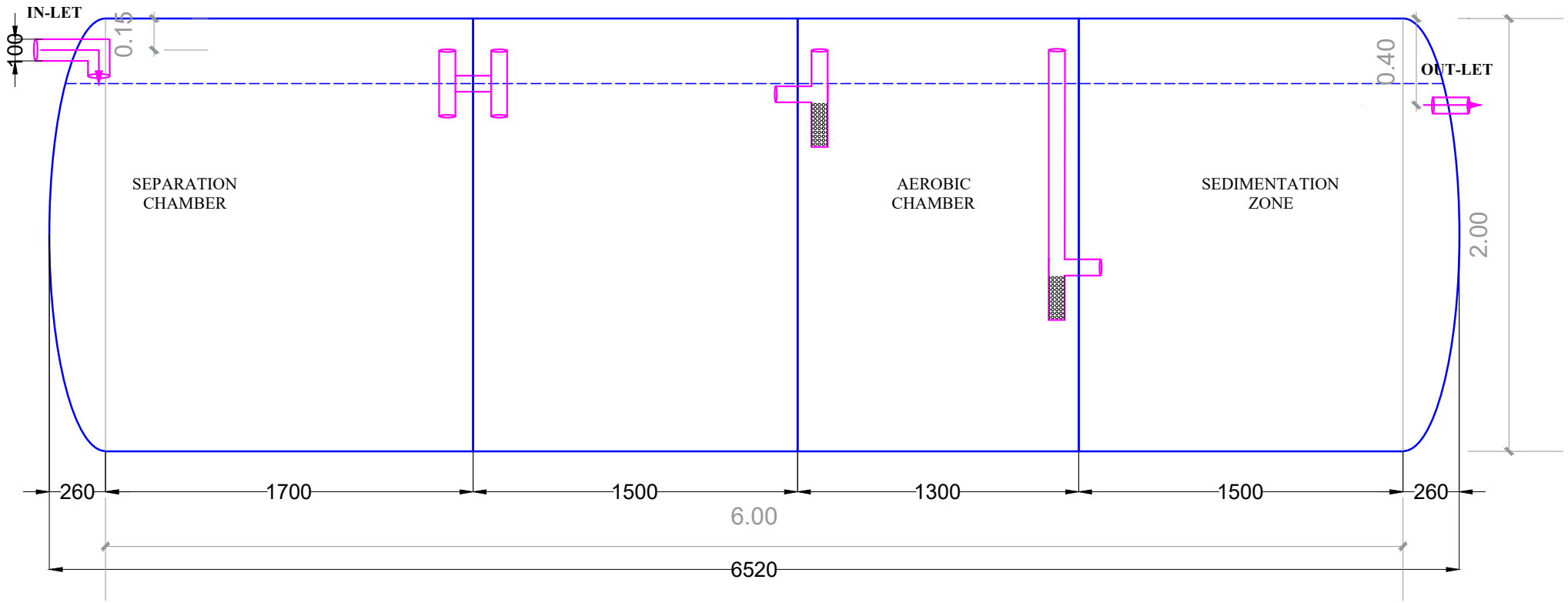


MASTER SEPTIC TANK & SOAK WEL LAYOUT PLAN OF DYNAMIC SUN ENERGY PRIVATE LTD.

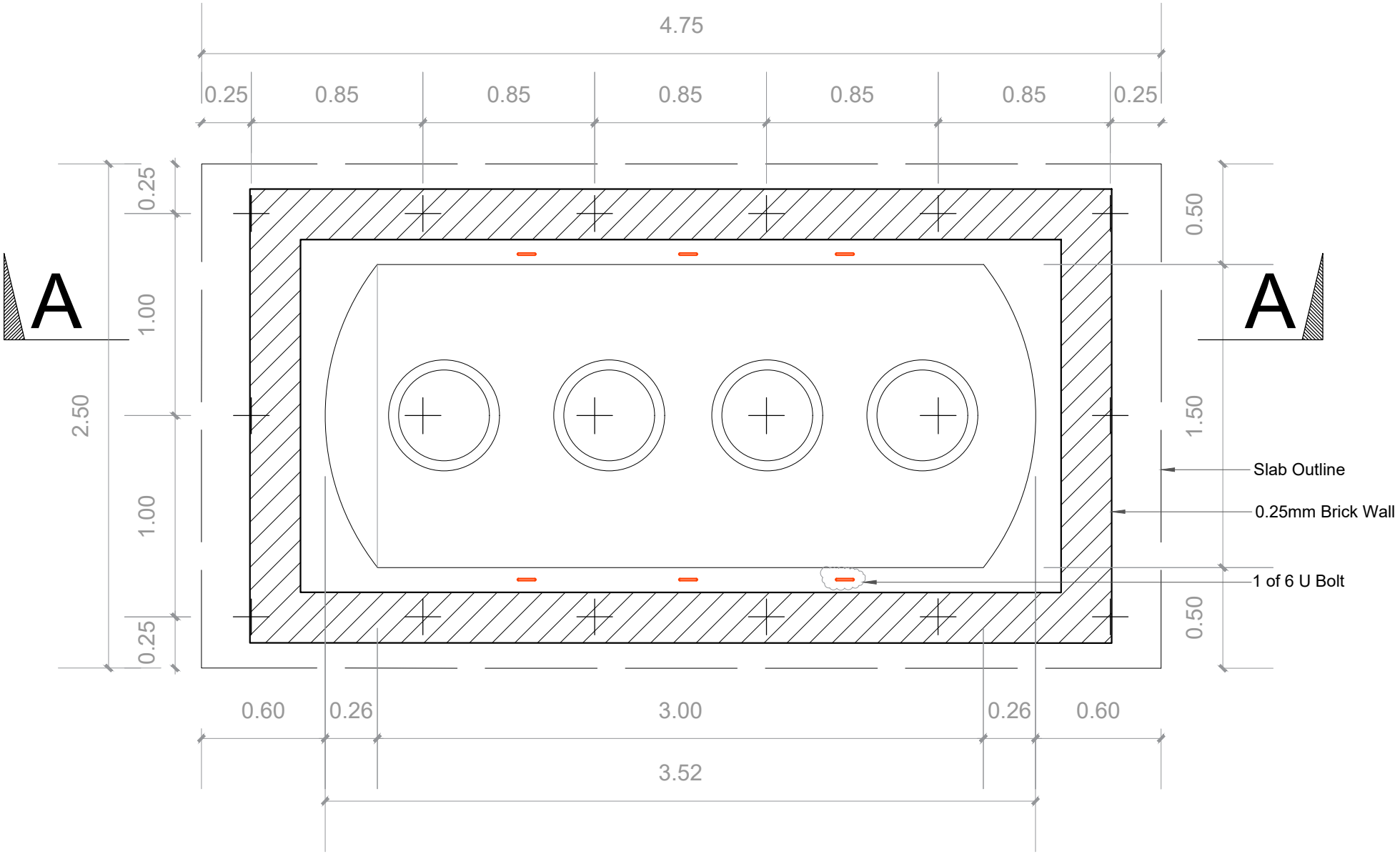
PROJECT NAME :	CONSULTANT :	CLIENT NAME :	OWNER SIGN :	DESIGN BY :	DRAWING PREPARED BY :	DRAWING TITLE :	NOTES :
CAPACITY: **15 KLD SEWAGE TREATMENT PLANT (PACKAGE-STP)**	GREEN GENESIS ENGINEERING LTD Address: HOUSE B174,Road 23 DOSH,MOHAKHALI. Dhaka-1212, BANGLADESH. Tel : 01765829951, 01678797924. E-MAIL: support08@greengenesisbd.com GGEL	**DYNAMIC SUN ENERGY PRIVATE LTD.**		MAHMUD AL HASAN B.SC.ENGINEER (CHEMICAL) GENERAL MANAGER.	MD.MAHBUBUL ALAM (CIVIL ENGINEER)	MASTER PLAN SHEET NO : 01 | DATE : 20-Feb-23	REVISION : 00 | SCALE : MM



PROJECT NAME :	CONSULTANT :	CLIENT NAME :	OWNER SIGN :	DESIGN BY :	DRAWING PREPARED BY :	DRAWING TITLE :	NOTES :
CAPACITY: **15 KLD SEWAGE TREATMENT PLANT (PACKAGE-STP)**	GREEN GENESIS ENGINEERING LTD Address: HOUSE B174,Road 23 DOSH,MOHAKHALI. Dhaka-1212, BANGLADESH. Tel : 01765829951, 01678797924. E-MAIL: support08@greengenesisbd.com GGEL	**DYNAMIC SUN ENERGY PRIVATE LTD.**		MAHMUD AL HASAN B.SC.ENGINEER (CHEMICAL) GENERAL MANAGER.	MD.MAHBUBUL ALAM (CIVIL ENGINEER)	**LAY OUT PLAN** SHEET NO : 02 DATE : 20-Feb-23	REVISION : 00 SCALE : MM

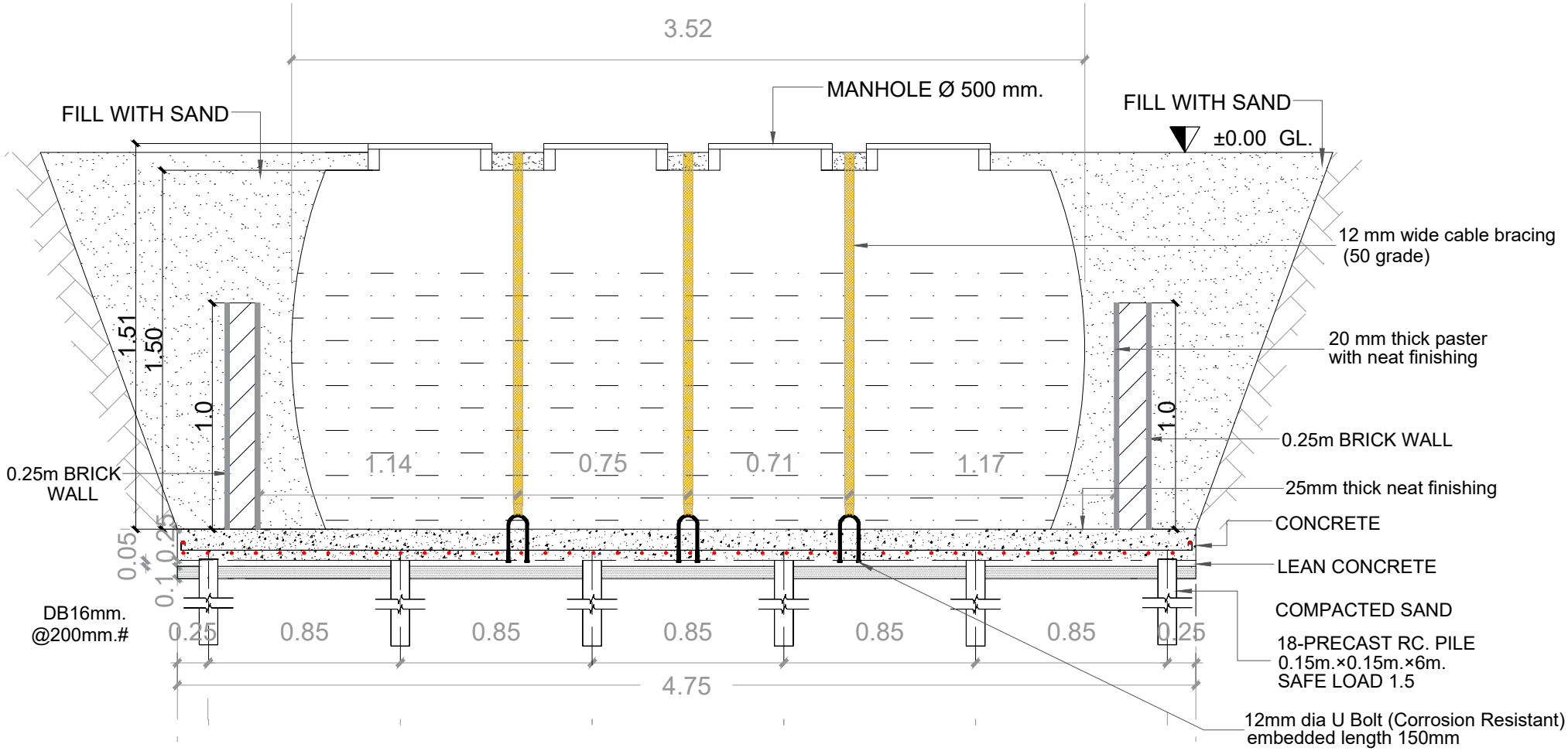


PROJECT NAME :	CONSULTANT :	CLIENT NAME :	OWNER SIGN :	DESIGN BY :	DRAWING PREPARED BY :	DRAWING TITLE :	NOTES :
CAPACITY: **15 KLD SEWAGE TREATMENT PLANT (PACKAGE-STP)**	GREEN GENESIS ENGINEERING LTD Address: HOUSE B174,Road 23 DOSH,MOHAKHALI. Dhaka-1212, BANGLADESH. Tel : 01765829951, 01678797924. E-MAIL: support08@greengenesisbd.com GGEL	**DYNAMIC SUN ENERGY PRIVATE LTD.**		MAHMUD AL HASAN B.SC.ENGINEER (CHEMICAL) GENERAL MANAGER.	MD.MAHBUBUL ALAM (CIVIL ENGINEER)	**SECTION PLAN** SHEET NO : 03 DATE : 20-Feb-23	REVISION : 00 SCALE : MM



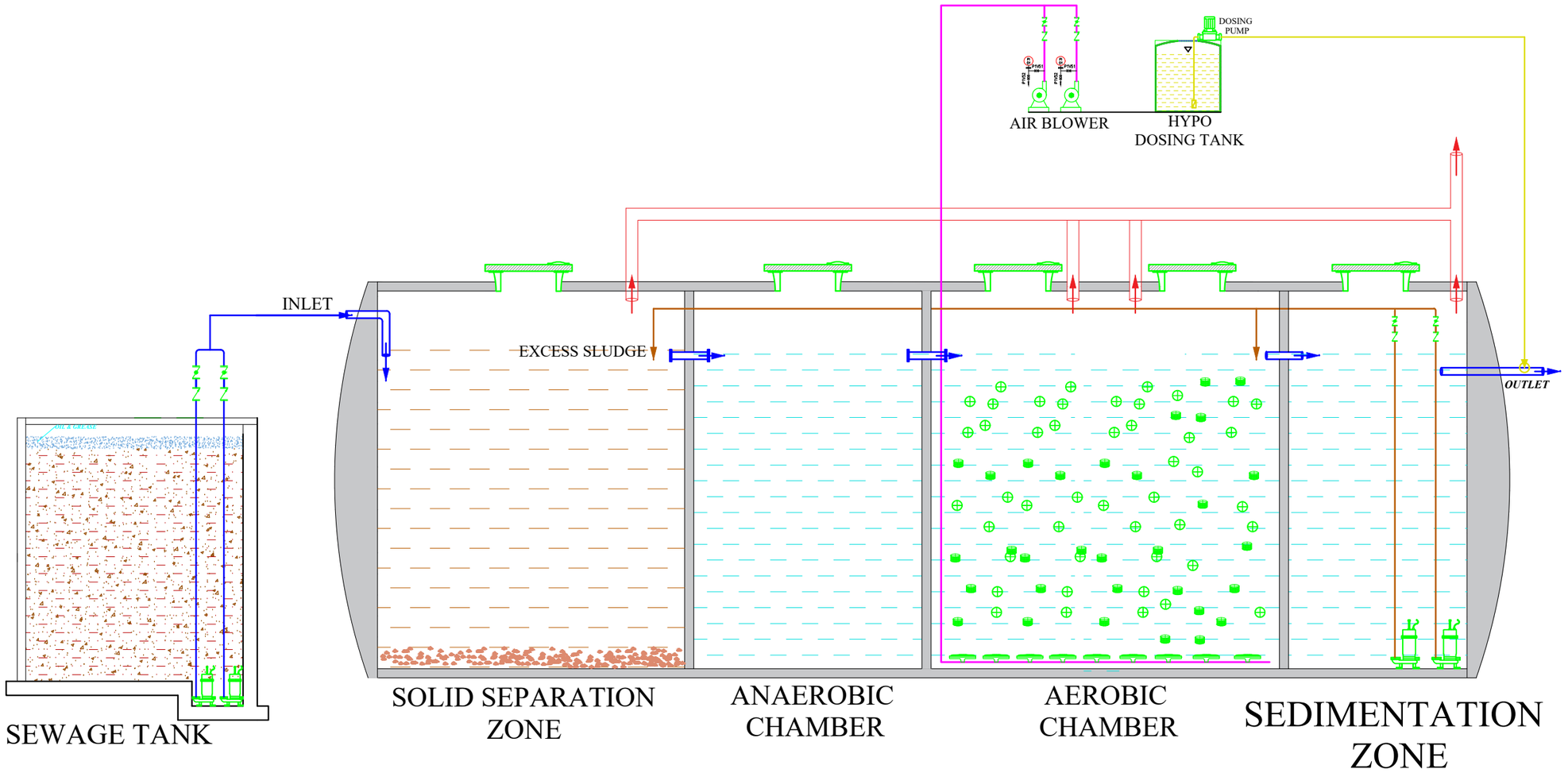
PLAN - VIEW

PROJECT NAME :	CONSULTANT :	CLIENT NAME :	OWNER SIGN :	DESIGN BY :	DRAWING PREPARED BY :	DRAWING TITLE :	NOTES :
CAPACITY: **15 KLD SEWAGE TREATMENT PLANT (PACKAGE-STP)**	GREEN GENESIS ENGINEERING LTD Address: HOUSE B174,Road 23 DOSH,MOHAKHALI. Dhaka-1212, BANGLADESH. Tel : 01765829951, 01678797924. E-MAIL: support08@greengenesisbd.com GGEL	**DYNAMIC SUN ENERGY PRIVATE LTD.**		MAHMUD AL HASAN B.SC.ENGINEER (CHEMICAL) GENERAL MANAGER.	MD.MAHBUBUL ALAM (CIVIL ENGINEER)	PLAN VIEW SHEET NO : 04 DATE : 20-Feb-23	REVISION : 00 SCALE : MM



SECTION A-A

PROJECT NAME :	CONSULTANT :	CLIENT NAME :	OWNER SIGN :	DESIGN BY :	DRAWING PREPARED BY :	DRAWING TITLE :	NOTES :
CAPACITY: **15 KLD SEWAGE TREATMENT PLANT (PACKAGE-STP)**	GREEN GENESIS ENGINEERING LTD Address: HOUSE B174,Road 23 DOSH,MOHAKHALI. Dhaka-1212, BANGLADESH. Tel : 01765829951, 01678797924. E-MAIL: support08@greengenesisbd.com GGEL	**DYNAMIC SUN ENERGY PRIVATE LTD.**		MAHMUD AL HASAN B.SC.ENGINEER (CHEMICAL) GENERAL MANAGER.	MD.MAHBUBUL ALAM (CIVIL ENGINEER)	SECTION A-A SHEET NO : 05 | DATE : 20-Feb-23	REVISION : 00 | SCALE : MM



PROJECT NAME :	CONSULTANT :	CLIENT NAME :	OWNER SIGN :	DESIGN BY :	DRAWING PREPARED BY :	DRAWING TITLE :	NOTES :
CAPACITY: **15 KLD SEWAGE TREATMENT PLANT (PACKAGE-STP)**	GREEN GENESIS ENGINEERING LTD Address: HOUSE B174,Road 23 DOSH,MOHAKHALI. Dhaka-1212, BANGLADESH. Tel : 01765829951, 01678797924. E-MAIL: support08@greengenesisbd.com GGEL	**DYNAMIC SUN ENERGY PRIVATE LTD.**		MAHMUD AL HASAN B.SC.ENGINEER (CHEMICAL) GENERAL MANAGER.	MD.MAHBUBUL ALAM (CIVIL ENGINEER)	**PROCESS FLOW DIAGRAM** SHEET NO : 06 DATE : 20-Feb-23	REVISION : 00 SCALE : MM

Annexure – 15

List of Contractors

List of Contractors and Statement of Work (SoW)

Sl. No.	Designated Contractor	Statement of Work
01	Active Construction Ltd.	Construction Work of Block Substation Building (2 Block SS Buildings)
02	M/S Altab Enterprise	Construction Work of Main Substation Building
03	OTIK Tekno Ltd.	Supply, Fabrication, Erection & Installation of Steel Building Structure of 31 nos. mini substation building and related works
04	M/S Saiful Traders	Construction Work of Block Substation Building (1 Block SS Buildings)
05	Tex-k-Mart	Construction Work of Block Substation Building (2 Block SS Buildings)
06	Trazz BD	Construction Work of Block Substation Building (1 Block SS Buildings)
07	TURBOMECH E&C Limited	SPC Pile Driving by hydraulic hammer or virbo hammer machine with all mobilization, fuel, fooding, carrying, loading-unloading at pile drive location point in site.
08	M/S Alom Trading	SPC Pile Driving by hydraulic hammer or virbo hammer machine with all mobilization, fuel, fooding, carrying, loading-unloading at pile drive location point in site.
09	Shohor Kutub Shah Amanat Enterprise	SPC Pile Driving by hydraulic hammer or virbo hammer machine with all mobilization, fuel, fooding, carrying, loading-unloading at pile drive location point in site.
10	DRS-EPBL-MUKTI(JV)	Clearance of RoW, Construction, Installation, Testing & Commissioning with achieving related approvals of the 132kV Double Circuit Power Evacuation Line on turnkey basis
11	SOUTH ASIA ERECTORS	Clearance of RoW, Construction, Installation, Testing & Commissioning with achieving related approvals of the 132kV Double Circuit Power Evacuation Line on turnkey basis
12	Xian Electric Engineering Co., Ltd. Scientech Engineering and Services	Design, Engineering, Procurement, Manufacturing, Supply, CFR Transportation up to Chattogram Port, Erection, Installation, Testing & Commissioning of 132 kV AIS (Air Insulated Switchgear) Substation on Turnkey Basis of Dynamic Sun Energy Private Limited 100 MW AC (150 MW DC) Grid Tied Solar Plant at Pabna, Bangladesh
13	PT. ELSEWEDY ELECTRIC INDONESIA	For the purposes of execution/implementation of the PROJECT, the SELLER undertakes to supply the Plant and also undertakes to complete the work as described in the attached schedule and mentioned in the Purchase Order (PO No. DSEPL/PTEEL/

Sl. No.	Designated Contractor	Statement of Work
		TRANSFORMER/0099/2023) for supplying & supervision of installation, testing & commissioning of Power Transformers, Distribution Transformer and Other Transformers.
14	HENGTONG OPTIC ELECTRIC CO. LTD.	• DC Power Cable • AC Power Cable • Grounding Cable • FOC Cable • Communication Cable • C & I Cable
15	Changshu Fengfan Power Equipment Co., Ltd.	Transmission Line Materials • Tower • Conductors & OPGW • Hardware & Fittings • Underground Cable & Accessories • Necessary Other Materials
16	PETERSON INNOTEC CO. LTD. (PICL)	Engineering & Procurement of • PV Module Mounting Structure, • PHC Pile, • PV Module, • Grid-Connected Solar Inverter.
17	ELSEWEDY ELECTRIC	Power Transformer: • 02 Nos. of 80/120MVA, 33/132kV • 32 Nos. of 6.5MVA, 0.8/33kV • 01 No. of 1.0 MVA, 33/0.415kV
18	Power well	• Switchgear Panel 33kV Sub Station (GIS) (At Main Control Room) • Plant Auxiliary Sub Station Equipment
19	NR Electric	SCADA & PPC for Plant & Grid End

Annexure – 16

Slam Dam for Flood Management

A STABLE BASE TO FIGHT FLOODING
WITH WATER

EQUIPMENT






Slam Dam

SlamDam

As power plant is a nationally important and huge cost involving project so quick and effective flood management technology should be used to protect the power house or turbine building from inundation. Slam dam is one such flood management technology.

Slamdam is a temporary dam that can easily be deployed by 2 people to reduce the threat of high water. The seemingly simple dam can be efficiently deployed in case of high water are involved. It is normally used during abnormal flooding which occurs once in 50 years. It is used to protect the key-point installations from abnormal cyclone or flooding. In order to actually guarantee dry feet, to protect electric power stations and township from water, it is important to respond quickly, efficiently and above all effectively.

After getting alert from media, government agencies and any other appropriate source, the Emergency Response Team can start preparing the slam dam around the power house or turbine building of power plant area to protect it from inundation. It takes only two hours for 2 people to prepare a 100-meter emergency dam. The SlamDam has a height of upto 1m and a length of 5 m. Water from the surrounding area is used to fill the temporary dam. Dams or dikes can quickly and easily be increased by 30 and 50 cm. The dam can be filled with 4,700 litres of water in just 6 minutes. Retains elasticity from -35 degrees Celsius to +120 degrees Celsius. Slam dam is available at a length of 500 cm and can be stored in a standard plastic storage box (80 x 60 x 42 cm).

Slamdam lends itself to being used for retaining (contaminated) fire extinguishing water also. A temporary basin can be created rapidly, putting in full control of the removal of the substances captured. It can adopt any shape. This saves emergency response teams a considerable amount of set-up time, enabling them to concentrate on the disaster itself.

Steps to prepare Slamdam:

1. Unfold the slamdam;
2. Position the slamdam with 2 cm of overlap;
3. Fill the slamdam with water;
4. Seal the caps;
5. The water barrier is ready!

Cost: 200 tk/5meter

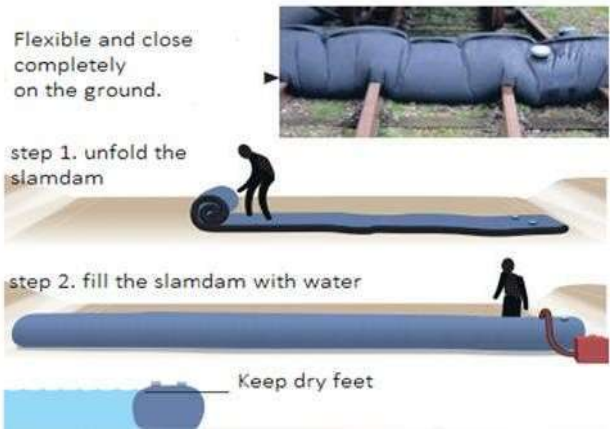


Figure: Steps to prepare Slamdam

Annexure – 17

Checklists and Forms for different hazards/Emergency Scenarios

Attachment 1 - Incident Situation Update Procedure Checklist

Incident Situation Update Procedure Checklist

The EHS Manager should update on a regular interval all members of the ESMP implementation team.

Updates should normally be held once an hour. The ideal duration of an update should be no more than 10 minutes.

Procedure

- EHS Manager gives a 10-minute notice.
- All Medical, Fire Fighting & Rescue Team and Support personnel to attend.
- Inform ESMP Implementation Team of the update meeting.
- Commence update with operations brief on the latest state of incident.
- Follow with short statements from all the Fire Fighting & Rescue Team members giving the latest situation update and actions from their own area of responsibility.
- Clarification of points of fact, if required, following each statement.
- Update completed. Individual ERT members revert to carrying out their actions.
- Recorder to make a summary of the update / prepare and issue with copies to all EMP Implementation Team. One copy to be retained on the central incident log.

Attachment 2 - Kidnap and Extortion Checklist

This checklist supplements the normal ERT checklists where Kidnap or other extortion is occurring or is possible.

Kidnap And Extortion Checklist	Responsibility
1. Call-out - EHS Manager - ERT - Human Resources Coordinator	Plant Manager
2. Establish secure communications link with ERT	EHS Manager
3. Ensure secure meeting room for ERT.	EHS Manager
4. Maintain effective logs	Fire Fighting & Rescue Team
5. Establish: - The current situation - The political and operational background - If any contacts or demands have been made by the instigators. - Who is aware of the incident? • Government • Security Forces/Police of country • Embassy/High Commission • Local employees • Relatives - What the country's policy is concerning negotiation with kidnappers etc.	EHS Manager
6. Notify Project Management and pass on details	Plant Manager
7. Consult with professional advisors/security consultants. Plant Manager to make final decision upon confirmation from DSEPL Authority.	Plant Manager
8. Consider the need to bring in other internal and external expertise, or reduce the team. In general, confine knowledge to minimum team.	ESMP Implementation Team
9. Evaluate the situation ▪ Is there positive evidence of kidnap? ▪ How reliable is the available information? ▪ Are the instigators known to be criminals, psychopaths or terrorists? ▪ What are the likely future actions of the instigators? - What is the risk? ▪ What threats have been made? Likely to be carried out? ▪ Is there a threat to life - hostage or others?	EHS Manager

Kidnap And Extortion Checklist	Responsibility
▪ Are other employees/families at risk? ▪ What is the business risk? ▪ What is the local Government likely to do if you negotiate?	
10. - Need for containment of information - Is containment of information possible, likely to last and appropriate? - What time scale may the Company have to work to? - What is likelihood rescue? - What attitude is local Government likely to take? - What are the immediate implications on operations?	ESMP Implementation Team
11. Confirm Company objectives - Remove threat to life - Display Company's determinations to show firm resolves and remain - a responsible corporate citizen	ESMP Implementation Team
12. Advise ERT on local laws and potential liabilities relating to communication and negotiation with kidnappers etc. and other liabilities.	Legal
13. Consider basic Company policies/strategies a. Response b. Control/secrecy c. Risk	Project Management
14. Confirm roles, powers and delegated authority of both the ERG and the ERT - Who is to be the ultimate Decision Maker? - Who is to conduct any negotiations? - Who will make up the Negotiating team locally? - Is additional support required in Country?	Project Management
15. Decide basic policies and initial way ahead. How much is to be proactive, and how much sit-and-wait?	Project Management

Attachment 3 – Government, key stakeholder & Media Holding Statement

Date:

Press Release No 1

Time:

DSEPL regrets to confirm that an incident – (describe in broadest terms) –

occurred at – (site/location) –

at – (time) –

Today/yesterday – (date)-

DSEPL have mobilized its Emergency Response Teams, and is working closely with the Local Emergency Services and has / is contacted / -ing the relevant authorities

Details of the incident are not yet confirmed, but every action is being taken to safeguard lives and the environment.

A further statement will be issued as soon as more information becomes available.

Direct enquiry lines have been established as follows:

Media ****

Relatives ****

Notes for Editors:

Attachment 4 - Initial Statement to Staff

Note: To be sent by electronic mail to all within the Country office, and to all DSEPL locations and offices

From Managing Director, (name of location)

Date

Time

INCIDENT REPORT

All staff should be aware that an incident has occurred at (place) at (time)

Today/yesterday.

(Briefest description of incident, e.g. The Installation is on fire following an explosion).

The local Incident Response Team and the Emergency Response Group in (location name) are taking necessary action.

More information will be made communicated, as it becomes available. In the meantime, any staff member approached for information by outside sources should refer them to the ERT Media Information Group in (location tel. No. ****)

Plant Manager, (name of location)

Attachment 5 - Security and Reception Standing Instruction

- Office Building Security staff to ascertain the identity of all personnel walking in/out of the office premises.
- Restrict all access to card / pass / permission holders.
- Always ensure tight security in all entry/exit points.
- Ensure availability of keys for all the areas.
- Update and maintain the keyboard status.
- Exercise extra caution during emergency situations.
- Always ensure company assets / personal property and valuables are secured and protected.
- Confidential things should be kept in a secured place.
- Visitors should be received at the reception.
- The reception on duty should inform to concern department to receive the visitor and inform the visitor to wait in the reception till a responsible person arrives.
- Reception to ensure that not to leave the visitors to wander on their own.
- The security / responsible person escort visitors.
- All the material in / out should be controlled through authorized gate passes.
- Identify strangers and report to Manager Administration.
- No media representatives to be admitted to any site.

Attachment 6 - General Notification/Record keeping Form

NOTIFY	(Circle either notifying of, or Updating Emergency Information)	UPDATE

Location			No:		Date:		Time:						
Priority	Urgent	☐	Immediate		☐		Standard		☐				
Emergency	Medical	☐	Fatality	☐	Environment		☐	Natural Disaster		☐			
Oil Spill	☐	Marine	☐	Explosion	☐	Fire	☐	Aviation	☐	Extortion	☐		
Other													
Injuries	No. of Fatalities		No. of Serious Injuries		No. of Minor Injuries								
DO NOT LIST NAMES ON THIS FORM - Report names verbally to EHS Manager													
Injuries This Report:													
Updated Weather	Dry	☐	Wet	☐	Windy	☐	Wind Direction		Wind Speed				
Forecast:	Other:												
Impact on Immediate Operations:													
External Assistance	Gov.	☐	Mutual Aid	☐	External Agency	☐	Medical	☐	Police	☐	Fire	☐	
Mobilized:	Other:												
Forward Response Plan:													
Next 30 Mins:													
Next 6 hours:													
Next 12 hours:													

Last External Contact:								
Agency	Time	By	Agency	Time	By	Agency	Time	By
Aviation			Govt.					
Medical								
Police								
Response from different teams: (Role and Person)								
Prepared by:					Approved by:			

Attachment 7 - Emergency Response Log

Page Number:		Date:
Name:		Position:
Contact Number:		Signature:
Time	Activity Completed	
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Attachment 8 - Bomb Threat Response Actions

CONTROL

The Project Manager is responsible for directing the action to be taken in response to any bomb threat. Responsibilities include the following:

- ✓ Producing a risk assessment.
- ✓ Devising and maintaining a search plan of the office.
- ✓ Devising and maintaining an evacuation plan.
- ✓ Liaising with the responsible authorities.
- ✓ Arranging staff awareness and bomb threat practices.

Bomb Threat

The person receiving the call will:

- ✓ Activate recording equipment if fitted and the threat is received by telephone. This could be mobile phone and have telephone on speaker phone.
- ✓ Adopt helpful attitude and be conciliatory.
- ✓ Make written notes using guidelines issued for that purpose.
- ✓ Report immediately to Security Focal Point.
- ✓ The Project Director should inform project management who must assess the credibility of the threat and possible consequences and consider whether to:
- ✓ Do nothing, evacuate or stay and search.
- ✓ Notify law enforcement agencies/emergency services.
- ✓ Alert neighboring business/residents.
- ✓ Implement emergency shutdown procedures.

Search (only if search is not a Police responsibility)

Searches may be undertaken in response to a specific warning. Attention points:

- ✓ Know the police policy and role on search and evacuation.
- ✓ Prepare search plans in advance to ensure that premises are checked as quickly and effectively as possible.

- ✓ Divide the area into manageable-sized sectors
- ✓ Form search teams familiar with the area.
- ✓ Define search priorities.
- ✓ Search in a logical and thorough manner so that no part of the sector is left unchecked.

"Do not touch or move any suspicious object"

Suspicious Object

If a suspicious object is found:

- ✓ If possible, leave a marker near the device.
- ✓ Inform the Security Focal Point.
- ✓ Stay out of sight of the object at a safe distance (normally at least 25 meters) and report every possible detail to the Security Focal Point.

Evacuation

The decision to evacuate will be taken by management on the advice of the EHS Manager. The police will be consulted for advice:

- ✓ Evacuate as quickly and efficiently as possible using all available exits.
- ✓ Provide alternative routes to avoid the danger of passing close to any suspicious device.
- ✓ Consult neighboring premises and emergency services.
- ✓ Gather all people in pre-designated "Assembly Areas" taking personal belongings with them.
- ✓ Do not use the car park as an assembly area**.**
- ✓ Check that everyone has left the premises.

Attachment 8A - Bomb Threat Checklist

- Switch on tape recorder (if connected)
- Tell the caller which town/district you are answering from
- Record the exact wording of the threat
- Ask these questions
    - Where is the bomb right now? ……
    - When is it going to explode? .....
    - What does it look like? .....
    - What kind of bomb is it? .....
    - What will cause it to explode? .....
    - Did you place the bomb? .....
    - Why? .....
    - What is your name? .....
    - What is your address? .....
    - What is your telephone number? .....
- Record time call completed.....
- Keep telephone line open
- Where automatic number reveal equipment is available record number
- Inform the security focal point

Time informed.....

This part should be completed once the caller has hung up and the security focal point has been informed

Time and date of call.....

Length of call.....

Number at which call is received (Your extension number) .....

- ABOUT THE CALLER

Sex of caller? ..... Male ☐ Female ☐

Nationality? ..... Age? .....

- THREAT LANGUAGE

Well Spoken ☐ Irrational ☐ Taped ☐

Foul ☐ Incoherent ☐

Message read by threat-maker ☐

- CALLER'S VOICE

Calm	☐	Crying	☐	Clearing throat	☐
Angry	☐	Nasal	☐	Slurred	☐
Excited	☐	Stutter	☐	Disguised	☐
Slow	☐	Lisp	☐	Accent	☐
Rapid	☐	Deep	☐	Familiar	☐
Laughter	☐	Hoarse	☐		

If the voice sounded familiar, who did it sound like?

……

- BACKGROUND SOUNDS

Street noises	☐	House noises	☐	Motor	☐
Animal noises	☐	Crockery	☐	Static	☐
Clear	☐	Voices	☐	Music	☐
PA system	☐	Booth	☐		
Factory machinery	☐	Office machinery	☐		

Other (specify).....

- REMARKS

.....

.....

.....

Signature..... Date.....

This appendix may be freely photocopied

Letter and Parcel Bomb Recognition Points

- Foreign mail, air mail and special delivery
- Restrictive markings such as confidential, personal etc.
- Excessive postage

- Hand-written or poorly typed address
- Incorrect titles
- Titles but no names
- Miss-spellings of common words
- Oily stains or discolorations
- No return addresses
- Excessive weight
- Rigid envelope
- Lopsided or uneven envelope
- Protruding wires or tinfoil
- Excessive securing material such as making tape, string etc.
- Visual distractions

Attachment 9 - Terrorist threat or action against company Personnel or facilities

Upon receipt of terrorist threat or action against company personnel or facilities, the senior company official will notify police/ RAB/ army for necessary actions. The following information can be used as a guide when reporting:

a. Nature and circumstances of threat or incident including date, time, location, injuries and damages sustained.

b. Fill data concerning affected employees including names and addresses of next of kin and whether they or other interested parties should be notified.

c. Reports on contacts and assistance offers to next of kin, if made, if the next of kin is residing or located in the immediate area.

d. If kidnapping/taking of hostages occurs, provide

1. Location, number, and identity of victims
2. Number and identity of terrorists involved, organizations, weapons used, other descriptive information.
3. Terrorist demands or claims.
4. The local assessment of the situation, including effect on business operations.
5. Initial actions taken by host government to respond to terrorist threat/incident. If company personnel, dependents, and facilities are threatened or subjects of a terrorist attack describe efforts in arranging enhanced security, medical assistance with host country officials (police, foreign minister, etc.).

e. Precautionary measures taken for other employees at the location of the incident and elsewhere in the host country.

f. Name of person sending message along with complete address, telephone number, and telex number for future contacts.

Terrorist Incidents & Kidnappings

<u>Immediate Action</u>

In the event of an actual or threatened terrorist incident or kidnapping, the Bangladesh Leadership Team shall be notified immediately. A sequence of events will occur at all locations; therefore, prompt detailed information is essential. The information above outlines what is needed in notification of this type of incident.

Checklists

Ransom Demand Telephone Checklist

Time of call: _____ Date: _____

Make every attempt to gain as much information from the caller as will furnish, but do not give the caller the impression you are reading questions from a checklist or that you are trying to keep him on the line so the call can be traced. Write down the responses of the caller word for word.

If a Demand:

Would you please repeat your statement?

_____

Who is making this demand?

_____

Why have you done this?

_____

If a Kidnap:

What is he/she wearing?

_____

Is he/she unharmed?

_____

Could you explain what you want?

_____

(Attempt to establish a time and date for next contact. Furnish a specific phone number.)

IF THE CALLER GETS INTO SPECIFICS ON PAYMENT, ASK:

What do you want?

_____

If money: What currency and how do you want it?

_____

Where and when should the ransom be delivered?

_____

How should the payment be made?

_____

End the call on a positive note by assuring the caller his demand will be communicated to the proper person in the company, as soon as possible. Leave the caller with the impression that his call has been understood and action will be taken. Make note of the following information.

Time call ended: _____

Background noises: _____

Sex of caller: _____

Approximate age: _____

Any accent: _____

What was the caller's attitude?

_____

Was the caller sober?

_____

Did the caller sound educated?

_____

What did you notice about the call that you find unusual?

_____

If the caller seemed familiar with the building or operation, indicate how:

_____

_____

Name of Person Receiving Call

_____

Date

IMPORTANT: Pass this form to your supervisor immediately after completing call details.

Annexure – 18

Participants' List of FGD & KII

FGD01

Pabna 100MW(AC) Solar Park, Bhabanipur, Hemayetpur, Pabna

List of Participants in Public Consultation/FGD

Affected Group

Address: Sonirdi

GPS: 24.0797N 89.0873E

Date: 25-04-23 **Time** 3.45

SL. No.	Participant's Name	Age	Occupation	Mobile No.	Signature
1	Md Mintu	40	Business	01796669369	
2	Shipon	32	Business	01793845006	
3	A. Mannan	55	Job	01917726078	
4	Masud Rana	47	Business	01729102019	
5	Abu Musa	63	Farmer	01797807581	
6	Ronju	53	Business	01740043323	
7	Saiful Islam	60	"	01711143016	
8	Aktarul "	49	"	01710530466	
9	Adlab Hitlar	45	Farmer	01741982710	
10	Mizanur	40	Business	01733486661	
11	Milon	31	"	01757679641	
12	Siddik	57	"	01727768735	
13	Akram	52	"		—

Facilitated By Burhan

Signature 25-04-23

Project Proponent:

Dynamic Sun Energy Pvt. Ltd.

Consultant:

Adroit Environment Consultants Ltd. (AECL)
A House of Complete Environmental management solution

FGD-2

Pabna 100MW(AC) Solar Park, Bhabanipur, Hemayetpur, Pabna

List of Participants in Public Consultation/FGD

Address: Manik Nagaro, Ishardi, Pabna Affected Group

GPS: 24.0794 N 89.0903E

Date: 26/04/2023 **Time** 03.20 PM

Sl. No.	Participant's Name	Age	Occupation	Mobile No.	Signature
1	Atahar	52	Day Labour		
2	Md Mukul	40	Day Labour	01772174004	
3	Rubel Paramanik	37	"	01797643283	
4	Afzal Molla	52	"	—	
5	Kuno Molla	60	Day Labour	—	
6	Hafiz Dewan	62	Day Labour	—	

Facilitated By Rabiul Alam

Signature

FGD - 4

Pabna 100MW(AC) Solar Park, Bhabanipur, Hemayetpur, Pabna

List of Participants in Public Consultation/FGD

Address: Char Gorgoria, Lokkhi Kunda Farmer Group

GPS: 23°59'53" N 89°08'05" E

Date: 27.04.23 **Time** 04:30 PM

SL No.	Participant's Name	Age	Occupation	Mobile No.	Signature
1	Tajul	50	Agriculture	01300327228	
2	Anwar Islam	48	"	01701742000	
3	Obaid poromanik	30	"	—	
4	Abdullah	36	"	01746739297	
5	Rezaul	44	"	01733568767	
6	Sumon Fakir	54		01738157775	

Facilitated By Rabiul Alam

Signature

FGD-3

Pabna 100MW(AC) Solar Park, Bhabanipur, Hemayetpur, Pabna

List of Participants in Public Consultation/FGD

Address: Char Kurulia, Women Group, Pabna

GPS: 23.9602N 89.1554E

Date: 28-04-28 **Time** 4.00

SL No.	Participant's Name	Age	Occupation	Mobile No.	Signature
1	মিনি	50	Housewife		মিনি
2	[illegible]	60	"	01720995877	
3	[illegible]	30	"		
4	[illegible]	30	"	01300951523	[illegible]
5	[illegible]	31	"	01705353822	
6	[illegible]	32	"	01706665281	[illegible]
7	[illegible]	45	"	01748627722	[illegible]
8	[illegible]	48	"	01773782392	[illegible]
9	[illegible]	50	"	01[illegible]63211	[illegible]

Facilitated By Burhan.

Signature 28-04-28

Project Proponent:

Dynamic Sun Energy Pvt. Ltd.

Consultant:

Adroit Environment Consultants Ltd. (AECL)
A House of Complete Environmental management solution

Consultation Meeting

Pabna 100MW(AC) Solar Park, Bhabanipur, Hemayetpur, Pabna

List of Participants in Public Consultation/FGD

Address: Dynamic Sun Energy office, Bhabanipur, Hemayetpur, P

GPS: 23.9657N 89.1580E

Date: 28/04/2023 **Time** 3:00 PM

SL No.	Participant's Name	Age	Occupation	Mobile No.	Signature
1	[illegible]	41	Ex-Member	01745521461	[signature]
2	ABDULLAH	65	Farmer.	01734898586	[signature]
3	Md. Rabiul Alam	35	Social Safety Expert	01745013395	[signature]
4	Salman Rocheb	32	DSEL	01777709440	[signature]
5	Md. Sohel Rana	33	DSEPL	01313 350020	[signature]
6	Md. Omcer Faruk	40	DSEL	01715-094839	[signature]
7	MAHBUB HOSSAIN	29	PTL.	01780-706727	[signature]
8	MD Sahidul Islam	65	PTL	01718 964871	[signature]
9	Md. Kamrul Hasan	28	DSEPL	01710-306925	[signature]
10	PINTO	45	SARVICE	01731931442	[signature]
11	ROBIUL MONDOL	45	Business	01735756607	[signature]
12	ABUL BASAR	31	Business	01764061380	BASAR
13	Abdul Bacid	36	Business	01721-667200	[signature]
14	JANNAT HOSEN	40	Business	01741648705	[signature]
15	MASUD RANA	26	Business.	01765074702	[signature]

Facilitated By MD. Burhanul Islam

Signature [signature] 26-04-23

abna 100MW(AC) Solar Park, Bhabanipur, Hemayetpur, Pabna

List of Participants in Public Consultation/FGD

Address: .....

GPS: .....

Date: ..... **Time** .....

Sl. No.	Participant's Name	Age	Occupation	Mobile No.	Signature
16	MD. ZUBAYER	27	Business	01876069593	
17	ZOHIRUL	45	"	01719378513	
18	HASINUR RAHMAN	42	"	01770136769	Hasinur
19	EMON	25	"	01855090353	Emon
20	Md. Irshad Ali	32	"	01725-095221	
21	MIRAZUL ISLAM	36	"	01747562420	
22	ASHIK	25	"	01892194123	
23	MD. ROFIQUL ISLAM	52	"	01718509721	
24	MD. ABU SAYED	50	Service	01723618723	
25	ALIMODDIN	58	"	01727598565	Alim
26	MD. KHAIRUL ISLAM	44	"	01987468951	
27	SAMIUL	27	"	01305980995	Samiul
28	RASEL AHMED	22	Business	01305577897	
29	MOTTALEB HOSEN	40	"	01751416140	
30	Shamsur Rahman	33	"	01737-552448	

Facilitated By MD. Burhanul Islam

Signature 28-04-23

Adroit Environment Consultants Ltd.

Project Name: Pabna 100MW ac Solar Park at Hemayetpur, Pabna Sadar, Pabna

Address: Bhabanipur, Hemayetpur, Pabna Sadar, Pabna

Stakeholder consultation (KII) with Govt. Official (Pabna Sadar Upazila)

Venue: Pabna Sadar Time: Date: 16/05/2023

SL	Name	Address	Age	Sex	Profession	Mobile No	Sign
1.	Tahmida Akter	Upazila Parisadh, Pabna	26	F	UNO, Upazila parisadh	-	
2.	Md. Mosarraf Hossain	Upazila. Parisadh, Pabna	50	M	Chairman, Upazila Parishad	01711-969031	Mosarraf
3.	Md. Mizanur Rahman	Hemayatpur Union	45	M	Union Secretary	-	Mizanur
4.							
5.							
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13.							

Adroit Environment Consultants Ltd.

Project Name: Pabna 100MW ac Solar Park at Hemayetpur, Pabna Sadar, Pabna

Address: Bhabanipur, Hemayetpur, Pabna Sadar, Pabna

Stakeholder consultation (KII) with Govt. Official (Pabna District)

Venue: Pabna Time: Date: 16/05/2023

SL	Name	Address	Age	Sex	Profession	Mobile No	Sign
1.	Md. Abul Kalam Azad	Fisheries office, Pabna	-	M	DFO	-	
2.	Dr. Md. Jamal Uddin	DAE, Pabna	54	M	DD, DAE, Pabna	01712272859	
3.	Md. Nazmul Hossain	DOE, Pabna	30	M	Assistant Director	-	
4.	Md. Abdul Mazed	BWDB	47		Sub. Assistant Eng	-	
5.							
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Annexure - 19

Meeting Minutes and Participation list of Formal Public Consultations

Annexure – 19 (a)

Minutes of Meeting & Participation List of First Formal Public Consultation

MINUTES OF MEETING

PROJECT NAME: **Pabna 100 MW (ac) Solar Park**	**ARRANGED BY:** DSEPL and AECL
VENUE: **Project Area, Bhabanipur, Hemayetpur, Pabna Sadar, Pabna**	**DATE/TIME:** 17-May-2023, 1.45 p.m.-3.00 p.m.
SUBJECT: **Public Consultation Meeting discussions for Solar Power Plant Project at Bhabanipur**	

SYNOPSIS:

As part of the EIA process, public consultation meeting was conducted at the Project Area. The purpose of the meeting was to explain the current status of Project activities and describe the preliminary outcome of the impact assessment with some of the affected people and to hear the concerns / issues / ideas raised by the stakeholders to allow these to be documented in the EIA Report.

PROJECT ATTENDEES:

DSEPL	:	Md. Robiul Islam (Company Secretary, DSEPL)
AECL	:	Dr. Nasir Uddin Khan (Environmental Consultant, Team Leader); Mamun-Ar-Rashid (Social and Resettlement Consultant); Shanjana Haider (Environmental Consultant); Md Golam Rasul (Consultant); Shahriar Ebn Bashar (Consultant); Sabrina Islam Labonno (Consultant); Raktim Banik (Consultant)

No	DESCRIPTION OF DISCUSSION	RESPONSE BY
1	**Welcome address and Project Description:** Public Consultation meeting started at 1.45 PM. Environmental Consultant of AECL, Shanjana Haider welcomed all the participants including other local govt. officials and introduced the team members from DSEPL and AECL. She also explained the current situation regarding the electricity generation in Bangladesh and background of this project. Then she requested Md. Robiul Islam (Company Secretary, DSEPL) to say a few words about the project. Md. Robiul Islam (DSEPL) explained about the importance of the Project for country as well as development of the local region / economy. He also explained the vision of GoB to provide uninterrupted power supply to meet the energy crisis in the country. He also thanked the local people for their enormous support and hospitality. Afterwards, Dr. Nasir Uddin Khan (Environmental Consultant) was requested to say a few words and he described the difference between Solar Power Plants and other existing plants in our country. He emphasized on the environmental low impacts of the plant. He assured that no fossil fuel will be used here and no noise hazard will occur during the operation phase of the plant. Additionally, he requested the local people not to worry about	NA

No	DESCRIPTION OF DISCUSSION	RESPONSE BY
	land wastage, as the proponent has planned to cultivate cash-crops where local men and women will get priority to work and the overall socio-economic condition of the area will flourish. As the height of the piles supporting the solar panel will be 12-13 ft, low rising crops can be cultivated there, Dr. Nasir added. Then, Mr. Mamun Ar Rashid (Social and Resettlement Consultant) briefly discussed the social evaluation of the project. He mentioned that DSEPL will compensate each and every person affected due to this project, the compensation will follow the ARIPA, 2017 and Electricity Act, 2018. Afterwards, Shanjana Haider, discussed about the current status and detail of the project, environmental & socio-economic management plans (local employment opportunities, resettlement issues, overall economic development) that will be undertaken by the proponent during construction and operation stage. She further explained the need for the public consultations in order to encourage the participants to raise their concerns / issues/suggestions and be part of the overall decision-making process. Based on above information, the forum was open for participants to raise their concerns / issues / ideas/suggestions related to the Project activities and associated impacts.	
2	**Participant name: Alhaj Mosharof Hossain** **Occupation: Upazila Chairman, Pabna Sadar Upazila, Pabna** During his speech he thanked DSEPL to initiate this project in their locality. He also highlighted some issues as mentioned below: ✓ The development projects on this vacant lands (Char) will not affect the agriculture of the country as most of the land was char land. He requested the proponent to pay adequate compensation to Project affected people so they get benefitted from this project; ✓ Affected persons should be supported or provided with resettlement assistance; ✓ Priority should be given to local residents for both professional and non-professional positions; ✓ Socio-economic issues to be given priority in finalizing Project aspects. He ended by concluding that the development projects are important for the nation but at the same time benefits of local population or local area / region should not be ignored.	NA
3	**Participant name: Mr. Janangir Alam** **Occupation: Union Parishad Chairman, Hemayetpur, Pabna Sadar, Pabna** During his speech, he requested the project authority to finish the land acquisition process as early as possible providing the exact amount of compensation to the affected people. Moreover, he emphasized on prioritizing local people to engage in the project during and after construction phase. He also informed that he is in full support to the project.	NA
4	**Participant name: G M Nazrul Islam** **Occupation: Inspector, DoE, Pabna District Office**	AECL

No	DESCRIPTION OF DISCUSSION	RESPONSE BY
	Participant visited the site and supervised the project authority's construction work. He assured that DSEPL has followed the latest DoE Rules and Regulations in the implementation of the project. He also requested the authority to follow them during the operation and maintenance phase too. Shanjana Haider thanked him for his support toward this project.	
5	**Participant name: Md. Atiar Rahman Biswas** **Occupation: Member, Hemayetpur Union Parishad** Participant explained the importance of the participation and opinions of local people in such kind of projects. He ensured to give all kinds of support when and where necessary and expected that local people will be benefitted through this project. Shanjana Haider thanked him for his support toward this project.	AECL
6	**Participant name: Md. Abdullah Mondal** **Occupation: Member, Hemayetpur Union Parishad** Participant explained the importance of the road development of their locality and he also expressed that due to the project it has already developed to a certain level and requested them to further contribute in that. He requested to contribute for the betterment of the socio-economic condition time to time.	NA
7	**Participant name: Mr. Shahid Biswas** **Occupation: Farmer, Bhabanipur.** Participant described how he contributed his land to this project and expected to have a good socio-economic development around the locality. As many of the local people contributed with their lands, he requested to give them priority for employment in the project activity.	NA
8	**Participant name: Md. Rabiul Mondal** **Occupation: Farmer, Bhabanipur.** Participant expressed his gratitude toward DSEPL to buy his land and compensate him with a handsome amount. He added that he has some other lands around the project and due to the intervention of this project the land price has increased upto 5 times. He requested the project authority to involve them in project activity so that their children can get proper education and job safety in future.	NA
9	**Participant name: Farida Begum** **Occupation: Farmer, Char Bhabanipur** Participant wanted that women should get priority in suitable jobs during and after the project. They can easily engage themselves in agricultural works at the project site. Respective officials took note of this issue and assured that they will consider the issue.	DSEPL

No	DESCRIPTION OF DISCUSSION	RESPONSE BY
16	**Various participants commented about the overall development and loss of livelihood for farmers and landowners** Shanjana Haider explained that the Project intends to follow international good practices for resettlement / relocation aspects. Best Available Technologies (BAT) will be implemented so that it does not affect the surrounding environment and also assured that they will be given priority for the cash crop cultivation beneath the solar panels during the project operation. She also concluded the Programme by ensuring the local people that they will incorporate local peoples view and suggestions regarding the project and they can report to the project authority anytime about their thoughts on the project through Grievance redress and stakeholder consultations will be continued during the construction and operation phase of the project at a regular interval.	AECL
17	Finally, Mr. Robiul Islam (DSEPL) ended his speech by thanking all the participants. He ensured that the livelihood restoration programs/ CSR activities will be properly implemented. He also mentioned that they will conduct skill building training, ensure women employment, preference of local people for employment, livelihood diversification initiatives etc. He said that DSEPL will do their best to meet the demands of the affected people and contribute in socio-economic flourishment of the area.	NA

LEGEND:

AECL	Adroit Environment Consultants Ltd.
DSEPL	Dynamic Sun Energy Private Ltd.
EIA	Environmental Impact Assessment
GoB	Government of Bangladesh
CSR	Corporate Social Responsibility
NA	Not Applicable

Adroit Environment Consultants Ltd.

Project Name: Pabna 100MW ac Solar Park at Hemayetpur, Pabna Sadar, Pabna.

Address: Hemayetpur, Pabna Sadar, Pabna

Accordy to Sign not Signature

Attendance Sheet for Formal Stakeholder Consultation

Venue: Project Site, Bhabanipur, Hemayetpur, Pabna **Time:** 2 pm **Date:** 17.05.2023

SL	Name	Address	Age	Gender	Profession	Mobile No	Sign
1.	Mamun Ar Rahul	Dhaka, Adeev.		Male	Service	01711125020	
2.	Md. Abdul Alim	Dhaka, Paramount Group	40	Male	Engineer	01730305207	
3.	Md. Bondha Haji	Hemayetpur Pabna	60	Male	Business	01711305866	
4.	G.M. Nagmul Islam	DOE- Pabna	56	Male	Job	01716-973586	
5.	Md. Robiul Islam	[illegible]	32	Male	Job	01719-256107	
6.	Md. Sohorab Ali					01711-911907	
7.	Dr. Nasir Khan	H-1, R-16, Sector-7 Uttara, Dhaka	57	Male	Env. Consultant	01732043061	
8.	MD. Shohel Rana	Vobanipur model high School	31	male	Head Teacher	01725930040	
9.	Faraah Pitagil	ADB	46	F	Safeguards	+639999996392	
10.	Dr. Richard Sitenington	ADB	50	M	— " —	+639999995291	
11.	Wataru Ozawa	JICA	53	M	Investment Officer	+81-90-6201-1882	
12.	YAGI Toshiharu	JICA	40.	M	Representative	01711 507 249	
13.	Shahnina Ebn Bahar	AECL	25	M	Ast. Consultant	01324-177498	
14.	Dr. Md. Jamal Uddin	DD, Dept. of Agronet		M.	Deputy Director.	01712272859	
15.	MD. Golam Rasul	Assistant Consultant, AECL	26	M	Assistant Consultant	01910477823	

Adroit Environment Consultants Ltd.

Project Name: Pabna 100MW ac Solar Park at Hemayetpur, Pabna Sadar, Pabna.

Address: Hemayetpur, Pabna Sadar, Pabna

Attendance Sheet for Formal Stakeholder Consultation

Venue: Project Site, Bhabanipur, Hemayetpur, Pabna **Time:** 2 pm **Date:** 17.05.2023

SL	Name	Address	Age	Gender	Profession	Mobile No	Sign
1.	[illegible]	[illegible]	-	M	[illegible]	01711-969031	-
2.	Shayjana Haider	Uttara, Dhaka	—	F	Environment Consultant	01717333671	Shayjana
3.	Salmira Islam Labonno	Uttara, Dhaka	-	F	Assitant consultant (Environment)	01733376611	Labonno.
4.							
5.							
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Adroit Environment Consultants Ltd.

Project Name: Pabna 100MW ac Solar Park at Hemayetpur, Pabna Sadar, Pabna.

Address: Hemayetpur, Pabna Sadar, Pabna

Attendance Sheet for Formal Stakeholder Consultation

Venue: Project Site, Bhabanipur, Hemayetpur, Pabna **Time:** 2 pm **Date:** 17.05.2023

SL	Name	Address	Age	Gender	Profession	Mobile No	Sign
1.	Md Sarwar Alam	Bhabanipur	45	M	Farmer	01743-921317	
2.	Md Shohag	"	20	M	Worker	01746-869318	
3.	Md Aslam	"	32	M	Business	01	
4.	Md Nojrul	Bahadurpur	37	M	"	01921-479274	
5.	Md Akramin	Hemayetpur	39	M	Driver	01308-279515	
6.	Md Habejul	Bhabanipur	30	M	Farmer	01759-495090	
7.	Murshed Biswas	"	25	M	"	01743-575964	
8.	Wasim	"	40	M	Farmer	01705-969808	
9.	Alraj Biswas	"	23	M	"	01795-494231	
10.	Md Marun	"	32	M	Worker	01968831469	
11.	Md Nasim	"	41	M	"	01944511905	
12.	Md Alamin	"	45	M	"	01974[illegible]274	
13.	Tariful	"	27	M	"	01929126337	
14.	Samsul	"	30	M	"	01794494374	
15.	Sharat	"	21	M	"	01913729217	

Adroit Environment Consultants Ltd.

Project Name: Pabna 100MW ac Solar Park at Hemayetpur, Pabna Sadar, Pabna.

Address: Hemayetpur, Pabna Sadar, Pabna

Attendance Sheet for Formal Stakeholder Consultation

Venue: Project Site, Bhabanipur, Hemayetpur, Pabna **Time:** 2 pm **Date:** 17.05.2023

SL	Name	Address	Age	Gender	Profession	Mobile No	Sign
1.	Md Shahid	Bhabanipur	25	M	Farmer	01718964878	
2.	Md Shafiul	"	30	M	Business	01764803222	
3.	Md Sabuj	"	45	M	Driver	01706665281	
4.	Md Nuim	"	18	M	Worker	01768623198	
5.	Md Shahid	"	19	M	Farmer	01312705502	
6.	Md Rana	"	27	M	Farmer	01775676490	
7.	Md Farid	"	42	M	Farmer	01730954811	
8.	Md Maidhuzur	"	37	M	"	01709646536	
9.	Ismail Mondol	"	35	M	"	01732969519	
10.	Md Mizan	"	27	M	"	01727462047	
11.	Md Aslam	"	38	M	"	01746295757	
12.	Joy Mondol	"	55	M	Farmer	01780729759	
13.	Md Gadar	"	20	M	Unemployed	—	
14.	Md Ashik	"	21	M	"	01733525429	
15.	Sujon	"	30	M	Driver	01311-138331	

Adroit Environment Consultants Ltd.

Project Name: Pabna 100MW ac Solar Park at Hemayetpur, Pabna Sadar, Pabna.

Address: Hemayetpur, Pabna Sadar, Pabna

Attendance Sheet for Formal Stakeholder Consultation

Venue: Project Site, Bhabanipur, Hemayetpur, Pabna **Time:** 2 pm **Date:** 17.05.2023

SL	Name	Address	Age	Gender	Profession	Mobile No	Sign
1.							
2.							
3.							
4.							
5.							
6.							
7.						01734898586	
8.	Mahedhi Hasan	Vobanipur	24	Male	Student	01763673810	
9.							
10.							
11.							
12.						01985206597	
13.						01727700875	
14.							
15.		Pabna			Student	01717029004	

Adroit Environment Consultants Ltd.

Project Name: Pabna 100MW ac Solar Park at Hemayetpur, Pabna Sadar, Pabna.

Address: Hemayetpur, Pabna Sadar, Pabna

Attendance Sheet for Formal Stakeholder Consultation

Venue: Project Site, Bhabanipur, Hemayetpur, Pabna **Time:** 2 pm **Date:** 17.05.2023

SL	Name	Address	Age	Gender	Profession	Mobile No	Sign
1.	মোঃ শুকুর আলী মন্ডল	ভাবানীপুর	২৭	পুরুষ	কৃষক	০১৯০৫২৬৬৯৯৯	শুকুর
2.	মোঃ মিরাজুল	ভাবানীপুর	৩৮	পুরুষ	মিস্ত্রি	০১৭৬০৭৩৬৪৪৭	মিরাজুল
3.	মোঃ ইকবাল	ভাবানীপুর	৩৪	পুরুষ	ড্রাইভার	01734-185471	ইকবাল
4.	মোঃ আইনাল হক	হেমায়েতপুর	৪৫	পুরুষ	ব্যবসা	01731-103461	আইনাল
5.	মোঃ ইমরান	গাবানীপুর	৩৭	পুরুষ	ব্যবসা	০১৭৩৭৭০৬৮২	ইমরান
6.	আলমগীর	ভাবানীপুর	৪০	পুরুষ	ব্যবসা	০১২৮২৬০২২১	আলমগীর
7.	মোঃ আবুল কাশেম	ভাবানীপুর	৪০	পুরুষ	কৃষক	০১৩১৩৬০৫৮৫	আবুল
8.	সাজ্জাদ	পানিয়া দিঘীর	২৫	পুরুষ	ব্যবসা	01765-251237	সাজ্জাদ
9.	মিনারুল	ধিরানুর	২৭	পুরুষ	ব্যবসা	০১৪১৪৭৪৬৬৭৪	মিনারুল
10.	জাহিদুল	ধিরাম পুর	২১	পুরুষ	কাজ করি	০১৪২১২২৬৯০২	জাহিদুল
11.	জিহাদ	ধিরাম পুর	২১	পুরুষ	ব্যবসা	01318926508	জিহাদ
12.	হাসান	নক্সাবগাছা	২৩	পুরুষ	চাকরি	০১৭২০২৯৪৩০৬	হাসান
13.	আমিনুল ইসলাম	হেমায়েতপুর	৬১	পুরুষ	ড্রাইভার	০১৭১৮৬৫৬৮১৪	আমিনুল
14.	মোঃ আব্দুল মোমিন	আবানীপুর দিঘীর	৫২	পুরুষ	ব্যবসা	০১৭১২৭২৬০২৮	মোমিন
15.	[illegible]	[illegible]	৪১		কৃষিকাজ	০১৭২৭৬৪৭৬২১	[illegible]

Adroit Environment Consultants Ltd.

Project Name: Pabna 100MW ac Solar Park at Hemayetpur, Pabna Sadar, Pabna.

Address: Hemayetpur, Pabna Sadar, Pabna

Attendance Sheet for Formal Stakeholder Consultation

Venue: Project Site, Bhabanipur, Hemayetpur, Pabna **Time:** 2 pm **Date:** 17.05.2023

SL	Name	Address	Age	Gender	Profession	Mobile No	Sign
1.	[illegible]	চর ভবানিপুর	৩০	পুরুষ	কাজ করেন না	01314611807	[illegible]
2.	[illegible]	চর ভবানিপুর	৪০	পুরুষ	"	-	[illegible]
3.	[illegible]	চর ভবানিপুর	৪০	"	"	01324941768	[illegible]
4.	[illegible]	চর ভবানিপুর	৪০	"	"		
5.	[illegible]	" "	৩৫	"	"	01773782392	[illegible]
6.	[illegible]	" "	৬৫	"	"	01794862772	
7.	[illegible]	" "	৪০	"	"	01312231362	
8.	[illegible]	" "	৬০	"	কাজ করেন	01312231362	
9.	[illegible]	" "	৩৫	মহিলা	কাজ নিয়ে	01781970433	[illegible]
10.	[illegible]	" "	২২	মহিলা	কৃষি	01301566413	[illegible]
11.	[illegible]	" "	২৫	মহিলা	কৃষি	01305493632	[illegible]
12.	[illegible]	" "	৩৫	মহিলা	কৃষি	01705557600	
13.	[illegible]	" "	২০	"	কৃষি	01753124197	[illegible]
14.	[illegible]	" "	২০	"	কৃষি	01727728006	
15.	[illegible]	" "	২২	"	কৃষি	01773206395	[illegible]

Adroit Environment Consultants Ltd.

Project Name: Pabna 100MW ac Solar Park at Hemayetpur, Pabna Sadar, Pabna.

Address: Hemayetpur, Pabna Sadar, Pabna

Attendance Sheet for Formal Stakeholder Consultation

Venue: Project Site, Bhabanipur, Hemayetpur, Pabna **Time:** 2 pm **Date:** 17.05.2023

SL	Name	Address	Age	Gender	Profession	Mobile No	Sign
1.	[illegible]	[illegible]	22	[illegible]	[illegible]	—	—
2.	[illegible]	[illegible]	60	[illegible]	[illegible]	01920468886	[illegible]
3.	[illegible]	[illegible]	22	[illegible]	[illegible]	—	—
4.	[illegible]	[illegible]	26	[illegible]	[illegible]	01606-222960	—
5.	[illegible]	[illegible]	28	[illegible]	[illegible]	01797[illegible]	—
6.	[illegible]	[illegible]	26	[illegible]	[illegible]	01722-535266	[illegible]
7.	[illegible]	[illegible]	80	[illegible]	[illegible]	—	—
8.	[illegible]	[illegible]	60	[illegible]	[illegible]	01962[illegible]	[illegible]
9.	[illegible]	[illegible]	60	[illegible]	[illegible]	01260124359	[illegible]
10.	[illegible]	[illegible]	20	[illegible]	[illegible]	01306454456	Robiul
11.	[illegible]	[illegible]	60	[illegible]	[illegible]	01981602292	[illegible]
12.	[illegible]	[illegible]	60	[illegible]	[illegible]	02922-022600	[illegible]
13.	[illegible]	[illegible]	26	[illegible]	[illegible]	—	[illegible]
14.	[illegible]	[illegible]	60	[illegible]	[illegible]	02302-992600	[illegible]
15.	[illegible]	[illegible]	40	[illegible]	[illegible]	—	[illegible]

Adroit Environment Consultants Ltd.

Project Name: Pabna 100MW ac Solar Park at Hemayetpur, Pabna Sadar, Pabna.

Address: Hemayetpur, Pabna Sadar, Pabna

Attendance Sheet for Formal Stakeholder Consultation

Venue: Project Site, Bhabanipur, Hemayetpur, Pabna **Time:** 2 pm **Date:** 17.05.2023

SL	Name	Address	Age	Gender	Profession	Mobile No	Sign
1.	Md Mizan Mahmud	Bhabanipur	20	M	Worker	01705579566	
2.	Md Marzan	"	68	M	Farmer	01 –	
3.	Md Dulal	"	23	M	"	01778967755	
4.	Md Lutfor	"	52	M	"	01755068904	
5.	Md Billal	"	43	M	"	01987844513	
6.	Habibur Rahman	"	57	M	Farmer	01705520298	
7.	Mizanur Rahman	"	55	M	"	01777084000	
8.	Md Sohel Rana	"	30	M	Business	01776060065	
9.	Kobiul Islam	"	40	M	Fisherman	–	
10.	করিম মোল্লা	"	50	M	মাছ চাষী	–	
11.	সাদুল মিয়া	"	35	M	কৃষক চাষী	–	
12.	মিয়াদ হোসেন	"	42	M	কৃষি চাষী	–	
13.	Md Raisul	"	32	M	Farmer	–	
14.	রহিম মিয়া	প্রতাপপুর	66	M	পোল্ট্রি ব্যবসায়ী	০১৭২৫-০২৬৬৬	
15.	সুমন	হেমায়েতপুর	20	M	ছাত্র	০১৭০৭-৫২৬৭২১	

Adroit Environment Consultants Ltd.

Project Name: Pabna 100MW ac Solar Park at Hemayetpur, Pabna Sadar, Pabna.

Address: Hemayetpur, Pabna Sadar, Pabna

Attendance Sheet for Formal Stakeholder Consultation

Venue: Project Site, Bhabanipur, Hemayetpur, Pabna **Time:** 2 pm **Date:** 17.05.2023

SL	Name	Address	Age	Gender	Profession	Mobile No	Sign
1.	Adil	Bhabanipur	23	M	Student	01790857724	
2.	Sharmin	"	30	M	Farmer	01304055[illegible]	
3.	Md Siddam	"	42	M	"	01778774993	
4.	Faisal	"	45	M	"	01870-732357	
5.	Akmal Hossain	"	38	M	"	01718-022659	
6.	Anowar Hossain	"	50	M	Business	01718-540092	
7.	Md Jewel	"	22	M	Student	01319537044	
8.	Esty	"	21	F	"	01709062402	
9.	Mosammd Alia	"	30	F	House wife	01736614123	
10.	Nasima Begom	"	32	F	"	01716749083	
11.	Tokuni	"	26	F	"	—	
12.	Bina	"	25	F	"	01 —	
13.	Md Azad	"	30	M	Worker	01723152802	
14.	Sujon	"	32	M	"	01774-284670	
15.	Md Surajul	"	37	M	-	01328-306097	

Adroit Environment Consultants Ltd.

Project Name: Pabna 100MW ac Solar Park at Hemayetpur, Pabna Sadar, Pabna.

Address: Hemayetpur, Pabna Sadar, Pabna

Attendance Sheet for Formal Stakeholder Consultation

Venue: Project Site, Bhabanipur, Hemayetpur, Pabna **Time:** 2 pm **Date:** 17.05.2023

SL	Name	Address	Age	Gender	Profession	Mobile No	Sign
1.	[illegible]	[illegible]	20	[illegible]	[illegible]	01834205420	
2.	[illegible]	" "	20	"	[illegible]	01877752529	
3.	[illegible]	" "	[illegible]	"	[illegible]	-	
4.	[illegible]	" "	[illegible]	"	[illegible]	01870044945	
5.	[illegible]	" "	80	"	[illegible]	-	
6.	[illegible]	" "	[illegible]	"	[illegible]	01320573948	
7.	[illegible]	" "	[illegible]	"	[illegible]	01814586626	
8.	[illegible]	" "	62	"	[illegible]	01323739223	
9.	[illegible]	" "	28	"	[illegible]	-	
10.	[illegible]	" "	[illegible]	"	[illegible]	01722557673	[illegible]
11.	[illegible]	" "	80	"	[illegible]	01 -	
12.	[illegible]	" "	[illegible]	"	[illegible]	01765422934	
13.	[illegible]	" "	22	"	[illegible]	01772769257	
14.	[illegible]	" "	26	"	[illegible]	01792200474	[illegible]
15.	[illegible]	" "	40	"	[illegible]	01724538610	[illegible]

Adroit Environment Consultants Ltd.

Project Name: Pabna 100MW ac Solar Park at Hemayetpur, Pabna Sadar, Pabna.

Address: Hemayetpur, Pabna Sadar, Pabna

Attendance Sheet for Formal Stakeholder Consultation

Venue: Project Site, Bhabanipur, Hemayetpur, Pabna **Time:** 2 pm **Date:** 17.05.2023

SL	Name	Address	Age	Gender	Profession	Mobile No	Sign
1.	Chanda Rani	Vobanipur	17	F	Housewife	–	
2.	Rihi Khatun	"	33	F	"	–	
3.	Rakhi Bissas	"	28	F	polting business	019.182.292.11	
4.	Hoimonti Bala	"	59	F	"	–	–
5.	Rina Begum	Vobanipur	30	F	Housewife	–	
6.	Maisa Akter	"	17	F	student	–	
7.	Nilufa Akter	Vobanipur	12	F	student	–	
8.	Renu Khatun	"	45	F	–	–	–
9.	Roksana	Vobanipur	21	F	housewife	015.224.392.82	
10.	Hamida Banu	"	55	F	"	–	–
11.	Akhi Rani	"	19	F	Polting business	017.328.593.22	
12.	Shapla Rani	"	36	F	"	–	
13.	Fatema Begum	"	26	F	housewife	017.213.489.32	
14.							
15.							

Annexure – 19 (b)

Minutes of Meeting & Participation List of Second Formal Public Consultation

MINUTES OF MEETING

PROJECT NAME: Pabna 100 MW (ac) Solar Park	**ARRANGED BY:** DSEPL and AECL
VENUE: Project Area, Bhabanipur, Hemayetpur, Pabna Sadar, Pabna	**DATE/TIME:** 17-August-2023, 11.30 a.m.-1.00 p.m.

SUBJECT: Second Public Consultation Meeting discussions for Solar Power Plant Project at Bhabanipur

SYNOPSIS:

As part of the ESIA process, public consultation meeting was conducted at the Project Area. The purpose of the meeting was to present the identified impacts and the ESMPs, highlighting how the concerns of the communities and stakeholders from previous consultations were addressed in the ESIA and ESMP.

PROJECT ATTENDEES:

DSEPL	:	Md. Robiul Islam (Company Secretary, DSEPL)
AECL	:	Shanjana Haider (Environmental Consultant); Md. Burhanul Islam (Social and Resettlement Consultant); Md Golam Rasul (Consultant); Shahriar Ebn Bashar (Consultant); Sabrina Islam Labonno (Consultant); Md. Mosaddaqur Rahman (Consultant)

No	DESCRIPTION OF DISCUSSION	RESPONSE BY
1	**Welcome address and Project Description:** Public Consultation meeting started at 11.30 AM. Environmental Consultant of AECL, Shanjana Haider welcomed all the participants including other local govt. officials and introduced the team members from DSEPL and AECL. She also explained the current situation regarding the electricity generation in Bangladesh and background of this project. Then she requested Md. Robiul Islam (Company Secretary, DSEPL) to say a few words about the project. Md. Robiul Islam (DSEPL) explained about the importance of the Project for country as well as development of the local region / economy. He also explained the vision of GoB to provide uninterrupted power supply to meet the energy crisis in the country. He also thanked the local people for their enormous support and hospitality. Afterwards, Shanjana Haider, discussed about the current status and detail of the project, identified impacts and the environmental & socio-economic management plans (local employment opportunities, resettlement issues, overall economic development) that will be undertaken by the proponent during construction and operation stage according to their concern shared during the last public consultation meeting. She further explained the need for the public consultations in order to encourage the participants to raise their concerns / issues/suggestions and be part of the overall decision-making process.	NA

No	DESCRIPTION OF DISCUSSION	RESPONSE BY
	Based on above information, the forum was open for participants to raise their concerns / issues / ideas/suggestions related to the Project activities and associated impacts.	
2	**Participant name: Md. Nazmul Hossain** **Occupation: Assistant Director, DoE, Pabna District Office** He mentioned that DSEPL has followed the latest DoE Rules and Regulations in the implementation of the project. During his speech, he highlighted the benefits of solar power plant as it didn't use any raw materials which have negative impacts on environment like coal or gas power plants and this type of power plant also don't discharge liquid waste. He told the local people that, this type of projects are green projects and have very minimum impacts on nature. He ended by concluding that the development projects are important for the nation but at the same time he also requested DSEPL to take actions to mitigate any negative impacts on local environment. Shanjana Haider thanked him for his support toward this project.	NA
3	**Participant name: Md. Khaledin Anam** **Occupation: Agricultural Extension officer, Pabna Sadar, Pabna** During his speech, he discussed about the importance of solar power plant in agricultural sector of Pabna Sadar as water used for cleaning solar panels can be reused in agricultural land. He also mentioned about the continuous supply of electricity can be helpful for operating agricultural tools. At the end he requested the project authority that after completing the project implementation, remaining vacant land in project area can be used for agricultural activity. Shanjana Haider thanked him for his support toward this project.	DSEPL personnel noted the point
4	**Participant name: Md. Musharraf Hussain** **Occupation: Assistant Director, BWDB, Pabna District** Participant ensured that this project have no negative impact on surface and ground water. He also requested the local people to support this project as it will improve the socio-economic condition of Pabna Upazila. Shanjana Haider thanked him for his support toward this project.	NA
5	**Participant name: Md. Afsar Uddin** **Occupation: Executive Engineer, BWDB, Pabna District** He discussed that this project implementation will have least environmental impacts and it will improve the electricity supply of whole nation. At the end he thanked the project authority for taking initiatives to implement the project. He also asked local people for their support throughout this project and expected that local people will be benefitted through this project.	NA

No	DESCRIPTION OF DISCUSSION	RESPONSE BY
	Shanjana Haider thanked him for his support toward this project.	
6	**Participant name: Saiful Biswas** **Occupation: Local Representatives** He explained that this project improved road connectivity and socio-economic condition in their locality. He ensured to give all kinds of support when and where necessary and expected that local people will be benefitted through this project.	NA
7	**Participant name: Amena Khatun** **Occupation: Housewife, Bhabanipur.** Participant explained that she is very happy to get the opportunity to work here. Now she can support her family with her income and can also send her children to school with that money. She requested that other interested women should also be given suitable job opportunities so that they can also earn money for their family and can improve their living standard. She requested the project company to arrange some trainings which are related to project activities so that their children can work here too after they complete their education. Respective officials took note of this issue and assured that they will consider the issue.	DSEPL personnel noted the point
8	**Participant name: Saiful Islam** **Occupation: Businessman, Bhabanipur.** Participants explained that this project implementation has improved the road connectivity and expressed his gratitude toward DSEPL. He also requested the project company to buy construction materials, daily necessities from local people to improve their economic condition. At the end he requested project authority for construct a mosque within the project area for local people religious activity. Respective officials took note of this issue and assured that they will consider the issue. He also mentioned that, they will construct a mosque as it is already incorporated in their layout	DSEPL personnel noted the point
9	**Participant name: Jamal Pramanik** **Occupation: Farmer and project construction worker, Char Bhabanipur** Participant expressed his gratitude toward DSEPL to buy his land and compensate him with a handsome amount. He also thanked project authority for involving him in project work as a day labourer.	DSEPL personnel noted the point
10	**Participant name: Atahur Member** **Occupation: Local Representatives, Char Bhabanipur** Participants thanked DSEPL as due to this project road connectivity has improved in their area. He also mentioned that this project has enhanced the socio-economic condition in their area as the project authority recruit local people in project activity.	NA

No	DESCRIPTION OF DISCUSSION	RESPONSE BY
11	**Various participants commented about the overall development and loss of livelihood for farmers and landowners** Shanjana Haider explained that the Project intends to follow ADB SSP 2009 and Govt. prevailing laws for resettlement activity. Best Available Technologies (BAT) will be implemented so that it does not affect the surrounding environment and also assured that they will be given priority for the cash crop cultivation beneath the solar panels during the project operation. She mentioned that, they have and will be given priority for employment and the project company will do several CSR activities for the improvement of the socio-economic condition of the surrounding area. She also concluded the program by ensuring the local people that they will incorporate local peoples view and suggestions regarding the project and they can report their concerns and complaints anytime regarding the project through Grievance redress mechanism. She also assured that stakeholder consultations will be continued during the construction and operation phase of the project at a regular interval so that their concerns and suggestions can be addressed accordingly.	AECL
12	Finally, Mr. Robiul Islam (DSEPL) ended his speech by thanking all the participants. He ensured that if there are any remaining land related payments then it will be made as soon as possible and he also mentioned that CSR activities will be properly implemented. He mentioned that they will conduct skill building training, ensure women employment, preference of local people for employment etc. He said that DSEPL will do their best to meet the demands of the affected people and contribute in socio-economic flourishment of the area.	NA

LEGEND:

AECL	Adroit Environment Consultants Ltd.
DSEPL	Dynamic Sun Energy Private Ltd.
EIA	Environmental Impact Assessment
GoB	Government of Bangladesh
CSR	Corporate Social Responsibility
NA	Not Applicable

Adroit Environment Consultants Ltd.

Project Name: Pabna 100MW ac Solar Park at Hemayetpur, Pabna Sadar, Pabna.

Address: Hemayetpur, Pabna Sadar, Pabna

Attendance Sheet for 2nd Formal Stakeholder Consultation

Venue: Project Site, Bhabanipur, Hemayetpur, Pabna **Time:** 11:30 am **Date:** 17.08.2023

SL	Name	Address	Age	Sex	Profession	Mobile No	Sign
1.	[illegible]	হেমায়েতপুর		পুরুষ		01711-301866	
2.	মো: সুলতান মাহমুদ	উপজেলা কৃষি অফিস	৪৬	পুরুষ	উপসহকারী কৃষি অফিসার	01710-777080	
3.	মোঃ আবদুল মোমিন	সহকারী রাজস্ব কর্মকর্তা	৬২	পুরুষ		01747-381669	
4.	মোঃ হারুন অর রশিদ	উপ-সহকারী প্রকৌশলী	31	পুরুষ	উপ-সহকারী প্রকৌঃ	01318-235279	HRashid
5.	মোঃ নাজমুল হোসাইন	সেচকাজ পরিচালক, পাবনা	36	পুরুষ	সহকারী পরিচালক	01726653749	
6.	মোঃ আবু সাঈদ	মুহুরী-২, ডিসি	38	পুরুষ		01713-936107	
7.	Md. Afsar Uddin	Executive Engineer Bangladesh Water Dev. Board, Pabna	58	Male	Gov. Service	01957658233	
8.	Md. Khaledin Anam	Agriculture Extension Officer, Pabna Sadar	29	Male	Gov. Service	01758467616	
9.	Md. Musharaf Hossain	B.W.D.B, Pabna S.D.	57	Male	Gov. service	01712-014286	
10.	Shawjana Haider	Uttara, Dhaka	37	Female	Consultant	01783376604	Shawjana
11.	MD. Golam Rasel	Uttara, Dhaka	27	Male	Asst. Consultant	01324-177492	
12.	Shahriar Ebn Bashar	Uttara, Dhaka	24	Male	Asst. Consultant	01324-177498	
13.	Sabrina Islam	Uttara, Dhaka	24	Female	Asst. Consultant	01521410735	
14.	Md. Mosaddaqur Rahman	Uttara, Dhaka	30	Male	JKL consaltant	01324-177496	
15.							

Adroit Environment Consultants Ltd.

Project Name: Pabna 100MW ac Solar Park at Hemayetpur, Pabna Sadar, Pabna.

Address: Hemayetpur, Pabna Sadar, Pabna

Attendance Sheet for 2nd Formal Stakeholder Consultation

Venue: Project Site, Bhabanipur, Hemayetpur, Pabna **Time:** 11:30 am **Date:** 17.08.2023

SL	Name	Address	Age	Sex	Profession	Mobile No	Sign
1.	মো: হাবিবুর	চর ভোবানীপুর	২৫	পুরুষ	ব্যবসা	01703960735	
2.	মিঠুন কুমার	তাড়াস সিরাজগঞ্জ	২৫	পুরুষ	ছাত্র	01704934374	
3.	মো: আলতাফ হোসেন	আটঘরিয়া, পাবনা	৩৮	পুরুষ	সি.এন.জি চালক	01327127732	
4.	রফিকুল ইসলাম	গোবিন্দগঞ্জ, গাইবান্ধা	২৭	পুরুষ	অটো চালক	01723821334	
5.	মো: ইমন আলী	চর ভোবানীপুর, পাবনা	১৮	পুরুষ	ছাত্র	01721759158	
6.	মো: জাকির হোসেন	কালিদাস মিলি, তাড়াস	২১	পুরুষ	ছাত্র	01887059303	
7.	মো: রুবেল হোসেন	চর গোপীনাথ	২৬	পুরুষ	কৃষি	01867594392	
8.	মো: সুলতান মাতব্বর	"	২৫	পুরুষ	চাকরি	01743121546	
9.	মোহাম্মদ	"	২৪	পুরুষ	ছাত্র	01303937248	
10.	আসাদ মন্ডল	গোপালপুর	২৬	পুরুষ	ছাত্র	০১৩১৯০৬০৯২৬	
11.	সাজিব	জোটিকয়া, আমিনপুর পাবনা	১৮	পুরুষ	মিস্ত্রী	01317648868	
12.	ইছলাম	আমলাপুর	২০	পুরুষ	মিস্ত্রী	01911774667	
13.	আকিব	আমবাগান, আমিনপুর	২২	পুরুষ	ছাত্র	01707830783	
14.	রুবেল	ভাংনাড়া	২৯	পুরুষ	কৃষি	01780574875	
15.	নাজমুল	মলমিয়াপাড়া	১৯	পুরুষ	চাষী	01752545778	

Adroit Environment Consultants Ltd.

Project Name: Pabna 100MW ac Solar Park at Hemayetpur, Pabna Sadar, Pabna.

Address: Hemayetpur, Pabna Sadar, Pabna

Attendance Sheet for 2nd Formal Stakeholder Consultation

Venue: Project Site, Bhabanipur, Hemayetpur, Pabna **Time:** 11:30 am **Date:** 17.08.2023

SL	Name	Address	Age	Sex	Profession	Mobile No	Sign
1.	ইমন	চর ভবানীপুর	১৪	M	ছাত্র	-	ইমন
2.	তিয়ন	"	১৮	M	ছাত্র	01345402491	Sohan.
3.	শাহীন	"	২০	M	ছাত্র	-	Shahin
4.	আলীহাজ	"	৬৫	M	ব্যবসা	০৬০২৮৮৮৮৩৩	Ali
5.	মিহাদ	"	১৭	M	কৃষক	০১৩০৬৫৪৭৭৭	-
6.	আশিকাব	হেমায়েতপুর	২৫	M	শ্রমিক	01/253-133441	Ashik
7.	সেলিম	"	১৫	M	শ্রমিক	-	Selim
8.	মোঃ শাহিদুল ইসলাম রানা	"	৪০	M	শ্রমিক	০১৯৬৭ ১১৪৯৩৭	Rana
9.	মোঃ সাজ্জাদ	শাহির দিয়ার	২৪	M	কৃষক	01765-251237	Ok
10.	মোঃ ইউসুফ হোসেন	শাহির দিয়ার	২২	M	ব্যবসা	01725191277	Yusuf
11.	মোঃ আবির হুসাইন	চর বাঘবাড়ীয়া	২৪	M	ব্যবসা	01771-647401	Abir
12.	মোঃ সাইফুল ইসলাম	হিমায়েতপুর	২৪	M	মোবাইল ব্যবসা	01738-378839	Saif
13.	বকুল খাঁ	চর বাঘবাড়ীয়া	২০	M	মোবাইল ব্যবসা	01757-028168	BOKUL
14.	মোঃ শিমুল	হিমায়েতপুর	২২	M	ইজিবাইক চালক	01733-656520	Shimul
15.	মোঃ শিয়াম মোল্লা	দাপুনিয়া	২৩	M	ইজিবাইক চালক	01311-067981	-

Adroit Environment Consultants Ltd.

Project Name: Pabna 100MW ac Solar Park at Hemayetpur, Pabna Sadar, Pabna.

Address: Hemayetpur, Pabna Sadar, Pabna

Attendance Sheet for 2nd Formal Stakeholder Consultation

Venue: Project Site, Bhabanipur, Hemayetpur, Pabna **Time:** 11:30 am **Date:** 17.08.2023

SL	Name	Address	Age	Sex	Profession	Mobile No	Sign
1.	পারভীন	ভবানীপুর	২৪	F	গৃহিনী	-	
2.	মায়মা	"	০৬	F	ছাত্রী	-	মায়মা
3.	জমেলা খাতুন	ভবানীপুর	৫০	F	গৃহিনী	-	-
4.	মনোয়ারা বেগম	ভবানীপুর	৩৫	F	ব্যাবসা	-	
5.	মাহমুদা	"	০২	F	-	-	-
6.	মোছা: জেলা খাতুন	"	২৮	F	স্বামী - মুদি কাজ	-	
7.	মিঠুন		০৫	M	ছাত্র	-	মিঠুন
8.	রিনা	"	৩২	F	স্বামী - মুদির কাজ	-	Rina
9.	নাসরিন		০৬	F	ছাত্রী	-	নাসরিন
10.	বাবু	সুনাপট্টি	৪২	M	ব্যবসায়ী	01743401666	বাবু
11.	রায়হান	কুড়িগ্রাম	২৮	M	ছাত্র	01735206887	
12.	নয়ন		২৩	M	ছাত্র	01721630940	
13.	মেলোয়ার	চর মুতাহ মুর	২২	M	ড্রাইভার	01889608695	
14.	আহলাম		৬০	M	ব্যবসা	01726889403	
15.	রিদয়		৬৬	M	ব্যবসা	0175 386228	

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Attendance Sheet for 2nd Formal Stakeholder Consultation

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SL	Name	Address	Age	Sex	Profession	Mobile No	Sign
1.	[illegible]	[illegible]	80	M	[illegible]	01792917853	—
2.	[illegible]	"	26	"	[illegible]	01892245086	[illegible]
3.	[illegible]	"	26	"	[illegible]	01775748362	[illegible]
4.	[illegible]	"	30	"	[illegible]	01842742461	[illegible]
5.	[illegible]	"	28	M	[illegible]	01754-731389	[illegible]
6.	[illegible]	"	24	M	[illegible]	01765617477	[illegible]
7.	[illegible]	[illegible]	50	M	[illegible]	01887326291	[illegible]
8.	[illegible]	"	60	M	[illegible]	01300291505	[illegible]
9.	[illegible]	"	69	M	[illegible]	01786620[illegible]	[illegible]
10.	[illegible]	[illegible]	20	M	[illegible]	01[illegible]	[illegible]
11.	[illegible]	"	28	"	[illegible]	01761[illegible]	[illegible]
12.	[illegible]	"	22	"	[illegible]	01988-[illegible]	[illegible]
13.	[illegible]	[illegible]	48	"	[illegible]	[illegible]	[illegible]
14.	[illegible]	"	26	"	[illegible]	নাই	[illegible]
15.	[illegible]	"	22	"	[illegible]	01726362647	[illegible]

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SL	Name	Address	Age	Sex	Profession	Mobile No	Sign
1.	আল -আমিন	চাটমোহর	২৭	M	ছাত্র	01938389901	Amin
2.	মো: আবুল কাশেম	[illegible]	৬০	M	ব্যবসা	01759190468	Bashem.
3.	মো: জহুরুল ইসলাম	নাটোর বড়াইগ্রাম	৫৫	M	চাকরী	01728-976179	—
4.	মো: রিয়াজুল ইসলাম	পাবনা আধিয়াড়িয়া	২৭	M	ব্যবসা	01875797117	—
5.	মো: জেনুল বারী	পাবনা সদর	২৯	M	কৃষি	01775-600323	জেনুল
6.	মো: শাকিল হোসেন	পাবনা - সদর, পাবনা	২৪	M	কৃষি	01725-110037	শাকিল
7.	রনি শেখ	পাবনা - আধিয়াড়িয়া	২৩	M	ব্যবসা	01700963256	Roni
8.	SHAHIN ALAM	PABNA-	26	M	ব্যবসা	01722309381	SHAHIN
9.	লাল মিয়া	পাবনা- আধিয়াড়িয়া	22	M	ছাত্র	01793-837788	লাল
10.	রাকিব হোসেন	পাবনা - সদর-পাবনা	20	M	ছাত্র	01791335290	Rakib
11.	নাইম হোসেন	পাবনা - আধিয়াড়িয়া	20	M	ছাত্র	01725309391	Nayeem
12.	রিয়াজুল	পাবনা- আধিয়াড়িয়া	20	M	ব্যবসা	01964176776	[illegible]
13.	মো: রতন শর্দ	পাবনা সদর পাবনা	৪৬	M	ব্যবসায়	01790263850	Ratan
14.	মো: কাইজার হোসেন	[illegible]	৪৭	M	ব্যবসায়	01729449642	Shahjahan
15.	মো: আবু তাহের	[illegible]	৫৭	M	ব্যবসা	01724455564	[illegible]

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SL	Name	Address	Age	Sex	Profession	Mobile No	Sign
1.	[illegible]	[illegible]	[illegible]	পুং.	কৃষক	নাই	[illegible]
2.	[illegible]	[illegible]	৫৫	পুং	কৃষক	-	-
3.	[illegible]	"	৬০	পুং.	চাষী	01645084577	[illegible]
4.	[illegible]	"	২৮	পুং.	চাষী	01720596625	
5.	[illegible]	"	২০	পুং.	পড়ুয়া	নাই	[illegible]
6.	[illegible]	[illegible]	২৮	পুং.	[illegible]	01740161487	[illegible]
7.	[illegible]	"	২৬	পুং.	সদস্য	01774592748	[illegible]
8.	[illegible]	"	৬৫	পুং.	মুখ্যমন্ত্র	01[illegible]	
9.	[illegible]	[illegible]	৪৬	পুং.	কৃষক	01886724598	[illegible]
10.	[illegible]	[illegible]	৪০	পুং.	[illegible]	01920492882	
11.	[illegible]	[illegible]	২৩	পুং.	[illegible]	-	[illegible]
12.	[illegible]	"	২৭	পুং.	[illegible]	01645084444	
13.	[illegible]	[illegible]	৬৫	পুং.	[illegible]	নাই	[illegible]
14.	[illegible]	[illegible]	২৫	পুং.	[illegible]	0176-631621	[illegible]
15.	[illegible]	[illegible]	২৪	পুং.	[illegible]	01761005626	[illegible]

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SL	Name	Address	Age	Sex	Profession	Mobile No	Sign
1.	Abdel Basit	Bhabanipur,	35	m	LDF	0721-667200	
2.	Abd Basar	Char Basudeb	32	m	Local Employee	01764041380	
3.	Saibulislam	Bhabanipur	27	m	Ex-operator	01300180026	
4.	Md: Hamid	Vobanipur	43	m	LPF	01798.213931	
5.	Burhan	Char Basudeb	32	M	Job	01717253995	
6.	[illegible]	"	26	M	[illegible]	01764-552017	
7.	[illegible]	[illegible]	20	M	[illegible]	01966879899	
8.	[illegible]	[illegible]	20	M	[illegible]	01701[illegible]2008	
9.	[illegible]	[illegible]	23	M	[illegible]	01301047714	
10.	[illegible]	[illegible]	22	M	[illegible]	01611539356	
11.	[illegible]	"	08	M	[illegible]	01822784800	
12.	[illegible]	[illegible]	02	M	[illegible]	01721922455	
13.	Shojib mahamud	বাবাবিড়িয়া	২৩+	m	চাকুরী	01723-575033	
14.	OMAR FARUK	ভাগিনাসকল	26	m	চাকুরি	01763017852	
15.	MD: ROCKY	বিভিন্নেরী রায়নগর	29	m	বিভিন্ন	01787956787	

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SL	Name	Address	Age	Sex	Profession	Mobile No	Sign
1.	[illegible]	[illegible]	29	M	চাষী	01XX4500670	
2.	[illegible]	[illegible]	[illegible]	M	কৃষক	-	
3.	[illegible]	[illegible]	28	M	[illegible]	01706-180895	
4.	[illegible]	[illegible]	66	M	[illegible]	01[illegible]-0[illegible]	
5.	[illegible]	[illegible]	22	M	[illegible]	01768942710	
6.	[illegible]	[illegible]	8C	M	[illegible]	01754 390972	
7.	[illegible]	[illegible]	42	M	[illegible]	01X14581244	
8.	[illegible]	[illegible]	60	M	[illegible]	-	
9.	[illegible]	[illegible]	29	M	[illegible]	-	
10.	[illegible]	[illegible]	21	M	ব্যবসা	01778083632	
11.	[illegible]	[illegible]	26	M	[illegible]	0161-1193355	
12.	[illegible]	[illegible]	28	M	[illegible]	-	
13.	[illegible]	X	26	M	[illegible]	-	
14.	[illegible]	[illegible]	20	M	[illegible]	-	JAHIR
15.	[illegible]	[illegible]	[illegible]	M	[illegible]	01[illegible]	

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SL	Name	Address	Age	Sex	Profession	Mobile No	Sign
1.	মো: রবিউল	হেমায়েতপুর	৪০	পু.	ব্যবসা	01724598892	রবিউল
2.	মো: কাশেম	হেমায়েতপুর	২৫	পু.	চাকুরী	01738749209	কাশেম
3.	মো: সাকিব	সলিমপুর	22	পু	চাকুরী	01846325069	সাকিব
4.	রবি বিশ্বাস	হেমায়েতপুর	২৫	পু	ব্যবসা	-	রবি
5.	[illegible]	সলিমপুর	২৫	পু.	ব্যবসা	-	[illegible]
6.	মো- আক্কাস	নতাং সাড়ি	২৬	পু.	ব্যবসা	-	Asgor
7.	কামরুন	বড় সাড়িপুর	২৫	পু.	ব্যবসা	01780108800	কামরুন
8.	আবুল বাশার	"	22	পু.	চাকরী	01720215463	বাশার
9.	[illegible]	[illegible]	20	পু.	ব্যবসা	-	[illegible]
10.	[illegible]	"	২৯	পু.	গৃহিণী	-	[illegible]
11.	মো: ফজিবার রহ:	হেমায়েতপুর	৪৫	পু	কৃষক	-	-
12.	টুটুল	"	৪২	পু	গৃহিণী	01716 235822	টুটুল
13.	মো: মোস্তফা কামাল	হেমায়েতপুর	৬৮	পু	কৃষক	-	-
14.	[illegible]	[illegible]	৭২	পু	[illegible]	-	-
15.	আলামিন	"	২৮	পু	ব্যবসা	01742225564	Alamin

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SL	Name	Address	Age	Sex	Profession	Mobile No	Sign
1.	[illegible]	[illegible]	28	M	[illegible]	01305577897	[illegible]
2.	Alimul	[illegible]	35	M	[illegible]	01757.680528	Alimul
3.	[illegible]	[illegible]	40	M	[illegible]	[illegible]	[illegible]
4.	[illegible]	[illegible]	29	M	[illegible]	01482-090922	[illegible]
5.							
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SL	Name	Address	Age	Sex	Profession	Mobile No	Sign
1.			৬৬	m		-	
2.		"	৬২	m		-	
3.		"	২৮	m		01749292299	
4.			৬৫	m		-	
5.			৩০	m		-	
6.			৩৭	m		01722559988	
7.			২৮	m			
8.			৩২	m		01754727325	
9.			৪৪	m		01735753208	
10.			২৭	m			
11.			২০	m		01732597788	
12.							
13.							
14.							
15.							

Annexure – 20

ToR of Project Level Grievance Redress Mechanism (GRM)

Terms of Reference: Project-level Grievance Redress Mechanism (GRM)

1. Introduction and Overview

These ToR provide guidance on the importance and functions of the Grievance Redress Mechanism (GRM) for support this Project. The Grievance Mechanism will be implemented during both the construction and operational period of the project to ensure that all complaints from local communities along with anonymous person are dealt with appropriately, with corrective actions being implemented, and the complainant being informed of the outcome. It will be applied to all complaints received related to the project activity and intervention. The Project GRM provides an additional formal way for project affected stakeholders to register their complaints about project social and environmental risks and impacts. stakeholder engagement should begin early in project design and continue throughout the project cycle.

The basic characteristics of a good grievance redress mechanism process are:

- All the project related information needs to disclosed during stakeholder meeting and update them time to time about the project implementation;
- Project affected stakeholders are free to raise their concern and inform project authority about their problem from project implementation;
- Concerns arising from project implementation are adequately addressed in a timely and respectful manner by project authority;
- Project authority should establish a GRM committee for address the concern of project affected people and solve them and
- Grievance Redress Committee (GRC) will maintain a Complaints Database, which will contain all the information on complaints or grievances received from the communities or other stakeholders. This would include: the type of complaint, location, time, actions to address these complaints, and final outcome.

2. Grievances Procedure

The grievances redress procedures and mechanism ensure that project affected persons are provided with the appropriate solution or compensations and that all administrative measures are in line with the law. The grievance resolution process includes four key stages – (i) Receive; (ii) Investigate/Enquire; (iii) Respond and Resolve; (iv) Monitoring and (v) Close Out.

The intention is to resolve a complaint as quickly and at as low a level as possible to avoid a minor issue becoming a significant grievance. If the project affected person didn't get the grievance from project company, then they have the opportunity to pursue the grievance through the court as it is his or her legal right.

2.1 Receiving Complaints or Concerns

Diverse members of the project affected community, including more vulnerable groups such as women and youth can register their complains or concern about the project impacts. Here are some methods need to be available by the project company for receiving concern or complins from project affected community-

- A grievance reporting form both in English and Bangla can be made for receiving complaints or concerns;
- A complaint box can be established by the project company near the project entrance for receiving written complaints;
- Telephone/ mobile number/ e-mails for receiving complaints need to be available;
- All the concerns and complaints need to be registered in complaints log book; and
- Face to face meetings or consultations with the project affected stakeholders can be done at regular intervals for receiving their concerns.

The Grievance should include the following information:

- the name(s) of the person/people submitting the complaint ("the Complainant");
- a means for contacting the Complainant (email, phone, address, other);
- if the submission is on behalf of those alleging a potential or actual harm, the identity of those on whose behalf the complaint is made, and written confirmation by those represented of the Complainant's authority to lodge the complaint on their behalf;
- a description of the potential or actual harm;
- names of the individual(s) or institutions responsible for the risk/harm (if known), and the location(s) and date(s) of harmful activity (if Complainant states that harm has already occurred);
- whether the Complainant wishes for their identity to be kept confidential; and
- the specific response requested from the GRM.

However, Complainants are not required to provide all of the information listed above. Initially, the Complainant needs only to provide enough information to determine eligibility. Confidentiality and privacy for complainants should be honored where this is seeming to be necessary or important.

2.2 Investigate or Enquiries

The GR & CSR Manager of DSEPL will investigate the root cause of each of the receiving problems. They may gather information from any other sources in order to more clearly describe the cause and effects of grievance. Investigations may include site visits and meetings to determine: the scale and impact of the grievance and what options there may be for appropriate responses or resolutions.

2.3 Respond and Resolve

The project company will establish a two-tier project-specific Grievance Redress Mechanism. The first tier will work at the grass-roots level. At this level, the grievances are reported to the GR & CSR Manager. After

investigation, if the issue/s cannot be resolved by the GR & CSR Manager within 7 days, they will be brought to second tier which is GRC. Dynamic Sun Energy Pvt. Ltd. will establish a committee for potential resolution. The committee consult properly with the affected people in presence of Local representatives from Union Parishad to ensure issues are managed in an amicable way. The GRC will be comprised of 5 members including Dynamic Sun Energy Pvt. Ltd. Director (convener), Plant manager, EHS Manager, member from contractor, GR & CSR Manager and local elected representatives. The GRC normally provide solution within 15 days of receiving the grievance from the GR & CSR Manager. The response time between activating the procedure and reaching a resolution should be as short as possible.

The fundamental objective of the GRM will be to resolve any project related grievances locally in consultation with the aggrieved party to facilitate smooth implementation of the ESMP. Another important objective is to democratize the development process at the local level and to establish accountability to the affected people.

In case a dispute is not resolved by arbitrational tribunal, then if any of the Party disagrees, the aggrieved party has the right to appeal to the ordinary courts of law. However, the preferred option of dispute settlement ought to be the option of settling the dispute amicably because recourse to courts may take a very long-time even year before a final decision is made and therefore, should not be the preferred option for both parties concerned.

2.4 Monitoring

The GR & CSR Manager have the responsibility for tracking and monitoring the implementation of grievance redress mechanism and of evaluating that redress is granted to APs in a timely and efficient manner. They also have the responsibility for giving regular feedback to the complainants about the progress of the grievance redress process.

The monitoring should include

- Ensure that the GRMs is enough for addressing and solving all received complaints and concerns;
- Evaluate the progress of implementation of grievance resolutions made within 15 days from the decision making;
- Ensure that the Complainants are satisfied with the grievance resolutions outcome; and
- Documentation of all the details of complaints received and the progress in solving them will be kept.

2.5 Close Out

A grievance is closed out when no further action is needed to be taken for any grievance. The final outcome and acceptance of the grievance resolution to the Aps should be recorded and closed for further monitoring. All grievances should be closed out within the initial 15 days or as soon as possible thereafter and after all reasonable attempts to resolve the grievance have been attempted.

As a general policy, project proponent will work proactively towards preventing grievances through implementation of impact mitigation and community liaison activities that anticipate and address potential issues before they become grievances. Minor issues will be solved by the contractor or GR & CSR Manager in consultation with the aggrieved party and the local Union parishad representatives.

Annexure - 21

Chemical Management Principles of DSEPL

রাসায়নিক পদার্থ ব্যবস্থাপনা সংক্রান্ত মূলনীতি
Chemical Management Principles

লক্ষ্য ও উদ্দেশ্য:

উক্ত কারখানা তার সকল কর্মকাণ্ড পরিচালনায় সর্বদা কর্মক্ষেত্রে পেশাগত স্বাস্থ্য নিরাপত্তা প্রদান ও পরিবেশবান্ধব প্রক্রিয়া অবলম্বন সহ অন্যান্য স্বাস্থ্য সচেতনতামূলক পদক্ষেপ গ্রহনে বদ্ধ পরিকর। উক্ত লক্ষ্যে প্রনীত এই রাসায়নিক দ্রব্য "ব্যবস্থাপনা সক্রান্ত মূলনীতিসমূহের"মূখ্য উদ্দেশ্য হল প্রতিষ্ঠানের জন্য রাসায়নিক দ্রব্য ক্রয়, ব্যবহার, সংরক্ষণ ও অপসারণ সংক্রান্ত নিয়মাবলী বর্ণনা করা এবং রাসায়নিক দ্রব্য ক্রয় ব্যবহার সংরক্ষণ ও অপসারণ কাজে নিয়োজিত বাক্তিদের দায়িক্ত কর্তব্য বর্ণনা ও বাস্তবায়নের জন্য নির্দেশনার ভিত্তি প্রস্তুত করা, যাতে সুরক্ষিত ভাবে রাসায়নিক দ্রব্য ব্যাবহারের মাধ্যমে পরিবেশগত স্বাস্থ্য ও নিরাপত্তা ঝুঁকি কমানো যায় এবং ক্রেতাদের RSL, MRSL এবং ZDHC MRSLঅনুসরণ করা।

আইনের সূত্র ও মূলনীতি সমূহের উৎস:

রাসায়নিক দ্রব্য ব্যবস্থাপনা সংক্রান্ত পলিসি (Chemical Management Policy) বাস্তবায়নের লক্ষ্যে এই মূলনীতিগুলো প্রণয়ন করা হল। বাংলাদেশের পরিবেশ সংরক্ষণ বিধিমালা ১৯৯৭(সংশোধিত ২০১০), বাংলাদেশ শ্রম আইন ২০০৬(সংশোধিত ২০১৩),বিপজ্জনক বর্জ্য ও জাহাজভাঙ্গার বর্জ্য ব্যবস্থাপনা বিধিমালা (২০১১), বাংলাদেশ শ্রম বিধিমালা (২০১৫) ইত্যাদি সহ পরিবেশগত আইনি বাধ্যবাধকতা (Environmental Legal Requirements) অনুসারে প্রযোজ্য আইন ও বিধি-বিধান, দেশের প্রচলিত পরিবেশ আইনের সাথে সম্পৃক্ত জাতিসংঘের পরিবেশ নিতিমালা সূমহ ,গণপ্রজাতন্ত্রী বাংলাদেশ সরকার কর্তৃক বিভিন্ন সময়ে স্বাক্ষরিত পরিবেশ নিয়ন্ত্রণের জন্য প্রবিধান এবং রাসায়নিক দ্রব্য ব্যবহার ও নিয়ন্ত্রণের ক্ষেত্রে ক্রেতাদের নির্দেশনা।

মূলনীতি - সমূহ:

ক.ক্রয়, ব্যবহার,সংরক্ষণ ও অপসারণ সংক্রান্ত যথাযথ সচেতনতা নিশ্চিত করা:

1) রাসায়নিক পদার্থ ব্যবস্থাপনা টিম গঠন **(Chemical Management Team):**
রাসায়নিক পদার্থের যথাযথব্যবস্থাপনা এবং সচেতনতা নিশ্চিত করতে কারখানা প্রধানকে অবহিতকরণ সাপেক্ষে রাসায়নিক পদার্থ ব্যবস্থাপনা টিম গঠন করা হবে। কারখানা কমপ্লায়েন্স প্রধান এই টিমের প্রধান হিসাবে সকল মূলনীতি, রাসায়নিক দ্রব্য ব্যবস্থাপনা পদ্ধতি ইত্যাদি প্রণয়ন ও তদারকি করবেন এবং কেমিক্যাল রেস্পন্সিবল গুরুত্বপূর্ণ ভূমিকা পালন করবে। টিমের গঠন এবং সদস্যদের দায়িত্বও কর্তব্য যথাযথভাবে নথিভুক্ত থাকবে। যেহেতু কারখানাতে সক্রিয় সেইফটি কমিটি রয়েছে সেহেতু সেইফটি কমিটিকে রাসায়নিক পদার্থ ব্যবস্থাপনার উক্ত দায়িত্ব অর্পণ করে "রাসায়নিক পদার্থ ব্যবস্থাপনা টিম গঠন" সক্রান্ত প্রয়োজন পূরণ করা হবে।

2) রাসায়নিক পদার্থ সম্পর্কে যথাযথ সচেতনতা নিশ্চিতকরণের লক্ষ্যেনিয়মিত আলোচনা, প্রশিক্ষণ ও অনুশীলন **(Consultation, Training & Drill):**
   - রাসায়নিক পদার্থ ব্যবস্থাপনা টিম রাসায়নিক পদার্থের সাথে জড়িত সকল শ্রমিক ও স্টাফদের সাথে নিয়মিত আলোচনা করবে এবং তাদের প্রশিক্ষণ ও অনুশীলন নিশ্চিত করবে। প্রশিক্ষণের বিষয়বস্তুতে নতুন রাসায়নিক পদার্থের পরিচিতি, যথাযত কর্মপন্থা, লেবেলে প্রদর্শিত তথ্য,

সেফটিডাটা সিট(SDS) এর ব্যবহার, ঝুঁকির ধরণ, ঝুঁকি নিয়ন্ত্রণ ব্যবস্থা, নিঃসরণ নিয়ন্ত্রণ, যথাযথ পি পি ই, প্রাথমিক চিকিৎসা ইত্যাদি থাকতে হবে।

- Training need assessment করতে হবে এবং কাজের ধরণ অনুযায়ী ট্রেইনিং মডিউল প্রস্তুত করতে হবে।
- সকল কর্মকর্তা ও কর্মচারীকে রাসায়নিক পদার্থের সনাক্তকরণের উপর সাধারণ প্রশিক্ষণ দিতে হবে। উর্ধতন কর্তৃপক্ষকেও রাসায়নিক ব্যবস্থাপনা পলিসি সম্পর্কে অবহিত করতে হবে।
- প্রযোজ্য ক্ষেত্রে সাব-কন্ট্রাক্টর,সাপ্লাইয়ার ও অন্যান্য সংশ্লিষ্টদের রাসায়নিক পদার্থের ব্যবস্থাপনা পলিসি এবং RSL, MRSLসম্পর্কে অবহিত করতে হবে।

খ. স্বাস্থ্য ও পরিবেশের উপর রাসায়নিক পদার্থের ঝুঁকি নিরূপণ ও সেফটি বোর্ডে প্রদর্শন:

3) নিরাপদ কর্মপন্থা এবং ঝুঁকি মূল্যায়ন **(Safe Working Procedure & Risk Assessment):**

- রাসায়নিক পদার্থ ব্যবস্থাপনা টিমে দায়িত্বপ্রাপ্ত ব্যক্তিকে সকল রাসায়নিক পদার্থের ব্যবহার , নড়াচড়া ও গুদামজাত করার নিরাপদ কর্মপন্থা নিশ্চিত করতে হবে এবং নিয়মিত ঝুঁকি মূল্যায়ন (Risk Assessment) করতে হবে।ঝুঁকি মূল্যায়ন(Risk Assessment) অনুযায়ী সকল সেফটি ডাটা সিট হালনাগাদ করতে হবে।
- রাসায়নিক পদার্থের যে কোন মিশ্রণ তৈরির ক্ষেত্রে অবশ্যই ঝুঁকি মূল্যায়ন করতে হবে।
- নিরাপদ কর্মস্থল নিশ্চিত করতে পেশাগত স্বাস্থ্য ও নিরাপদ বিষয়ে দায়িত্বপ্রাপ্ত বাক্তিকে নিম্নোক্ত ক্রমানুসারে ঝুঁকি কমানোর বিষয়ে পদক্ষেপ নিতে হবেঃ
  - ✓ বর্জনঃ অধিক ঝুঁকিপূর্ণ রাসায়নিক পদার্থ বর্জন করা।
  - ✓ প্রতিস্থাপনঃ অধিক ঝুঁকিপূর্ণ রাসায়নিক পদার্থ বর্জন না করা গেলে তার পরিবর্তে কম ঝুঁকিপূর্ণ রাসায়নিক পদার্থ ব্যবহার করা।
  - ✓ প্রকৌশলগত নিয়ন্ত্রণঃ নিয়ন্ত্রণমূলক ব্যবস্থা নেওয়া যাতে ঝুঁকি হ্রাস পায়।

4) ঝুঁকিপূর্ণ রাসায়নিক পদার্থ সনাক্তকরণ ও সেফটি বোর্ডে প্রদর্শন **(Identification & Exhibition of Hazardous Chemicals):**

শ্রম বিধি ৮০, ২০১৫ অনুসারে ঝুঁকিপূর্ণ রাসায়নিক পদার্থ সনাক্তকরণ, স্বাস্থ্যে ইহার সম্ভাব্য প্রভাব, সতর্কতামূলক ব্যবস্থা, প্রাথমিক চিকিৎসার ব্যবস্থা, ব্যক্তিগত সুরক্ষা উপকরণ বা যন্ত্রপাতি ব্যবহার ইত্যাদি যথযথ ভাবে সেফটি বোর্ডে প্রদর্শন করতে হবে।

5) শ্রমিকদের স্বাস্থ্যের নজরদারি **(Heath Surveillance):**

রাসায়নিক পদার্থের সাথে জড়িত শ্রমিকদের স্বাস্থ্যের নজরদারির জন্য নিয়মিত স্বাস্থ্য পরীক্ষা করতে হবে।

গ. রাসায়নিক পদার্থের ব্যবহার, সংরক্ষণ ও রাসায়নিক বর্জ্য অপসারণের ক্ষেত্রে যথাযথ নিয়ম মেনে চলা:

6) যথাযথ নিয়ম মেনে রাসায়নিক পদার্থের গুদামজাতকরণ**(Proper Chemical Storage)** করাঃ

রাসায়নিক পদার্থের গুদামজাতকরণের ক্ষেত্রে গুদামজাতকরণ পদ্ধতি অনুসরণ করতে হবে। উৎপাদন স্থলে**(**Production Floor) অল্প পরিমাণে রাসায়নিক পদার্থ সকল নিয়ম মেনে স্বল্প সময়ের জন্য রাখা যেতে পারে। তবে কোনও ক্রমেই অধিক পরিমাণ পদার্থ বা অধিক সময়ের জন্য রাসায়নিক পদার্থ উৎপাদন স্থলে রাখা যাবে না।

7) রাসায়নিক পদার্থের গুদামজাতকরণের ক্ষেত্রে সংকেত প্রদর্শন (**Signage Exhibition):**

রাসায়নিক পদার্থের গুদামজাতকরণের ক্ষেত্রে বিভিন্ন সংকেত যেমন সর্বসাধারণের প্রবেশ নিষেধ , খাদ্য দ্রব্য রাখা নিষেধ, উন্মুক্ত আলো নিষেধ, মোবাইল ব্যবহার নিষেধ ইত্যাদি প্রদান করতে হবে। অল্প পরিমাণ রাসায়নিক পদার্থ গুদামজাতকরণের ক্ষেত্রেও যথাযথ সংকেত প্রদর্শন করতে হবে।

8) সেফটি ডাটা সীট সংগ্রহ এবং প্রদর্শন **(SDS Exhibition):**

শ্রম বিধি ৬৮(১০), ২০১৫ অনুসারে , প্রতিষ্ঠানে মানুষের শরীরের জন্য ক্ষতির কারণ হতে পারে এমন রাসায়নিক পদার্থ ব্যবহারের ক্ষেত্রে যথাযথ সতর্কতা সম্পর্কিত লিখিত নোটিশ, এম এস ডি এস সহজে সকলের দৃষ্টিগোচর হয় এমন স্থানে প্রদর্শন করতে হবে। এজন্য প্রতিটি রাসায়নিক পদার্থের সেফটি ডাটা সীট সরবরাহকারীদের কাছ থেকে সংগ্রহ করতে হবে। মূল এস ডি এস অনুসারে প্রয়োজনীয় এবং শ্রমিকদের জন্য সহজ পাঠ্য তথ্যগুলো বাংলা এম এস ডি এস এর মধ্যে সন্নিবেশ করতে হবে এবং এমন স্থানে প্রদর্শন করতে হবে যেন সহজেই পড়তে পারা যায়। প্রতিটি পদার্থের একটি এস ডি এস এর কপি ফাইলে রাখতে হবে।

9) সঠিকভাবে লেবেলিং করা **(Proper Labeling):**

প্রতিটি রাসায়নিক পদার্থের লেবেল,লেবেলিং পদ্ধতি অনুসারে করতে হবে। প্রতিটি লেবেল এ পণ্যের সনাক্তকারি তথ্য , জিএইচএস পিক্টোগ্রাম (GHS pictogram),ঝুঁকির ধরণ, ঝুঁকির বর্ণনা ,সতর্কতামূলক ব্যবস্থা, সরবরাহকারীদের তথ্য , উৎপাদনের তারিখ বা কারখানায় সংগ্রহের তারিখ, মেয়াদ শেষ হবার তারিখ ইত্যাদি থাকতে হবে। প্রতিটি রাসায়নিক পদার্থের কন্টেইনারে লেবেল থাকতে হবে। কর্মস্থলের লেবেলে কমপক্ষে পদার্থের নাম ও জিএইচএস পিক্টোগ্রাম (GHS pictogram) থাকতে হবে। অচেনা যে কোনও রাসায়নিক পদার্থ ব্যবহার অনুপযোগী লিখে চিহ্নিত করতে হবে এবং তা কর্তৃপক্ষের সিদ্ধান্তের জন্য আলাদা করে রাখতে হবে।

10) রাসায়নিক পদার্থ নিয়ন্ত্রণ **(Chemical Control):**

কেবলমাত্র নির্ধারিত কিছু প্রশিক্ষিত লোক রাসায়নিক পদার্থ ব্যবহার এবং নড়াচড়া করতে পারবে।রাসায়নিক পদার্থ রাখার গুদাম সর্বসাধারণের জন্য উন্মুক্ত থাকবে না।

11) রাসায়নিক পদার্থ যথাযথভাবে বিতরণ **(Proper Dispensing):**

- রাসায়নিক পদার্থের যথাযথ মান বজায় রাখার জন্য এবং রাসায়নিক পদার্থের দূষণ প্রতিরোধের জন্য পরিমাপ ও বিতরণের ক্ষেত্রে সর্বদা পরিষ্কার চামচ ও অন্যান্য উপকরণ ব্যবহার করতে হবে।
- বিতরণ করা রাসায়নিক পদার্থ পুনরায় মূল পাত্রে ফিরিয়ে আনা যাবে না।

12) নিয়ম মেনে রাসায়নিক পদার্থের বর্জ্য অপসারণ **(Chemical Wastage Disposal):**

পেশাগত স্বাস্থ্য ও নিরাপত্তা বিষয়ে দায়িত্বপ্রাপ্ত ব্যক্তিকে সকল রাসায়নিক পদার্থের বর্জ্য নড়াচড়া ,লেবেলিং ও গুদামজাত করার নিরাপদ কর্মপন্থা নিশ্চিত করতে হবে। রাসায়নিক পদার্থের বর্জ্য একটা আরেকটার সাথে মিশানো যাবে না। সেফটি ডাটা সীট অনুযায়ী অপসারণ করতে হবে। খালি ড্রাম যেন কারো দ্বারা পানি রাখা বা অন্য কোনও অনুপযোগী কাজে ব্যবহার না হয় সেদিকে বিশেষ ভাবে লক্ষ্য রাখতে হবে।

ঘ.গুনগত মান নিশ্চিতকরণ এবং রাসায়নিক পদার্থ ব্যবহারে স্বচ্ছতা নিশ্চিত করা:

13) গুনগত মান নিশ্চিতকরণ **(Quality Assurance):**

যথাযথমান নিশ্চিতকরণের জন্য নিয়মিত রাসায়নিক পদার্থের গুনগতমান পরীক্ষা এবং নিয়মিত মেয়াদ উত্তীর্ণের তারিখ পর্যবেক্ষণ করতে হবে। ফার্স্ট ইন ফাস্ট আউট (FIFO) পদ্ধতি অনুসরণ করতে হবে। খারাপ রাসায়নিক পদার্থ যথাযথ নিয়ম মেনে বর্জন করতে হবে এবং পরবর্তীতে যেন এমনটি না হয় সেজন্য মূল কারণ (root cause) নির্ণয় করতে হবে।

14) রাসায়নিক দ্রব্য ক্রয়ের ক্ষেত্রে ক্রয় নীতিমালা অনুসরণ করা **(Chemical Purchase Procedure):**

রাসায়নিক পদার্থ ক্রয়ের সময় অবশ্যই রাসায়নিক পদার্থ ক্রয় নীতিমালা অনুসরণ করতে হবে।

15) নিষেধাজ্ঞা আরোপকৃত রাসায়নিক দ্রব্য সংগ্রহ ও ব্যবহার না করা **(Chemical Restriction):**

নিষেধাজ্ঞা আরোপকৃত রাসায়নিক দ্রব্য ও জৈব দ্রাবক সংগ্রহ ও ব্যবহার করা যাবে না। প্রতিটি পদার্থ ক্রয়ের সময় ক্রেতার RSL, MRSLএবংZDHC MRSL,নিষিদ্ধ জৈব দ্রাবক (Banned organic solvent), REACH candidate list, authorization list, restriction list ইত্যাদির সাথে মিলিয়ে নিতে হবে এবং সরবরাহকারীর কাছ থেকে বিবৃতি (Declaration) নিতে হবে।

16) রাসায়নিক পদার্থ ব্যবহারে স্বচ্ছতা নিশ্চিত করা **(Traceability & Transparency):**

- রাসায়নিক পদার্থ ব্যবহারের প্রতিটি স্তরে যথাযথ রেজিস্ট্রার রাখতে হবে।
- রাসায়নিক পদার্থ ব্যবহারের প্রবাহ চিত্র তৈরি করতে হবে এবং তা নিয়মিত হালনাগাদ করতে হবে।
- নিয়মিত (প্রতি মাসে) রাসায়নিক পদার্থের ইনভেন্টরি করতে হবে।
- কোন প্রোডাক্টে কোন ক্যামিকেল (লট নম্বর অনুসারে) ব্যবহৃত হয় তা বের করার সিস্টেম থাকতে হবে এবং তা অনুসরণ করতে হবে।

ঙ.নিঃসরণ নিয়ন্ত্রণ এবং জরুরি অবস্থা মোকাবেলা করার জন্য পরিকল্পনা করা (Spill control and emergency response plan)ঃ

17) রাসায়নিক পদার্থ গুদামজাতকরণ ও নড়াচরার ক্ষেত্রে জরুরী অবস্থায় কি কি করতে হবে তার একটি পরিকল্পনা থাকবে। জরুরী অবস্থা ব্যবস্থাপনার জন্য নিম্নোক্ত ব্যবস্থা বা সরঞ্জামদি থাকবেঃ

1) পি পি ই
2) যথাযথ সেকেন্ডারিকন্টেইনার মেইন্টেইন করতে হবে। সেকেন্ডারি কন্টেইনার নির্বাচনের ক্ষেত্রে যথা সম্ভব US 40CFR264.175 এবং CLP regulation(HSE) অনুসরণ করতে হবে। সবচেয়ে বড় কন্টেইনারে আয়তনের ১১০% বা সব কন্টেইনারের মোট আয়তনের ১০% বা এই দুই আয়তনের মধ্যে যেটি বড় সে আয়তনের সেকেন্ডারি কন্টেইনারনির্বাচন করতে হবে। তবে সীমাবদ্ধতা বিবেচনা করে কমপক্ষে ট্রে থাকতে হবে। মেইন স্টোরের ক্ষেত্রে সেকেন্ডারি কন্টেইনার ততটা প্রযোজ্য নয়।
3) যথাযথ স্পিল কিট
4) অগ্নি প্রতিরোধ ব্যবস্থা
5) প্রাথমিক চিকিৎসা উপকরণ
6) আই ওয়াশ স্টেশন (Eye Wash Station)ও জরুরী শাওয়ার (Emergency Shower)

7) জরুরী গুদাম বন্ধ করার প্রক্রিয়া
8) রাসায়নিক দুর্ঘটনা মোকাবেলা করার মত প্রশিক্ষিত কর্মী
9) জরুরী যোগাযোগের নম্বর

চ. রাসায়নিক পদার্থের ব্যবস্থাপনার কার্যকারিতা নিয়মিত নিরুপণ করাঃ

18) নিয়মিত রাসায়নিক পদার্থের ব্যবস্থাপনার মূল্যায়ন **(Regular Self-Assessment)**:
রাসায়নিক পদার্থের গুদামজাতকরণ, নড়াচড়ার পদ্ধতি, নিরাপত্তা ব্যবস্থা, প্রশিক্ষণসহ উপরোক্ত বিষয়গুলোর নিয়মিত মূল্যায়ন এবং অডিট করতে হবে,এবং সে অনুযায়ী সংশোধনীমূলক ব্যবস্থা গ্রহণকরতে হবে। এ জন্য বিভিন্ন ক্রেতা (Buyer) এর কেমিক্যাল ম্যানেজমেন্ট মডিউল (chemical management module) এবং নীতিমালা (policy) অনুসরণ করে রাসায়নিক পদার্থের ব্যবস্থাপনা সংক্রান্ত একটি কেপিআই(KPI) সিট তৈরি করা হবে। এছাড়াও বিভিন্ন ক্রেতার রাসায়নিক পদার্থ ব্যবস্থাপনা মূল্যায়নের ফরমেট (যেমনঃ H&M self-assessment format- BCMP self-assessment) ব্যবহার করা হবে।

19) নথি রাখা **(Record Keeping):**
ঝুঁকিমূল্যায়ন **(Risk Assessment)**,মূলকারণ নির্ণয় (**Root Cause Analysis)**,আলোচনা, প্রশিক্ষণ, অনুশীলন**,** রাসায়নিক পদার্থের ব্যবস্থাপনার মূল্যায়ন ইত্যাদির যথাযথ রেকর্ড রাখা হবে, যেন এই মূলনীতির কার্যকারিতা নিরূপণ করা যায়।

ছ. প্রতিরোধ এবং প্রতিকারমূলকব্যবস্থা গ্রহণঃ

20) রাসায়নিক দ্রব্য ব্যাবহারের বিভিন্ন নিয়মগুলো সনাক্তকরণ ও অনুসরণ করার জন্য একটি SOP মেনে চলতে হবে যেন প্রতিরোধমূলক ব্যবস্থা নেওয়া যায়। বিধিমালার সংশোধন, সংযোজন ইত্যাদি সকল কর্মচারীদের জানানো হবে।

21) রাসায়নিক পদার্থের ব্যবস্থাপনার কার্যকারিতা নিরূপণের মাধ্যমে প্রাপ্ত সমস্যাগুলো যথাযথ ভাবে সমাধান করা হবে।

22) ফিনিশড প্রডাক্ট ক্রেতাদের নির্দেশনা অনুযায়ী টেস্ট করা হবে, প্রডাক্ট রিস্ক এসেসস্মেন্ট (Product Risk Assessment) , মূল কারণ নি্রূপন (Root Cause Analysis) ও বিশ্লেষণ করা হবে। এবং সে অনুযায়ী প্রতিরোধ ও প্রতিকারমূলক ব্যবস্থা নেয়া হবে।

জ. উন্নত প্রযুক্তির ব্যবহার এবং ক্রমাগত উন্নয়ন নিশ্চিত করাঃ

23) নিয়মিত NPO (Non-productive output) হিসাব করা হবে এবং তা কমানোর জন্য পদক্ষেপ নেওয়া হবে। রাসায়নিক পদার্থ ব্যবহার কমানো, কারখানাতে রাসায়নিক পদার্থের সংখ্যা নিয়ন্ত্রন, রাসায়নিক পদার্থের যথাযথ কার্যক্ষমতা নিশ্চিতকরণ, সার্টিফাইড (যেমন ZDHC level-1,2,3 বা Buyer positive list) রাসায়নিক পদার্থ ব্যবহার নিচ্চিতকরণ ইত্যাদি লক্ষ্য পূরণ করতে কেপিআই (KPI)শীট তৈরি করতে হবে এবং তাতে বর্ণিত ব্যাবস্থা নিতে হবে।

24) বিকল্প হিসাবে কম ঝুঁকিপূর্ণ রাসায়নিক পদার্থ নিয়মিত খোঁজা হবে এবং তা ব্যবহার করা হবে।

25) নতুন টেকনোলজি খোঁজা হবে যাতে রাসায়নিক পদার্থের ব্যবহার প্রতিনিয়ত কমানো যায়।

এই নীতিমালা বাস্তবায়নের ক্ষেত্রে যদি কোন সমস্যা পরিলক্ষিত হয় এবং যদি কোন প্রক্রিয়ার পবির্তন, পরিবর্ধন, সংযোজন, বিযোজন এর প্রয়োজন হয় তাহলে কার্যকারী পরিষদের সদস্যবৃন্দ উর্দ্ধতন কর্তৃপক্ষের সাথে আলোচনা সাপেক্ষে তা সংশোধনী আনতে পারবে।

প্রস্তুতকারী	উপ-ব্যবস্থাপক (কমপ্লায়েন্স)	
যাচাইকারী	মহাব্যবস্থাপক	
অনুমোদনকারী	কারখানা অবধায়ক	

Annexure - 22

LOI from BPDB for Development of the Project

Encl. to letter no. [redacted]
SPICCRL/Solar/BG/020117/1
dated 2.1.18.

Central Secretariat
Bangladesh Power Development Board
WAPDA Building (1st Floor)
Motijheel C/A, Dhaka-1000.

বাংলাদেশ বিদ্যুৎ উন্নয়ন বোর্ড

Bangladesh Power Development Board

Memo No - 27.11.0000.101.14.013.17-5083 Dated: 31 -12-2017.

To
Shapoorji Pallonji Infrastructure Capital Company Private Ltd.
SP Centre, 41/44, Minoo Desai Marg,
Colaba, Mumbai-400 005.
Tel # +91 8879346297 Fax: +91 2266338176
Website: www.shapoorji.com, E-Mail: sunil.kulkarni@shapoorji.com

Subject: Letter of Intent (LOI) for the development of Grid-tied Solar PV Power Plant of 100 MW (AC) Capacity at Bhabanipur and Ratanpur Mouza, Pabna Sadar, Pabna, Bangladesh.

Ref: 27.00.0000.071.14.057.2017.690 dated: 05/12/2017.

Dear Sir,

A. REFERENCE

This Letter of Intent, hereinafter referred to as the "LOI" is being issued to the addressee, pursuant to approval received from the Power Division, Ministry of Power, Energy and Mineral Resources (MPEMR), Bangladesh Secretariat, Dhaka vide memo referred above for the development of the project identified below (the "Project") under the special act, 2010(Revised 2015) for enhancement of power & energy (বিদ্যুৎ ও জ্বালানীর দ্রুত সরবরাহ বৃদ্ধি (বিশেষ বিধান) আইন, ২০১০(সংশোধিত ২০১৫)) on the terms described in this LOI.

B. AUTHORIZATION

The People's Republic of Bangladesh represented by the Power Division, Ministry of Power, Energy and Mineral Resources, hereinafter referred to as the "GOB" accords its approval on the Levelized Tariff of US $ 0.1195/kWh on "No Electricity, No Payment" basis to Shapoorji Pallonji Infrastructure Capital Company Private Ltd. hereinafter referred to as the "Sponsor" and grants its permission to design, finance, insure, construct, own, commission, operate and maintain (the "Project") a 100 MW (AC) Grid-Tied Solar PV based power generating facility at Bhabanipur and Ratanpur Mouza, Pabna Sadar, Pabna, Bangladesh hereinafter referred to as the "Facility".

The Facility will have a net electric power generating capacity of 100 MW (AC). Net Energy Output from the Facility will be purchased on "No Electricity, No Payment" basis under the Power Purchase Agreement, hereinafter referred to as the "PPA". The Company formed by the Sponsor shall be solely responsible for the financing, development and completion of the Project and development of the necessary related facilities under the following terms & conditions, as measured from the date of issuance of this LOI and from the Project Effective Date:

1.	Plant Capacity	:	100 MW (AC) Grid-Tied Solar PV Power Plant.
2.	Project Sponsor	:	Shapoorji Pallonji Infrastructure Capital Company Private Ltd.
3.	Project Site Location	:	Bhabanipur and Ratanpur Mouza, Pabna Sadar, Pabna, Bangladesh.
4.	Consortium Members & Shareholding	:	Shapoorji Pallonji Infrastructure Capital Company Private Ltd. - 100%
5.	Project Land	:	Land should be non-agricultural. The Sponsor shall be responsible for the arrangement of proposed land for the project.
6.	Plant Type	:	Solar PV
7.	Plant Condition	:	Brand New
8.	Evacuation Voltage	:	132 KV Voltage
9.	Operating Voltage Range	:	+10% to -20%
10.	Operating Frequency Range	:	48.50 Hz to 51.5 Hz (continuous operation)
11.	Interconnection Line	:	The evacuation of electric power to be generated by the Facility will be through Ishurdi 230/132 KV Grid Substation. The proposed power plant will be connected to the 132 kV bus of Ishurdi substation by a 132 kV single circuit overhead or underground line (Interconnection line). This said interconnection line from sponsor's power plant to PGCB's substation will be implemented by the sponsor at its own cost including arrangement of necessary right of way. The sponsor will also construct necessary 132kV bay at Ishurdi substation including obtaining of necessary land with its own responsibility. In addition to that the sponsor will install, operate and maintain separate 132 kV interfacing breaker for its machine at the high voltage side of step-up Transformer and also construct the connecting lines for connection. The required 132 kV bay extension including circuit breaker, CT, PT, panel etc. of 230/132 kV Ishurdi Grid Substation will be implemented by the Company at its own cost and responsibility. The evacuation system will be completed in consultation and approval of PGCB. The Company shall maintain and operate the interconnection line including all related equipment of its connected bay of PGCB's Ishurdi substation with its own cost and responsibility.
12.	Required Financial Closing Date	:	04 (four) months from the Project Effective Date.
13.	Required Commercial Operation Date (RCOD)	:	12(Twelve) months from the Project Effective Date.

14. Contract Period : 20 Years
15. Project Effective Date : The date on which the last of Project Agreements is executed.

C. FORMATION OF COMPANY

The Sponsor shall form a "Company" for the purpose of this Project, which will be a special purpose vehicle i.e. a public/private limited company incorporated in the Joint Stock Companies, Bangladesh. The Project Agreements shall be executed by that "Company" which will be responsible for design, finance, insure, build, own, operate and maintain etc. of the Project. After the incorporation of the "Company", the rights and obligations of the Sponsor hereunder will be assigned to the "Company".

D. FINANCING OF THE PROJECT

Shapoorji Pallonji Infrastructure Capital Company Private Ltd. shall be responsible for financing the Project.

E. NO LIABILITY FOR REVIEW

No review, examination, evaluation or approval by BPDB of any document, instrument, drawing, specifications or design proposed or delivered by the Sponsor or the Company in connection with the delivering of its Proposal or BPDB's evaluation thereof or the issuance of this LOI shall relieve the Sponsor or the Company from any obligation or liability that it would otherwise have had for its negligence in the preparation of such document, instrument, drawing, specification or design or failure to comply with applicable laws of Bangladesh or to satisfy the Company's obligations under this LOI, the Project Agreements, or the other documents comprising the Security Package (as defined in the IA) with respect thereto, nor shall BPDB be liable to the Sponsor or the Company or any other person by reason of its review, examination, evaluation or approval of any document, instrument, drawing, specification, or design.

F. VALIDITY OF THE PROPOSAL AND THE PROPOSAL SECURITY

The validity of the Proposal and Proposal Security shall have to be extended for an additional period of three (3) Months or more until such time as the Project Agreements are executed.

G. GOVERNING LAW

This Letter of Intent shall be governed by and construed in accordance with the Laws of Bangladesh.

H. ACCEPTANCE OF LETTER OF INTENT (LOI)

You are requested to communicate your acceptance (not acknowledgement) of this LOI within 7 (seven) days from the issuance of this LOI.

I. TERMINATION OF LOI

1. The Company formed by the Sponsor will sign the Implementation Agreement ("IA") and the Power Purchase Agreement ("PPA"), (collectively, the "Project Agreements") with the GOB and BPDB respectively on the date to be notified by BPDB, failure to which, BPDB shall reserves the right to terminate this LOI by written notification to the Sponsor & forfeit the

Shapoorji Pallonji Infrastructure Capital Company Pvt. Ltd.

Proposal Security. The Sponsor will collect the Project Agreements from the Office of the IPP Cell-1, BPDB, Dhaka upon the acceptance of LOI.

2. The Sponsor shall submit the Bank Guarantee as Proposal Security at the rate of USD 5,000.00 per MW for 100 MW (AC). Each consortium Member shall provide its own Bank Guarantee as Proposal Security on a proportionate shareholding basis as mentioned in the joint venture or consortium agreement. This Bank Guarantee shall continue till the Effective Date of the Project Agreements. If the Company fails to sign the Project Agreements within 7 (seven) Days following the notification of BPDB, BPDB shall have the right to terminate the LOI as well as to forfeit the Proposal Security.

3. The Company formed by the Sponsor will provide the Performance Security Deposit at the rate of USD 18,000.00 per MW for 100 MW (AC) only as per BPDB's standard format, Certificate of Incorporation (along with Memorandum and Articles of Association) for newly formed "Company" in Bangladesh no later than two (2) days prior to the date of signing of the Project Agreements, failure to which, BPDB shall reserves the right to terminate this LOI by written notification to the Sponsor.

4. The Sponsor will provide (i) the unconditional acceptance of LOI within seven (7) days (ii) unconditional Bank Guarantee as Proposal Security within fifteen (15) days iii) initialed Project Agreements within thirty (30) days and iv) documents of land along with Mouza map, RS Dag No. and RS Khatian No. (Site description will be part of the PPA) as per submitted Proposal within thirty (30) days from the issuance of this LOI. If the Sponsor fails to furnish (i) the acceptance of LOI and the Proposal Security within stipulated time as mentioned above, BPDB shall reserve the right to terminate this LOI. If the Sponsor fails to furnish i) initialed Project Agreements and ii) documents of land along with Mouza map, RS Dag No., RS Khatian No. and within stipulated time as mentioned above, BPDB shall reserve the right to terminate this LOI and forfeit the Proposal Security.

5. The Sponsor shall extend the Proposal validity & the Proposal Security validity at least 7 (seven) days prior to the expiration of the Proposal validity and Proposal Security validity, failure to which, BPDB shall have the right to forfeit the Proposal Security.

6. Upon termination of LOI, neither the Sponsor nor the Company shall have any claim for compensation or damages against BPDB or any other Governmental agency on any grounds whatsoever.

28-12-17

Director
IPP CELL-1, BPDB, Dhaka.

(Mina Masud Uzzaman)
Secretary
Bangladesh Power Development Board

Memo No - 27.11.0000.101.14.013-17-5083 Dated: 31 -12-2017.

Copy to:

1. Member, Finance/Generation/Administration/P&D/Distribution/Company Affairs, BPDB, Dhaka.
2. Chief Engineer, Generation/P&D/Private Generation (IPP/PPP), BPDB, Dhaka.
3. Controller of Accounts & Finance, BPDB, Dhaka.
4. Director, IPP Cell-1/System Planning/ Finance/Contract and Consultant Administration /Directorate of Renewable Energy and Research & Development, BPDB, Dhaka.
5. C S O to Chairman, BPDB, Dhaka.

6. Joint Secretary, Renewable Energy, Power Division, Ministry of Power, Energy & Mineral Resources, Bangladesh Secretariat, Dhaka.
7. P S to Secretary, Power Division, Ministry of Power, Energy & Mineral Resources, Bangladesh Secretariat, Dhaka.
8. Deputy Secretary, Development-1, Power Division, Ministry of Power, Energy & Mineral Resources, Bangladesh Secretariat, Dhaka.

31.12.17

(Pranob Kumar Ghosh)
Assistant Secretary (Dev.)
Central Secretariat, BPDB, Dhaka.

Infrastructure Capital Company Pvt. Ltd.
Shapoorji Pallonji

Accepted
(Sunil Kulkarni)

Annexure - 23

Approved Tower Schedule from PGCB

Project: Design, Supply, Installation, Testing & Commissioning of 132kV Double Circuit Evacuation Transmission Line From DSE 100MW (AC) Power Plant, Bhabanipur, Pabna to Jaynager Grid Sub-Station, Irshurdi, Pabna

~~Client~~ Grid : POWER GRID COMPANY OF BANGLADESH LIMITED

Sponsor Company DYNAMIC SUN ENERGY PRIVATE LIMITED, B&B Empire (7th Floor), Plot No.116, Road-11, Block-E, Banani, Dhaka-1213.

Document No. DSE/PGCB/132kV/J-P/TS **Rev.01**

POWER GRID COMPANY OF BANGLADESH
APPROVED
This approval is general only and does not release the manufacturer/contractor/supplier form compliance with specification and Standards for Design workmanship and performance as stipulated in the contract

Tower Schedule

SI. NO	Tower No.	Tower Type	Tower Height(m)	Raised Chimney (m)	Easting (m)	Northing (m)	Elevation (m)	Deviation Angle	Span (m)	Wind Span(m)	Section Length (m)	Weight Span (Cold) m	Weight Span (Hot) m	Major Crossings (with in ROW)	Remark
1	Gantry	Gantry SS	16		719521.77	2652057.13	12.08			29	58	9.0	10.0		
									58					Earthen Road, 11kV Line	
2	TT-01/0	1DT6+0 (with Aux-x-arm) (Terminal)	28.6		719517.99	2652115.44	12.13	65°03'31"LT		151	482	133	146		Angle of Entry 0deg with line side
									244					Tinshed, Mango Garden	
3	TT-01/1	1DL+6	35.04		719290.70	2652203.72	12.75			241		289	271		
									238						
4	T-1/0	1DT6+3	31.6		719068.91	2652289.87	13.51	57°46'55"RT		278	1218	247	256		
									318						
5	T-1/1	1D1+9	38.04		719008.37	2652601.59	13.86			309		355	345		
									300					Banana Garden, Earthen Road	
6	T-1/2	1DL+4.5	33.54		718951.12	2652896.34	13.90			300		272	279		
									300					Banana Garden, Earthen Road	
7	T-1/3	1DL+6	35.04		718893.84	2653191.21	13.80			300		321	316		
									300					Banana Garden	
8	T-2/0	1D25+1.5	30.58		718836.72	2653485.31	13.96	12°23'48"LT		311		273	283		
									323					Banana Garden, Earthen Road	
9	T-2/1	1D1+9	38.04		718708.69	2653781.35	13.51			311		350	341		
									300						
10	T-2/2	1DL+6	35.04		718589.61	2654056.67	13.96			300		273	280		
									300					Brickfield	
11	T-2/3	1DL+9	38.04		718470.71	2654331.57	13.84			297	2065	313	309		
									295					Brickfield, Banana Girden	
12	T-2/4	1DL+9	38.04		718353.51	2654602.57	13.82			297		327	320		
									298					Banana Garden	
13	T-2/5	1DL+3	32.04		718235.03	2654876.52	13.87			285		257	265		
									272					Earthen Road	
14	T-2/6	1DL+3	32.04		718126.90	2655126.51	13.62			275		267	269		
									277						
15	T-3/0	1DT6+3	31.6		718016.80	2655381.09	13.68	49°29'31"LT		289		289	289		
									300					Banana Garden, Earthen Road	
16	T-3/1	1DL+6	35.04		717730.15	2655469.39	13.40			299		307	305		
									299					Earthen Road	
17	T-3/2	1DL+6	35.04		717444.39	2655557.40	13.54			299		314	311		
									299						
18	T-3/3	1DL+3	32.04		717158.76	2655645.38	13.83			300		275	282		
									300					Earthen Road	
19	T-3/4	1DL+6	35.04		716871.59	2655733.84	13.14			300	2697	314	311		
									300					Earthen Road	

14 FEB 2023
(Syed Md. Sohrjar Abdullah)
Superintending Engineer(Addl.ch)
TLD, Desig. & QC, PGCB

(Engr. Md. Emdadul Hoque)
Executive Engineer
TLD & QC, PGCB, Dhaka

Md. Sohel Rana
Sub-Divisional Engineer
Transmission Line Design & QC
PGCB, Dhaka

Dynamic Sun Energy Pvt. Ltd.

SI. NO	Tower No.	Tower Type	Tower Height(m)	Raised Chimney (m)	Easting (m)	Northing (m)	Elevation (m)	Deviation Angle	Span (m)	Wind Span(m)	Section Length (m)	Weight Span (Cold) m	Weight Span (Hot) m	Major Crossings (with in ROW)	Remark
20	T-3/5	1DL+6	35.04		716585.22	2655822.04	12.81			300		306	305		
									300						
21	T-3/6	1DL+3	32.04		716298.32	2655910.41	14.27			299		292	294		
									299					Earthen Road	
22	T-3/7	1DL+3	32.04		716013.01	2655998.29	14.40			299		301	301		
									300					Earthen Road	
23	T-3/8	1DL+3	32.04		715726.31	2656086.60	14.34			300		262	272		
									300					Earthen Road	
24	T-3A/0	1D25+9	38.08		715439.54	2656174.93	14.39	0°0'0"		300		345	335		Section Tower
									300					Earthen Road, Litchi Girden	
25	T-3A/1	1DL+9	38.04		715152.42	2656263.37	14.84			300		309	307		
									300					Earthen Road	
26	T-3A/2	1DL+6	35.04		714865.89	2656351.63	15.03			300		294	296		
									300					Banana Garden	
27	T-3A/3	1DL+4.5	33.54		714578.98	2656440.00	15.02			300		285	289		
									300					Banana Garden, Earthen Road	
28	T-3A/4	1DL+6	35.04		714292.58	2656528.22	15.05			300	2380	326	320		
									300					Banana Garden, Earthen Road	
29	T-3A/5	1DL+3	32.04		714005.98	2656616.50	14.54			300		272	280		
									300					Earthen Road	
30	T-3A/6	1DL+4.5	33.54		713719.32	2656704.79	15.12			291		294	294		
									283					Earthen Road, Litchi Girden	
31	T-3A/7	1DL+6	35.04		713449.22	2656787.99	15.23			290		306	303		
									298					Banana Garden, Earthen Road	
32	T-4/0	1D25+3	32.08		713164.61	2656875.65	15.22	9°58'40"RT		299		276	282		
									300					Brickfield, Earthen Road	
33	T-4/1	1DL+9	38.04		712897.40	2657012.38	14.16			300		316	312		
									300					Brickfield, Earthen Road	
34	T-4/2	1DL+9	38.04		712630.35	2657149.02	14.50			300		315	312		
									300					Brickfield	
35	T-4/3	1DL+6	35.04		712363.41	2657285.61	15.01			284	1951	270	274		
									268					Brickfield, Earthen Road	
36	T-4/4	1DL+6	35.04		712124.44	2657407.88	15.25			273		277	276		
									277					Earthen Road	
37	T-4/5	1DL+6	35.04		711877.61	2657534.18	14.82			279		279	280		
									281					Brickfield, Earthen Road	
38	T-4/6	1DL+6	35.04		711627.58	2657662.11	14.40			252		210	222		
									224					Brickfield, Tinshed	
39	T-5/0	1DT6+9	37.6	2	711428.12	2657764.17	13.89	55°47'54"RT		295		324	316		
									367		367			Pavement Road, 11kV Line, Semi Pucca, one storied Building	
40	T-6/0	1D1+12	41.04	2	711382.77	2658128.11	15.12	1°27'37"RT		320		375	363		
									274						
41	T-6/1	1DL+6	35.04		711355.84	2658400.55	15.18			252		193	206		
									230					11kV Line	
42	T-6/2	1DL+9	38.04		711333.24	2658629.30	14.95			278		281	280		

14 FEB 2023

(Syed Md. Sahriar Abdullah)
Superintending Engineer
TLD Design & QC, PGCB

Engr. Md. Emdadul Hoque
Executive Engineer
TLD & QC, PGCB, Dhaka

Md. Sohel Rana
Sub-Divisional Engineer
Transmission Line Design & QC
PGCB, Dhaka

Dynamic Sun Energy Ltd.

SI. NO	Tower No.	Tower Type	Tower Height(m)	Raised Chimney (m)	Easting (m)	Northing (m)	Elevation (m)	Deviation Angle	Span (m)	Wind Span(m)	Section Length (m)	Weight Span (Cold) m	Weight Span (Hot) m	Major Crossings (with in ROW)	Remark
									325		1123			Pavement Road, 11kV Line, Semi Pucca	
43	T-6/3	1D1+12	41.04		711301.25	2658953.01	15.33			310		331	326		
									294					Pavement Road, 11kV Line, Semi Pucca	
44	T-7/0	1D25+9	38.08		711272.36	2659245.38	15.55	21°41'12"RT		293	292	306	303		
									292						
45	T-8/0	1DT6+6 (Terminal)	34.6		711352.94	2659525.64	15.42	34°10'10"RT		197	102	217	218		
									102					11kV Line	Single Circuit Line
46	T-8AR	1DH-P	21.06		711431.57	2659591.11	15.55	21°34'23"LT		98	93	66	69		
									93					Rooppur-Baghabari 230kV TL	Single Circuit Line
47	T-8BR	1DH-P	21.06		711476.27	2659672.98	15.62	34°19'20"LT		100	107	77	78		Single Circuit Line
									107						Single Circuit Line
	T-9/0	-	-	-	-	-	-		-	-					Single Circuit Line
															Single Circuit Line
	T-8/0	-	-	-	-	-	-	-	-	-	108				Single Circuit Line
									108						Single Circuit Line
48	T-8AL	1DH-P	21.06		711376.83	2659630.63	15.39	14°53'20"RT		95	83	61	65		Single Circuit Line
									83					Rooppur-Baghabari 230kV TL	Single Circuit Line
49	T-8BL	1DH-P	21.06		711415.52	2659704.31	15.50	6°05'02"RT		87	90	59	60		Single Circuit Line
									90					Pavement Road	Single Circuit Line
50	T-9/0	1DT6+9 (Terminal)	37.6		711465.69	2659779.30	15.59	57°53'20"LT		205	319	243	242		
									319					Homestead, proposed 400kV Rooppur-DhakaLine	
51	T-10/0	1DT6+9 (Terminal)	37.6		711335.31	2660070.76	14.89	26°09'26"RT		204	88	235	235		
									88						Single Circuit Line
52	T-10AR	1DH-P	21.06		711338.48	2660159.16	14.49	6°49'18"LT		86	83	55	56		
									83					Proposed Rooppur-Dhamrai 230kV Line	Single Circuit Line
53	T-10BR	1DH-P	21.06		711331.62	2660241.52	14.98	23°57'49"LT		72	62	58	59		Single Circuit Line
									62						Single Circuit Line
	T-11/0	-	-	-	-	-	-		-	-	-				Single Circuit Line
															Single Circuit Line
	T-10/0	-	-	-	-	-	-	-	-	-	99				Single Circuit Line
									99						Single Circuit Line
54	T-10AL	1DH-P	21.06		711282.79	2660154.25	14.45	27°24'13"RT		91	83	63	64		Single Circuit Line
									83					Proposed Rooppur-Dhamrai 230kV Line	Single Circuit Line
55	T-10BL	1DH-P	21.06		711275.88	2660237.14	15.04	28°54'40"RT		74	64	60	61		Single Circuit Line
									64						Single Circuit Line
56	T-11/0	1DT6+0 (Terminal)	28.6		711302.04	2660295.48	14.79	30°21'29"LT		148		153	155		
									232					11kV Line	
57	T-11/1	1DL+3	32.04		711276.95	2660525.91	14.66			261		280	276		
									291						
58	T-11/2	1DL+1.5	30.54		711245.46	2660815.23	14.70			290		279	283		
									289						
59	T-11/3	1DL+3	32.04		711214.13	2661103.01	13.89			291	1694	294	293		

Md. Sohel Rana
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(Syed Md. Sahriar Abdullah)
Superintending Engineer (Addl.ch)
TLD, Design & QC, PGCB

14 FEB 2023

SI. NO	Tower No.	Tower Type	Tower Height(m)	Raised Chimney (m)	Easting (m)	Northing (m)	Elevation (m)	Deviation Angle	Span (m)	Wind Span(m)	Section Length (m)	Weight Span (Cold) m	Weight Span (Hot) m	Major Crossings (with in ROW)	Remark
									292						
60	T-11/4	1DL+3	32.04		711182.57	2661392.90	14.11			298		268	277		
									304						
61	T-11/5	1DL+9	38.04		711149.66	2661695.19	14.23			295		319	313		
									287					11kV Line, Earthen Road	
62	T-12/0	1DT6+9	37.6		711118.66	2661980.01	14.55	36°24'40"RT		298		311	308		
									310					Pavement Road, Litchi Garden	
63	T-12/1	1DL+9	38.04		711274.55	2662247.88	15.07			302	604	284	289		
									294					Litchi Garden	
64	T-13/0	1DT6+9	37.6	2	711422.26	2662501.69	14.78	45°49'10"LT		284		290	290		
									274					Rooppur-Pabna Highway	
65	T-13/1	1D1+12	41.04	2	711348.42	2662765.77	14.62			252	505	292	279		
									230					Litchi Garden	
66	T-14/0	1DT6+9	37.6		711286.41	2662987.57	14.29	36°32'18"RT		264		246	253		
									298					Litchi Garden	
67	T-14/1	1DL+9	38.04		711392.66	2663265.58	13.36			298		301	301		
									298						
68	T-14/2	1DL+6	35.04		711499.07	2663543.97	13.67			299	1170	295	296		
									300						
69	T-14/3	1DL+4.5	33.54		711606.18	2663824.24	13.42			287		264	270		
									274						
70	T-15/0	1DT6+6	34.6		711704.00	2664080.16	13.32	45°18'00"RT		294		298	298		
									313					Pavement Road	
71	T-15/1	1DL+9	38.04		711990.87	2664206.59	13.81			291	582	298	296		
									269					Litchi Garden	
72	T-16/0	1DT6+9	37.6		712236.73	2664314.93	13.40	41°59'37"LT		264		262	263		
									260					Pavement Road, Litchi Garden	
73	T-16/1	1DL+9	38.04	2	712343.45	2664552.16	13.91			292		295	295		
									324		896			Pavement Road, Litchi Garden	
74	T-16/2	1D1+12	41.04		712476.37	2664847.59	13.84			318		324	323		
									311					Pavement Road, Litchi Garden, Semi Pucca	
75	T-17/0	1DT6+9	37.6	2	712604.15	2665131.61	13.36	29°56'32"LT		252		265	261		
									192					Litchi Garden	
76	T-17/1	1DL+9	38.04	2	712585.01	2665322.78	13.07			238	476	128	166		
									284					Litchi Garden, 11kV Line	
77	T-18/0	1QT6+9	50.4	3	712556.73	2665605.12	14.19	31°23'52"LT		288		363	336		
									292					Ishwardi-Rooppur 132kV Line, Highway	
78	T-18/1	1Q15+15M	56.4	2	712380.38	2665838.16	13.58			311	621	411	390		
									329					Pavement Road	
79	T-19/0	1D25+9	38.08	2	712181.72	2666100.68	13.88	6°37'49"RT		314		254	266		
									299		299			Tinshed	
80	T-20/0	1DT6-S	41.5		712030.27	2666357.93	14.12			149		134	138		
Total Double Circuit Route Length (m)=									19797						
Total Single Circuit Route Length (m)=									1062						

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Sub-Divisional Engineer
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(Syed Md. Sahriar Abdullah)
Superintending Engineer (Addl.ch)
TLD, Design & QC, PGCB

14 FEB 2023

Annexure - 24

Submission copy of IEE Report to DoE

২৯ মার্চ ২০২৩

বরাবর
পরিচালক
পরিবেশ অধিদপ্তর
রাজশাহী বিভাগীয় কার্যালয়
বগুড়া

বিষয়ঃ "১০০ মেগাওয়াট এ সি গ্রিড সোলার পাওয়ার প্লান্ট" শীর্ষক উন্নয়ন প্রকল্পের অনুকূলে অনাপত্তি প্রদান প্রসঙ্গে

জনাব
গণপ্রজাতন্ত্রী সরকারের মাননীয় প্রধানমন্ত্রীর স্লোগান "শেখ হাসিনার উদ্যোগ ঘরে ঘরে বিদ্যুৎ" এই উদ্দ্যোগের আওতায় পাবনা জেলার, পাবনা সদর উপজেলার হিমাইতপুর, ভবানীপুর গণপ্রজাতন্ত্রী বাংলাদেশ সরকারে বিদ্যুৎ আলানি ও খনিজ সম্পদ মন্ত্রণালয় কর্তৃক অনুমোদিত ১০০ মেগাওয়াট ক্ষমতার সৌরবিদ্যুৎ প্রকল্পটি বাস্তবায়ন করার জন্য " ডাইনামীক সাম এনার্জি প্রাইভেট লিমিটেড" কাজ করে যাচ্ছে। ইতোমধ্যে প্রকল্প স্থাপনের লক্ষ্যে পরিবেশ অধিদপ্তর অবস্থানগত ছাড়পত্রের অনুমতি নেওয়া জন্য পরিবেশ অধিদপ্তর পাবনা জেলা অফিসে আবেদন করি যার পর নং- ছাড়- ০৮, তারিখ ২২/০৮/২০২২

পরবর্তীতে পরিবেশ অধিদপ্তর রাজশাহী বিভাগীয় দপ্তরের পরিবেশগত ছাড়পত্র বিষয়ক কমিটির গত ১০ জানুয়ারি ২০২৩ইং তারিখের ১৭৮ তম সভায় সিদ্ধান্ত মোতাবেক আমরা ইতিমধ্যে প্রকল্পের অনুকূলে জেলা প্রসাসক হতে গন বিজ্ঞপ্তি হাতে পেয়েছি এবং পানি উন্নয়ন বোর্ডের থেকে অনাপত্তিপত্র সংগ্রহ করার জন্য আবেদন করেছি যদিও আমাদের প্রকল্প পানি উন্নয়ন বোর্ডের কোনো জমিতে পড়েনি।

এছাড়াও বোর্ড সভার সিদ্ধান্ত মোতাবেক আমরা বিভাগীয় কমিটির নিকট আইইই প্রতিবেদন উপস্থাপন এর জন্য একটি প্রেসেন্টেশন তৈরি করেছি এবং উক্ত প্রেসেন্টেশন উপস্থাপনা করার জন্য একটি নির্ধারিত দিন এর জন্য আবেদন করছি।

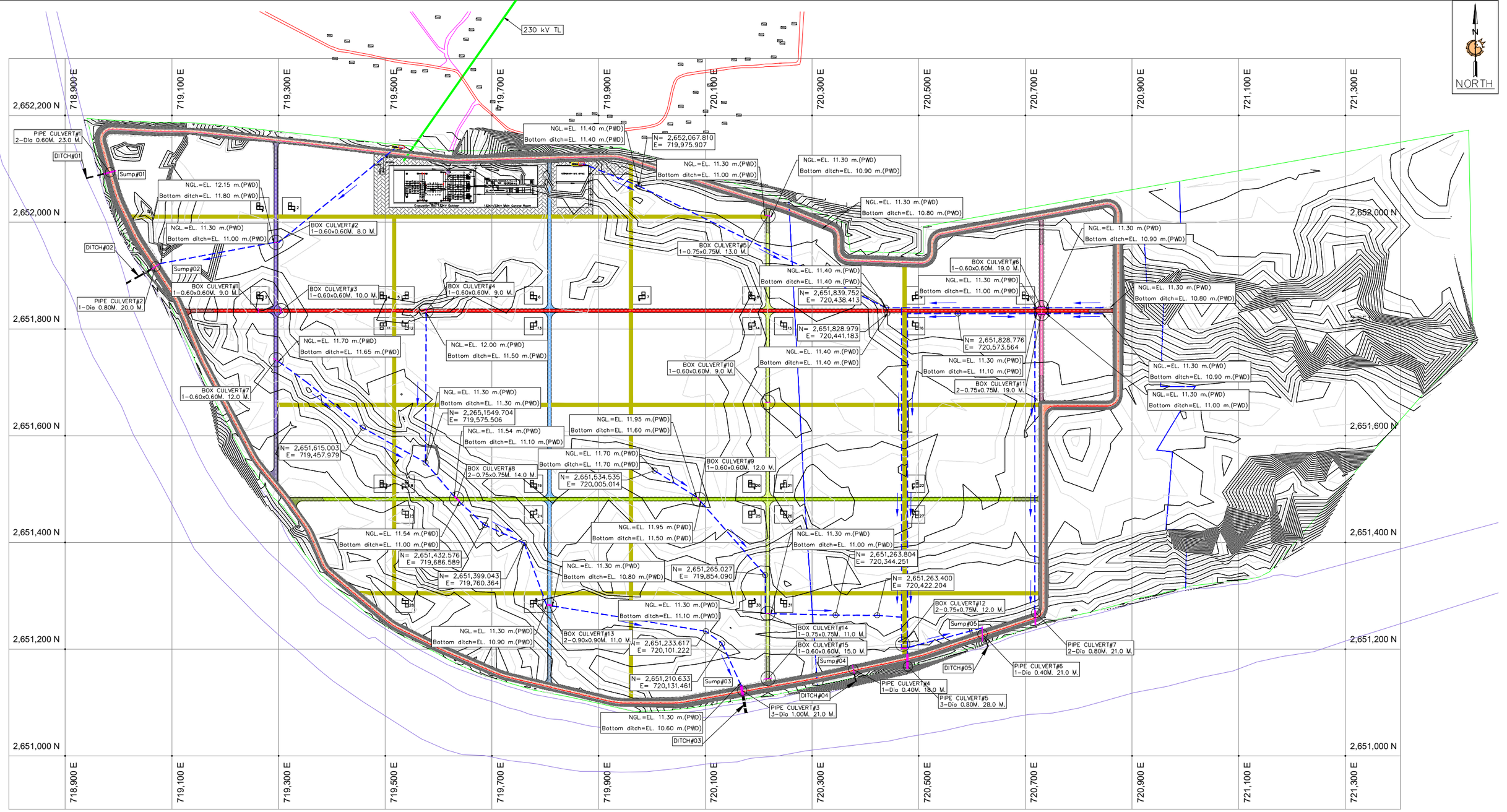
পরিশেষে উপরিউক্ত বিষয় সুবিবেচনায় নিয়ে জাতীয় স্বার্থ সংশ্লিষ্ট উক্ত প্রকল্পটির দ্রুত বাস্তবায়নের লক্ষ্যে আমাদের প্রতিষ্ঠানের অনুকূলে অনাপত্তিপত্র প্রদানের জন্য প্রয়োজনীয় ব্যবস্থা গ্রহণ করার জন্য আপনাকে সবিনয় অনুরোধ করা যাচ্ছে।

ধন্যবাদান্তে
আপনার বিশ্বস্ত

সাইফুল ইসলাম ইমরান
ব্যাবস্থাপক এবং পরামর্শক (ডি এস সি এল)
মোবাইলঃ ০১৭১৬৩৪২০৮২

Annexure - 25

Drainage Plan of the Project Site



LEGEND

- Project boundary / Fence
- Toe slope
- Intermediate drain
- Earth drain to river
- Flow line

LEGEND		
LIST		REMARK
	5.00 M. R01_Boundary road/Cofferdam	EL.14.00 M. (PWD)
	6.50 M. R02_Internal road	EL.12.50 M. PWD
	6.50 M. R03_Internal road	EL.12.50 M. PWD
	6.50 M. R04_Internal road	EL.12.50 M. PWD
	6.50 M. R05_Internal road	EL.12.50 M. PWD
	6.50 M. R06_Internal road	EL.12.50 M. PWD
	6.50 M. R07_Internal road	EL.12.50 M. PWD

Table A: Pipe culvert details

Designation	Nº Tubes	Dimensions	Inlet (IL)	Outlet (IL)	Length Pipe	Slope
		Diameter (m)	m	m	m	(m/m)
PIPE 01	1	0.80	11.00	10.90	20.00	0.0050
PIPE 02	2	0.60	11.30	11.19	23.00	0.0050
PIPE 03	2	0.80	10.80	10.71	19.00	0.0050
PIPE 04	3	0.80	10.80	10.66	28.00	0.0050
PIPE 05	2	0.80	10.80	10.70	21.00	0.0050
PIPE 06	1	0.40	11.30	11.26	21.00	0.0050
PIPE 07	1	0.40	11.30	11.21	18.00	0.0050
PIPE 08	3	1.00	10.60	10.50	21.00	0.0050

Table B: Box culvert details

Designation	Nº Culverts	Dimensions (m)		Inlet (IL)	Outlet (IL)	Length Box	Slope
		(B) Length	(A) Height	m	m	m	(m/m)
BOX-01	1	0.60	0.60	11.78	11.74	9.00	0.0050
BOX-02	1	0.60	0.60	11.85	11.81	8.00	0.0050
BOX-03	1	0.60	0.60	11.90	11.85	10.00	0.0050
BOX-04	1	0.60	0.60	11.70	11.66	9.00	0.0050
BOX-05	1	0.75	0.75	11.00	10.94	13.00	0.0050
BOX-06	1	0.60	0.60	11.00	10.91	19.00	0.0050
BOX-07	1	0.60	0.60	11.72	11.66	12.00	0.0050
BOX-08	2	0.75	0.75	11.10	11.03	14.00	0.0050
BOX-09	1	0.60	0.60	11.60	11.54	12.00	0.0050
BOX-10	1	0.60	0.60	11.85	11.81	9.00	0.0050
BOX-11	2	0.75	0.75	11.10	11.01	19.00	0.0050
BOX-12	2	0.75	0.75	10.90	10.84	12.00	0.0050
BOX-13	2	0.90	0.90	10.90	10.85	11.00	0.0050
BOX-14	1	0.75	0.75	11.10	11.05	11.00	0.0050
BOX-15	1	0.60	0.60	11.37	11.30	15.00	0.0050

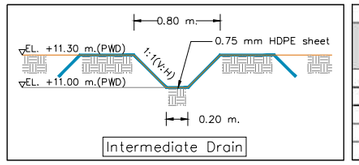


Table C: Sump details

Designation	Sump Details		
	Width (m)	Length (m)	Depth (m)
Sump-01	2.00	2.00	0.10
Sump-02	2.50	2.50	0.10
Sump-03	4.50	4.50	0.10
Sump-04	1.50	1.50	0.10
Sump-05	1.50	1.50	0.10

Table D: Ditch details

Designation	Type of ditch	Dimensions (m)				Inlet (IL)	Outlet (IL)	Length Ditch	Slope (I)
		Side Slope (1V:sH)	T	B	H	m	m	m	(m/m)
Ditch1	Ground Ditch	2	2.00	0.40	0.40	11.19	11.02	34.11	0.0050
Ditch2	Ground Ditch	2	2.50	0.50	0.50	10.90	10.63	53.14	0.0050
Ditch3	Ground Ditch	2	4.50	0.90	0.90	10.50	10.34	31.65	0.0050
Ditch4	Ground Ditch	2	1.50	0.30	0.30	11.21	11.14	13.78	0.0050
Ditch5	Ground Ditch	2	1.50	0.30	0.30	11.20	11.14	12.93	0.0050

REV	DATE	DESCRIPTION	DRAWN	CHECKED	APPROVED
0	Aug / 28 / 2022	PRELIMINARY	SUEBPHONG	WANAGORN	POOSIT ??.3489

PROJECT : 100MW (AC) SOLAR PARK, BHABANIPUR, PABNA.

OWNER : DYNAMIC SUN ENERGY PRIVATE LIMITED

CONTRACTOR :

EPC :

DESIGN : Infratech Energy Co., Ltd. 1032/217 Pananyothin 18/1 RD. Jatujak District, Bangkok 10900,Thailand www.infratechenergy.com

DRAWING TITLE : INTERNAL DRAINAGE PLAN

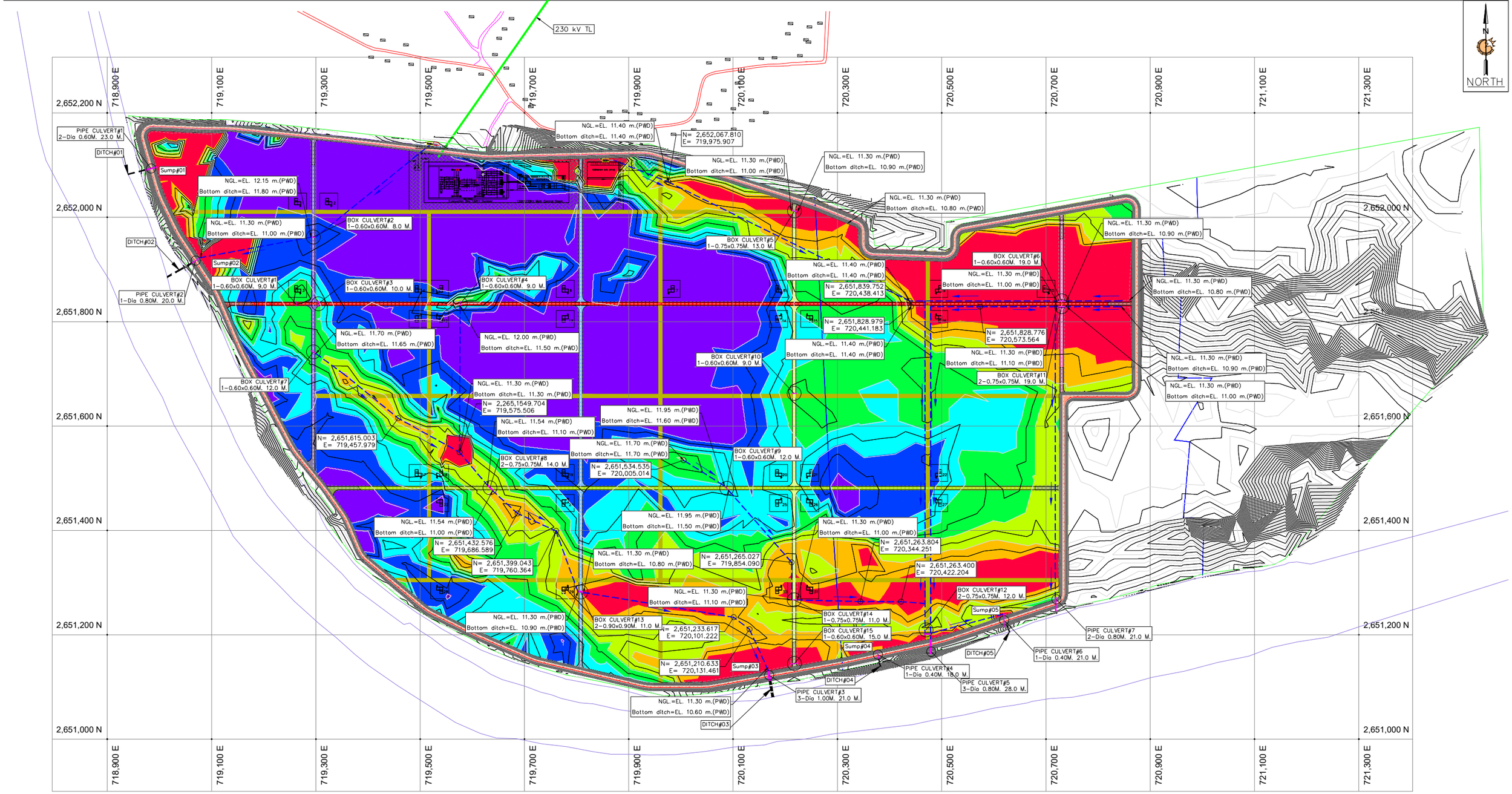
PROJECT DOCUMENT NO :

DRAWING NO : DR - 1

SCALE : 1 : 7,500

PAPER : A3 (m.)

SHEET : 1 / 7



LEGEND
Project boundary / Fence
Toe slope
Intermediate drain
Earth drain to river
Flow line

LEGEND		
	LIST	REMARK
	5.00 M. R01_Boundary road/Cofferdam	EL.14.00 M. (PWD)
	6.50 M. R02_Internal road	EL.12.50 M. PWD
	6.50 M. R03_Internal road	EL.12.50 M. PWD
	6.50 M. R04_Internal road	EL.12.50 M. PWD
	6.50 M. R05_Internal road	EL.12.50 M. PWD
	6.50 M. R06_Internal road	EL.12.50 M. PWD
	6.50 M. R07_Internal road	EL.12.50 M. PWD

Elevation Table			
Number	Min. Depth (m.)	Max. Depth (m.)	Color
1	11.300	11.300	
2	11.300	11.500	
3	11.500	11.700	
4	11.700	11.900	
5	11.900	12.100	
6	12.100	12.300	
7	12.300	12.000	

REV	DATE	DESCRIPTION	DRAWN	CHECKED	APPROVED
0	Aug / 28 / 2022	PRELIMINARY	SUEBPHONG	WANAGORN	POOSIT ??.3489

PROJECT :
100MW (AC) SOLAR PARK,
BHABANIPUR, PABNA.

OWNER :
DYNAMIC SUN ENERGY
PRIVATE LIMITED

CONTRACTOR :

EPC :

DESIGN :
Infratech Energy Co., Ltd.
1032/217 Pattanyathin
18/1 RD. Jalujak District,
Bangkok 10900,Thailand
www.infratechenergy.com

DRAWING TITLE :
INTERNAL DRAINAGE PLAN (NOT FUNCTIONING IF OUTSIDE BOUNDARY ROAD IS FLOODING)

PROJECT DOCUMENT NO :

DRAWING NO : DR - 2

SCALE : 1 : 7,500

PAPER : A3 (m.)

SHEET : 2 / 7

Annexure - 26

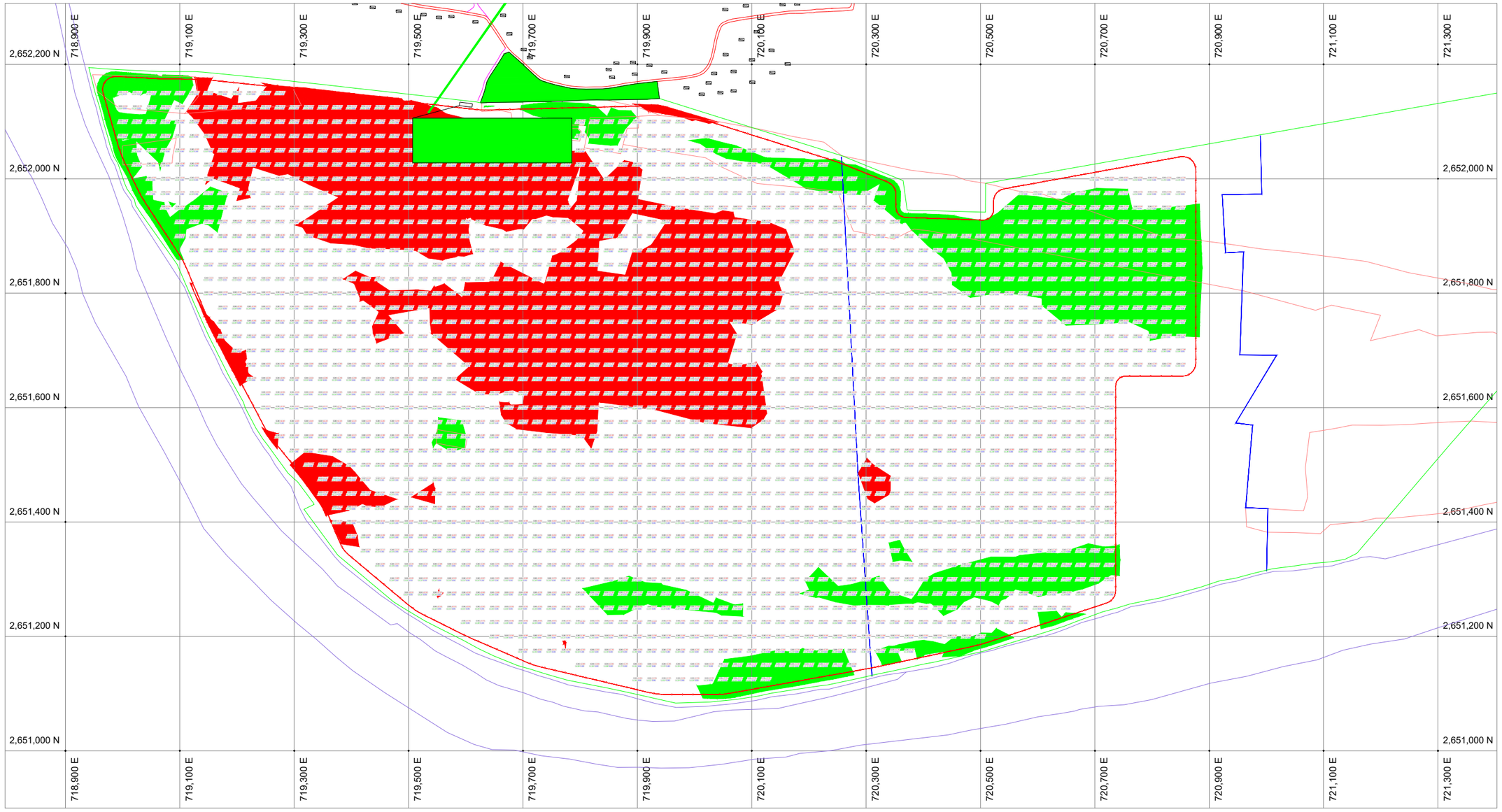
Sand Filling Calculation

SAND CUT AND FILLING CALCULATION:

100 MWac Bhabanipur, Pabna, Bangladesh							
Item	**Description of Scope of Work Element**	UOM	Quantities	Material cost,$	Labor cost,$	Mat.+Labor Cost,$	**Total ($)**
1	**General cut&Fill (Cut to EL12.30 to fill at lower area to 11.30)**						
	Cut quantity	M3	67,591				
	Fill quantity	M3	71,555				
2	**Out door Substation area and Main Control Room**						
	Platform fill upto EL.14.00 m. by soil CBR > 6% compact 95% standard proctor (first level)	M3	36,575				
	Platform fill upto EL.15.42 m. by soil CBR > 6% compact 95% standard proctor (substation platform level)	M3	13,725				
3	**Dike & Boundary Road width 5.0 m. (EL.14.00 m.) Length 5.266 km.**						
	Dike embankment fill up to road base (Fill), with material CBR 4% min. compacted to 95% MOD. AASHTO	M3	135,966				
4	**Internal Road width 6.5 m. (EL.12.50 m.) length 6.076 km. with ramp**						
	Embankment fill up to road base (Fill), with material CBR 4% min. compacted to 85% MOD. AASHTO	M3	20,556				
	Total Volume of Filling Sand	M3	210,786				

Annexure - 27

Cut-Fill of Typical Road



LEGEND

- COORDINATE LINE REFERENCE
- BOUNDARY LINE
- PROJECT BOUNDARY / FENCE
- CUT ZONE (CUT to 12.30)
- FILL ZONE (FILL to 11.30)

Fill Area Summary:

Name	Filling Area (sq.m)
#Outside Materials Stock Yard	11276.125 sq.m
#Outdoor & Main Control Building	21685.829 sq.m
#River Embankment Area	88127.345 sq.m
#Inside Project Area	205360.090 sq.m
Totals Filling Land Area (sq.m)	326450.199 sq.m
Totals Filling LAnd Area (Acres)	81.310 Acres

Cut/Fill Summary

Name	Cut Factor	Fill Factor	2d Area	Cut	Fill
#Cut to 12.30 (Vol)	**1.000**	**1.000**	1386074.236sq.m	67590.962 Cu. M.	
#Fill to 11.30 (Vol)	**1.000**	**1.000**	1388151.264sq.m		71555.283 Cu. M.
Totals					

REV	DATE	DESCRIPTION	DRAWN	CHECKED	APPROVED
0	Aug / 27 / 2022	PRELIMINARY	SUEBPHONG	WANAGORN	POOSIT ??.3489

PROJECT :
100MW (AC) SOLAR PARK,
BHABANIPUR, PABNA.

OWNER :
DYNAMIC SUN ENERGY
PRIVATE LIMITED

CONTRACTOR :

EPC :

DESIGN :
Infratech Energy Co., Ltd.
1032/217 Pahonyothin
18/1 RD., Jatujak District,
Bangkok 10900,Thailand
www.infratechenergy.com

DRAWING TITLE :
SITE GRADING PLAN

PROJECT DOCUMENT NO :

DRAWING NO :
PLATFORM – 1

SCALE : 1 : 7,500
PAPER : A3 (m.)
SHEET : 1 / 2

Annexure - 28

Approved Balumohal from DC Office

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
জেলা প্রশাসকের কার্যালয়, কুষ্টিয়া।
(রাজস্ব শাখা)
E-mail:dckushtia@mopa.gov.bd
Website:www.dckushtia.gov.bd

দরপত্র বিজ্ঞপ্তি ০১/২০২০

বালুমহাল ও মাটি ব্যবস্থাপনা আইন-২০১০ এবং বালুমহাল ও মাটি ব্যবস্থাপনা বিধিমালা- ২০১১ এবং জেলা বালুমহাল ব্যবস্থাপনা কমিটির ১৪ ডিসেম্বর ২০২০ খ্রি. তারিখের সভার কার্য-বিবরণীর সিদ্ধান্ত মোতাবেক কুষ্টিয়া জেলার নিম্ন লিখিত বালুমহালগুলি ইজারা প্রদানের জন্য দরপত্র আহবান করা যাচ্ছে। নিম্ন তপশিল বর্ণিত বালু মহালগুলো বাংলা ১৪২৭ সনের ৩০ চৈত্র পর্যন্ত অবশিষ্ট সময়ের জন্য ইজারা প্রদানের নিমিত্ত দরপত্রে উল্লিখিত শর্ত সাপেক্ষে কেবলমাত্র অনুমোদিত তালিকাভুক্ত ইজারাদার ব্যক্তিগণ জেলা প্রশাসক, কুষ্টিয়া বরাবর ১,০০০/-(এক হাজার) টাকা (অফেরতযোগ্য) মূল্যের ব্যাংক ড্রাফট/পে অর্ডার জমা দিয়ে জেলা প্রশাসক, কুষ্টিয়া কার্যালয়ের রাজস্ব শাখা এবং সকল উপজেলা নির্বাহী অফিসারের কার্যালয় হতে অফিস চলাকালীন সময় দরপত্র ফরম ক্রয় করতে পারবেন। দরপত্রের সাথে উদ্ধৃত দরের ২৫% জামানত বাবদ ব্যাংক ড্রাফট বা পে-অর্ডার জেলা প্রশাসক,কুষ্টিয়ার অনুকূলে দাখিল করতে হবে। হাইড্রোগ্রাফিক চার্টের অন্তর্ভুক্ত বা নদীর মধ্য হতে ড্রেজিংয়ের মাধ্যমে কোন অবস্থাতেই বালু উত্তোলন করা যাবে না। দরপত্রের অন্যান্য শর্তাবলী দরপত্র ফরমের সাথে সংযুক্ত থাকবে। প্রয়োজনীয় তথ্যাদি বর্ণিত অফিস থেকে জানা যাবে।

ক্রমিক নং	বালুমহালের নাম	উপজেলার নাম, মৌজার নাম ও জমির পরিমাণ	সরকারী মূল্য (১৪২৭ বঙ্গাব্দের অবশিষ্ট তিন মাসের জন্য)	দরপত্র ক্রয়ের তারিখ ও সময়	দরপত্র দাখিলের তারিখ ও সময়	দরপত্র খোলা ও বায়াইয়ের তারিখ ও সময়
০১.	বাহাদুরখালী মৌজার বালুমহাল।	উপজেলা- কুষ্টিয়া সদর মৌজার নাম - বাহাদুরখালী, জমির পরিমান ২৯.৫৩ একর।	১,০০,০০০/-	১ম পর্যায় ০৩.০১.২০২১ হতে ০৬.০১.২০২১	০৭/০১/২০২১ দুপুর ১২.০০টা	০৭.০১.২০২১ বিকাল ৪.০০টা
০২.	মহানগর, কচুয়াদাম ও শুকদেবপুর মৌজার বালুমহাল।	উপজেলা- কুষ্টিয়া সদর। মৌজার নাম - কচুয়াদাম , মহানগর ও শুকদেবপুর জমির পরিমান- ৫৫৮.৮৮ একর ।	১,৫০,০০০/-			
০৩	জুগিয়া, শালদহ ও গোপিনাথপুর মৌজার বালুমহাল।	উপজেলা- কুষ্টিয়া সদর মৌজার নাম- জুগিয়া, শালদহ ও গোপিনাথপুর জমির পরিমান- ১২০.৯৪ একর।	২৫,০০,০০০/-	২য় পর্যায় ১০.০১.২০২১ হতে ১৩.০১.২০২১	১৪.০১.২০২১ দুপুর ১২.০০টা	১৪.০১.২০২১ বিকাল ৪.০০টা
০৪.	মজমপুর, বোয়ালদহ ও হাটশহরিপুর মৌজার বালুমহাল।	উপজেলা- কুষ্টিয়া সদর। মৌজার নাম- মজমপুর, বোয়ালদহ ও মঙ্গলবাড়ীয়া জমির পরিমান- ৯০.১৩০০ একর	২০,০০,০০০/-			
০৫.	জয়নাবাদ, রাহিনীপাড়া ও ছেউড়িয়া মৌজার বালুমহাল।	উপজেলা- কুমারখালী মৌজার নাম- রাহিনী পাড়া ও জয়নাবাদ জমির পরিমান- ৭১.০২ একর	২২,০০,০০০/-			
০৬.	কাশিমপুর, হাবাসপুর, কবুরাট ও কয়া মৌজার বালুমহাল	উপজেলা- কুমারখালী মৌজার নাম - কাশিমপুর জমির পরিমান- ২০৬.০১ একর।	১,৫০,০০০/-			
০৭.	বহলাগোবিন্দপুর ও চাপড়া মৌজার বালুমহাল	উপজেলা- কুমারখালী মৌজার নাম - বহলাগোবিন্দপুর ও চাপড়া জমির পরিমান- ১৪০.৪৭ একর	৫০,০০০/-			
০৮.	এলঙ্গী ও এলঙ্গী আচার্য্য মৌজার বালুমহাল	উপজেলা- কুমারখালী মৌজার নাম - এলঙ্গী আচার্য জমির পরিমান- ১.৭১৮৭ একর।	১,০০,০০০/-			
০৯.	ভাড়রা মৌজার বালুমহাল	উপজেলা- কুমারখালী মৌজার নাম- ভাড়রা জমির পরিমান- ৪৩.৯০ একর	১,০০,০০০/-			

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১০.	হাসদিয়া, কেশবপুর মৌজার বালুমহাল	উপজেলা- কুমারখালী মৌজার নাম- হাসদিয়া ও কেশবপুর জমির পরিমান- ১৩.৭৯ একর।	৬,০০,০০০/-			
১১.	উত্তর মুলগ্রাম,হিজলাকর, এনায়েতপুর ও গোবিন্দপুর মৌজার বালুমহাল	উপজেলা-কুমারখালী মৌজার নাম- উত্তর মুলগ্রাম, হিজলাকর, এনায়েতপুর, গোবিন্দপুর আয়তন ৪০.৯৫ একর	১৩,৫০,০০০/-			
১২.	কুমারখালী থানার সেরকান্দি তেবাড়ীয়া মৌজায় নদীর দক্ষিন পাড়ের বালুমহাল	উপজেলা- কুমারখালী মৌজার নাম - তেবাড়ীয়া , আড়াকুন্ডু ও সেরকান্দি জমির পরিমান- ৯.৯৩ একর	১,০০,০০০/-			
১৩.	ঘোড়ামারা, রানাখড়িয়া মৌজার বালুমহাল	উপজেলার - নিরপুর মৌজার নাম -ঘোড়ামারা জমির পরিমান- ৫০০.০০ একর।	১,০০,০০০/-			
১৪.	নিরপুর থানাধীন মিনাপাড়া, কাকদহ, কিডিনগর ও বিশালচন্ডি মৌজার বালুমহাল	উপজেলার - নিরপুর আয়তন ২৬০.৩৩ একর	১,৫০,০০০/-			
১৫.	পশ্চিম বাহিরচর বালুমহাল (নিরপুর থানার সীমানা হতে চরদাদাপুর মৌজা পর্যন্ত)	উপজেলার - ভেড়ামারা মৌজার নাম - পশ্চিম বাহিরচর জমির পরিমান- ৩৮৫.০০০০ একর।	৩০,০০,০০০/-			
১৬.	ভেড়ামারা থানার পশ্চিম ও পূর্ব দাদাপুর মৌজার বালুমহাল	উপজেলার - ভেড়ামারা মৌজার নাম - পশ্চিম চরদাদাপুর জমির পরিমান- ১২৭.৫৯ একর।	২,৫০,০০০/-			
১৭.	ভেড়ামারা থানার চরগোলাপনগর আরাজিসারা বালুমহাল	উপজেলার - ভেড়ামারা মৌজার নাম - চরগোলাপনগর ও আরাজীসারা জমির পরিমান- ৪১.০০ একর।	৩,৫০,০০০/-			
১৮.	ভবানীপুর বালুমহাল (কোমরভোগ ও গনেশপুর)	উপজেলার - খোকসা মৌজার নাম- ভবানীপুর ও গনেশপুর জমির পরিমান - ৫৭.২৯ একর ।	১,৫০,০০০/-			
১৯.	হিজলাবট ও খানপুর মৌজার বালুমহাল	উপজেলা-খোকসা মৌজার নাম-হিজলাবট ও খানপুর আয়তন ৫৪.৩৪ একর	২,০০,০০০/-			
২০.	ওসমানপুর মৌজার বালুমহাল (নদীর পশ্চিম পাড়ে)	উপজেলা- খোকসা মৌজার নাম-ওসমানপুর আয়তন- ৮৮.৪৭ একর	১,৫০,০০০/-			
২১.	চাঁদট মৌজার বালুমহাল	উপজেলার - খোকসা মৌজার নাম- চাঁদট জমির পরিমান- ৩৫.০১ একর।	১,৫০,০০০/-			

উক্ত বালুমহাল ইজারা সম্পর্কিত বিস্তারিত তথ্য অত্র কার্যালয়ের রাজস্ব শাখা হতে প্রত্যেক কার্য দিবসে অফিস চলাকালীন সময় জানা যাবে। বালু মহাল ইজারা সংক্রান্ত জেলা বালুমহাল ব্যবস্থাপনা কমিটির সভায় অনুমোদনের পর চূড়ান্ত অনুমোদন সাপেক্ষে ইজারার অর্থ জমা নেওয়া হবে।

১৩/১২/২০২০

মোঃ আসলাম হোসেন
জেলা প্রশাসক
ও
সভাপতি
জেলা বালুমহাল ব্যবস্থাপনা কমিটি
কুষ্টিয়া।
ফোন নং-০৭১-৬২৩০০

বালুমহাল ইজারার আবেদনের শর্তাবলী ঃ

০১। দরপত্র জেলা প্রশাসকের কার্যালয়, কুষ্টিয়া এর রাজস্ব শাখা, পুলিশ সুপারের কার্যালয়, কুষ্টিয়া, নির্বাহী প্রকৌশলী, গণপূর্ত বিভাগ, নির্বাহী প্রকৌশলী পানি উন্নয়ন বোর্ড, নির্বাহী প্রকৌশলী সড়ক ও জনপথ বিভাগ এবং সকল উপজেলা নির্বাহী অফিসারের কার্যালয়, কুষ্টিয়ায় পাওয়া যাবে।

০২। বালুমহাল বুঝে নেওয়ার দিন থেকে বাংলা ১৪২৭ সনের ৩০ চৈত্র পর্যন্ত ইজারার মেয়াদ কার্যকর থাকবে।

০৩। আবেদন পত্রের সাথে ১০০০/- (এক হাজার) টাকা মূল্যের (অফেরতযোগ্য) আবেদন ফি কুষ্টিয়া জেলার যে কোন তপশীলভূক্ত ব্যাংক থেকে ব্যাংক ড্রাফট/পে-অর্ডার এর মাধ্যমে জেলা প্রশাসক, কুষ্টিয়া এর অনুকূলে জমা প্রদান করতে হবে।

০৪। দরপত্রের সাথে জামানত হিসেবে উদ্ধৃত দরের ২৫% হারে কুষ্টিয়া জেলার যে কোন তফশীল ব্যাংক থেকে ব্যাংক ড্রাফট/পে-অর্ডার এর মাধ্যমে জেলা প্রশাসক, কুষ্টিয়া এর অনুকূলে জমা দিতে হবে।

০৫। নির্ধারিত সময়ের পর কোন আবেদন ফরম বিক্রি করা হবে না।

০৬। নির্ধারিত তারিখ ও সময়ে জেলা প্রশাসকের কার্যালয়,কুষ্টিয়া এর রাজস্ব শাখা, পুলিশ সুপারের কার্যালয় এবং সকল উপজেলা নির্বাহী অফিসারের কার্যালয়ে রক্ষিত দরপত্র বাক্সে দরপত্র গ্রহণ করা হবে।

০৭। কোন ঘসামাজা, কাটাকাটি ও ত্রুটিপূর্ণ আবেদন পত্র গ্রহণ করা হবে না।

০৮। বালুমহাল ইজারায় সিদ্ধান্ত হওয়ার পর ইজারা গ্রহীতাকে কার্যাদেশ প্রাপ্তির ০৭(সাত) কার্যদিবসের মধ্যে সমুদয় অর্থ (ভ্যাট, আয়কর এবং সরকার নির্ধারিত অন্যান্য করসহ) সরকারের অনুকূলে জমা প্রদান করতে হবে।

০৯। ইজারা সংক্রান্ত সরকারি নীতিমালা ও সময়ে সময়ে জারীকৃত সরকারি বিধি বিধানসমূহ ইজারাগ্রহীতাকে মেনে চলতে হবে।

১০। বালুমহাল ইজারা সংক্রান্ত জেলা বালুমহাল ব্যবস্থাপনা কমিটি, কুষ্টিয়া, প্রাপ্ত আবেদনপত্র যাচাই-বাছাই ও প্রচলিত বিধি-বিধান অনুসরণপূর্বক বালুমহাল ইজারা সম্পর্কে অভিজ্ঞতা ও যোগ্যতা বিবেচনা করে উপযুক্ত আবেদনকারীর অনুকূলে নির্ধারিত মূল্যে ইজারা বন্দোবস্ত প্রদানের বিষয়ে সিদ্ধান্ত গ্রহণ করবেন।

১১। জেলা বালুমহাল ব্যবস্থাপনা কমিটি ইজারা সংক্রান্ত বিষয় চূড়ান্ত করে ইজারা বন্দোবস্ত দিবেন এবং কর্তৃপক্ষের সঙ্গে লিজ চুক্তি সম্পাদন করতে হবে।

১২। ইজারা গ্রহীতাকে ইজারা মূল্যের উপর ৫% আয়কর ও ১৫% ভ্যাট জমা প্রদান করতে হবে।

১৩। ইজারাদার কোন অবস্থাতেই বালুমহালের কোন অংশ সাব-লিজ দিতে পারবেন না। সাব-লিজ প্রদান করলে ইজারা বাতিল বলে গণ্য হবে।

১৪। আবেদনপত্র দাখিলের পূর্বে আগ্রহী ইজারাগ্রহীতা বালুমহালটি সরেজমিন দেখে আবেদন দাখিল করতে হবে। পরে আপত্তি উত্থাপন করলে তা বিবেচনায় নেয়া হবে না।

১৫। কর্তৃপক্ষ যে কোন আবেদনপত্র গ্রহণ বা বাতিলের ক্ষমতা সংরক্ষণ করেন এবং সর্বোচ্চ দর প্রদানকৃত আবেদনপত্র রিজার্ভ রেখে পুনরায় দরপত্র আহবান করতে পারবে।

১৬। জেলা প্রশাসকের কার্যালয়,কুষ্টিয়া কর্তৃক যে সকল ব্যক্তি ইতো:পূর্বে ইজারা দরপত্রে অংশগ্রহণের তালিকাভুক্ত হয়েছেন, উক্ত ব্যক্তিগণই শুধু ইজারায় অংশগ্রহণ করতে পারবেন।

১৭। কার্যাদেশ প্রাপ্তির ০৭(সাত) কার্যদিবসের মধ্যে সরকারি পাওনা পরিশোধে ব্যর্থ হলে জামানত বাজেয়াপ্ত করা হবে।

১৮। ইজারার অর্থ পরিশোধের পরবর্তী ০৭(সাত) কার্যদিবসের মধ্যে ৩০০/-টাকার নন জুডিশিয়াল ষ্ট্যাম্পে ইজারাগ্রহীতা চুক্তিপত্র সম্পাদন করবেন। পরবর্তীতে বালুমহালের দখল বুঝিয়ে দেওয়া হবে।

১৯। সর্বোচ্চ দরদাতা একাধিক হলে লটারির মাধ্যমে তাদের মধ্যে থেকে একজনকে নির্বাচন করে বালুমহাল ইজারা প্রদান করা হবে।

২০। ইজারা দরপত্রের সাথে ইজারায় অংশগ্রহণের তালিকাভুক্তির সনদপত্র সংযুক্ত করতে হবে।

২১। হাইড্রোগ্রাফিক চার্টের অন্তর্ভুক্ত বা নদীর মধ্য হতে ড্রেজিংয়ের মাধ্যমে কোন অবস্থাতেই বালু উত্তোলন করা যাবে না।

২২। ইজারাকৃত বালুমহালগুলো হাইড্রোগ্রাফিক চার্টের আওতামুক্ত থাকবে।

০৩/১২/২০২০

সাদিয়া জেরিন
সদস্য সচিব
জেলা বালুমহাল ব্যবস্থাপনা কমিটি
ও
রেভিনিউ ডেপুটি কালেক্টর
কুষ্টিয়া।

Annexure - 29

License from BIWTA to collect sand

Advocate

42- ANNEXURE-B

TELEX NO.: 642787 BIWTA BJ
FAX NO. : 880-2-9551072
GRAMS. : AUTHORITY
PHONES : 9556151-55
: 9555042, 9552027
: 9552038, 9551692

বাংলাদেশ অভ্যন্তরীণ নৌ-পরিবহন কর্তৃপক্ষ
BANGLADESH INLAND WATER TRANSPORT AUTHORITY

B

সূত্র বিজিপি/অপস-৭১/বালি/মাটি উত্তোলন/২০০৭-০৮/৪২৮ তারিখ ২৮/৪/০৯

মেসার্স আনোয়ারুল হক মাসুন,
মালিক, আনোয়ারুল হক মাসুম,
এন.এস.রোড. আমলাপাড়া,
কুষ্টিয়া।

বিষয় ঃ কুষ্টিয়া ও পাবনা জেলার আন্তঃ সীমানায় গড়াই ও পদ্মা নদীর তালবাড়ীয়া, রানাঘড়িয়া, ঘোড়ামারা, কাবলদ, বৃন্তিনগর, বিশালচন্ডি, মেনাপাড়া। ভেড়ামারা থানার পদ্মা নদী ঃ পশ্চিমচর, দাদাপুর, পশ্চিম বাহিরচর, গোলাপ নগর, থানা- ঈশ্বরদী, জেলা- পাবনা পদ্মা নদী ঃ পূর্ব বাহিরচর, চরবরপুর, পাকশী, সাঁড়া, বামনগাঁও, চরনিকিলপুর, চরমাদিয়া (বুলচারা, ভেকুপাড়া) চর রানাগরিয়া, চরতালবাড়ীয়া মৌজা এবং থানা- কুষ্টিয়া সদর গড়াই নদী ঃ মহাদেবপুর, চাকলিয়া, মাটিয়াপাড়া, সুকদেবপুর, গোপিনাথপুর, সারদা, ঘুগিয়া, মজিমপুর, হাটসহরিপুর, বাহাদুরখালি, কুষ্টিয়া জেলার কুমারখালী থানায় গড়াই নদী ঃ কয়া, অয়নাবাদ, পশ্চিমকয়া, রায়ডাঙ্গা, মৌজা সমূহের অংশ বিশেষ হতে ৩০,০০,০০০ (ত্রিশ লক্ষ) ঘনফুট বালি/মাটি উত্তোলনের অনাপত্তি প্রদান প্রসঙ্গে।

(ক) নৌ-পরিবহন মন্ত্রনালয়ের স্মারক নং- নৌপম/টিএ-২৮/০৫ (অংশ-৩)/১০৭ তাং- ১৬/০২/২০০৯ইং।
(খ) ঢাকা দপ্তরের স্মারক নং- পিটিডি/অপস/এনওসি/মাটি খনন/উত্তরবস/৬৭৩ তাং- ২০/০৪/২০০৯ইং।
(গ) বিজিপি/অপস-৭১/বালি/মাটি উত্তোলন/২০০৭-০৮/৪২৫ তাং- ২৩/০৪/২০০৯ইং

উপর্যুক্ত বিষয় ও সূত্রস্থ (ক) স্মারকের প্রেক্ষিতে আপনার প্রতিষ্ঠান/কোম্পানীর বিপরীতে ৩০,০০,০০০ (ত্রিশ লক্ষ) ঘনফুট বালি/মাটি উত্তোলন কর্তৃপক্ষ কর্তৃক অনুমোদন হয়েছে। সূত্রস্থ (গ) স্মারকের মাধ্যমে উক্ত বালি/মাটি উত্তোলনের রয়্যালিটি বাবদ প্রতি ঘনফুট ০.১৫ টাকা হারে- ৩০,০০,০০০ × ০.১৫ = ৪,৫০,০০০/- (চার লক্ষ পঞ্চাশ হাজার টাকা), ১৫% ভ্যাট বাবদ = ৬৭,৫০০/- (সাতষট্টি হাজার পাঁচশত টাকা) এবং ৫% আয়কর বাবদ = ২২,৫০০/- (বাইশ হাজার পাঁচশত টাকা) মাত্র, আলাদা আলাদা পে-অর্ডারের মাধ্যমে ধন্যবাদের সহিত গ্রহণ করা হলো।

(মোঃ আবুর রাজ্জাক)
সহকারী পরিচালক
এবং
সহকারী বন্দর ও পরিবহন কর্মকর্তা
বাআনৌপক, বাঘাবাড়ী নদী বন্দর
সিরাজগঞ্জ।

অনুলিপি ঃ সদয় অবগতি ও পরবর্তী প্রয়োজনীয় ব্যবস্থা গ্রহণ করার জন্য প্রেরণ করা হলো।

১। জেলা প্রশাসক পাবনা/কুষ্টিয়া। (গত ০২/০২/২০০৯ইং তারিখে নৌ-পরিবহণ মন্ত্রনালয়ে অনুষ্ঠিত আন্তঃমন্ত্রনালয় সভার সিদ্ধান্তের ছায়ালিপি সংযুক্ত)।
২। পুলিশ সুপার, পাবনা/কুষ্টিয়া।
৩। পরিচালক, বন্দর ও পরিবহন বিভাগ, বাআনৌপ-কর্তৃপক্ষ, ঢাকা।
৪। অধিনায়ক, র‍্যাব-১২, পাবনা সদর, পাবনা।
৫। উপজেলা নির্বাহী কর্মকর্তা, ঈশ্বরদী/ভেড়ামারা।
৬। ভারপ্রাপ্ত কর্মকর্তা, ঈশ্বরদী/ভেড়ামারা থানা।
৭। নথি।

২৮/৪/০৯
সহকারী পরিচালক
এবং
সহকারী বন্দর ও পরিবহন কর্মকর্তা
বাআনৌপক, বাঘাবাড়ী নদী বন্দর
সিরাজগঞ্জ।

42

Annexure - 30

Agreement of Sand Purchase

খজ ৯১৮৫০৫৫

চুক্তিনামা

ফাতেমা ড্রেজিং প্রকল্প লিঃ ৪২/এ সেগুনবাগিছা, টানাকা টাওয়ার- ২য় তলা, রমনা, ঢাকা-১০০০.

= ১ম পক্ষ

মেসার্স আনোয়ারুল হক মাসুম , এন এস রোড, আমলাপাড়া, কুষ্টিয়া ।

= ২য় পক্ষ

১ম পক্ষ ফাতেমা ড্রেজিং প্রকল্প লিঃ প্যারামাউন্ট গ্রুপের অন্তর্গত ডায়নামিক সান এনার্জি থেকে গত ৬ই অক্টোবর ২০২২ ইং খ্রীষ্টাব্দে বালি ভরাটের কার্যাদেশ প্রাপ্ত হন। উক্ত বালি ভরাটের স্থানঃ- গ্রাম- ভবানিপুর, ইউনিয়ন- হেমায়েতপুর, থানা- পাবনা সদর, জেলা- পাবনা, বাংলাদেশ।

১ম পক্ষের, উক্ত প্রজেক্টে এলাকাভিত্তিক সার্বিক কাজের সহযোগীতা পাওয়ার নিমিত্তে স্থানীয় একজন মান্যগণ্য ব্যক্তির প্রয়োজন দেখা দিলে ১ম পক্ষ ২য় পক্ষের সহিত যোগাযোগ করেন। ২য় পক্ষ নিম্নলিখিত শর্তসাপেক্ষে ১ম পক্ষকে প্রজেক্টের কাজে সার্বিক সহযোগিতা করবেন মর্মে সম্মতি প্রকাশ করেন।

শর্তসমূহঃ

১) ১ম পক্ষ এবং ২য় পক্ষের মধ্যকার সৌহার্দপূর্ণ আলোচনার পরিপেক্ষিতে প্রতি সি.এফ.টি বালির দর ৩.৮৫ টাকা নির্ধারিত হয়। উক্ত প্রজেক্ট শেষ হওয়া অবদি বালির দর অপরিবর্তনীয় থাকিবে।

"দেশপ্রেমের শপথ নিন, দুর্নীতিকে বিদায় দিন"

খজ ৯১৮৫০৫৬

২) উক্ত দরের পক্ষে ২য় পক্ষ ১ম পক্ষকে এই মর্মে নিশ্চয়তা প্রদান করেন যে, বালি উত্তোলন সংশ্লিষ্ট যাবতীয় সরকারি দাপ্তরিক ও প্রশাসনিক কোন অনুমতি এবং ড্রেজার ও বাল্কহেড সমূহের কোন নিরাপত্তার প্রয়োজনীয়তা দেখা দিলে উক্ত বিষয়াবলী নিজ দায়িত্বে দেখভালো করবেন।

৩) বাল্কহেডের পরিমাপের হিসাবে বালির পরিমান নির্ধারিত হইবে। প্রতিদিনের মোট উত্তোলিত পরিমানের বালির স্লিপ ২য় পক্ষ ১ম পক্ষকে প্রদান করিবেন।

৪) প্রতি ৩০ দিন পরপর ১ম পক্ষ উত্তোলিত বালির পরিমান টাকা ব্যাংক চেকের মাধ্যমে ২য় পক্ষকে প্রদান করিবেন। অর্থ্যাৎ বালি উত্তোলনের দিন থেকে পরবর্তী ৩০ দিন পর্যন্ত যে পরিমান বালি ১ম পক্ষ উত্তোলন করবে, বালির দর অনুসারে সে পরিমান টাকা ২য় পক্ষকে প্রদান করিবেন।

৫) ২য় পক্ষের শর্তানুসারে বালি উত্তোলনের জন্য ১ম পক্ষ ২য় পক্ষকে অগ্রীম ২৫,০০,০০০/- (পঁচিশ লক্ষ) টাকা প্রদান করবেন। উক্ত অগ্রীম টাকা ১ম পক্ষ ২য় পক্ষের ১ম বিল থেকে কর্তন করিবে।

উপরিউক্ত শর্তসমূহ ২য় পক্ষ কারো দ্বারা প্ররোচিত না হইয়া পড়িয়া, বুজিয়া বোধগম্য হইয়া, সম্মতি হইয়া নিম্নে স্বাক্ষর করিলেন।

Nakibul Islam

১ম পক্ষ

২য় পক্ষ

স্বাক্ষীগণের স্বাক্ষর

১)

২) মোঃ

"দেশপ্রেমের শপথ নিন, দুর্নীতিকে বিদায় দিন"

Annexure - 31

FDPL – updated E-Trade License

ঢাকা দক্ষিণ সিটি কর্পোরেশন

www.dscc.gov.bd

লাইসেন্স ইস্যুর বিবরণ

ইস্যুর তারিখ :16/11/2022
ইস্যুর সময় :15:30:59

ই-ট্রেড লাইসেন্স

লাইসেন্স নং : **TRAD/DSCC/022804/2022**

স্থানীয় সরকার (সিটি কর্পোরেশন) আইন, ২০০৯ (২০০৯ সনের ৬০ নং আইন) এর ধারা ৮৪- তে প্রদত্ত ক্ষমতাবলে সরকার প্রণীত আদর্শ কর তফসিল, ২০১৬ এর ১০ অনুচ্ছেদ অনুযায়ী ব্যবসা, বৃত্তি, পেশা বা শিল্প প্রতিষ্ঠানের উপর আরোপিত কর আদায়ের লক্ষ্যে নিম্নে বর্ণিত ব্যক্তি/ প্রতিষ্ঠানের আনুকূলে অত্র ট্রেড লাইসেন্সটি ইস্যু করা হলো।

১।	ব্যবসা প্রতিষ্ঠানের নাম	:	ফাতেমা ডেইজিং প্রকল্প লিঃ		
২।	প্রতিষ্ঠানের মালিকের নাম	:	মোঃ নুরুল ইসলাম (চেয়ারম্যান)		
৩।	পিতা / স্বামীর নাম	:	মৌলভী সাদেক হোসাইন		
৪।	মাতার নাম	:	মোসা. ফাতেমা খাতুন		
৫।	ব্যবসার প্রকৃতি	:	লিমিটেড কোম্পানী		
৬।	ব্যবসার ধরণ	:	আমদানীকারক,প্রথম শ্রেনীর ঠিকাদারী,রপ্তানীকারক,সরবরাহকারী		
৭।	প্রতিষ্ঠানের ঠিকানা	:	৪২/এ/গ, সেগুনবাগিচা, ২য় তলা, ঢাকা-১০০০		
৮।	অঞ্চল / বাজার শাখা	:	১	ওয়ার্ড / মার্কেট:	২০
	এলাকা	:	-		
৯।	এনআইডি/পাসপোর্ট/জন্ম নিব: নং	:	৫৯৯৯১১৭৭৪৯	বিআইএন নং:	
	ফোন	:	০১৭১৩২২৩৫৫৫	ই-মেইল:	
১০।	অর্থ বছর	:	২০২২-২০২৩ [নতুন]	ব্যবসা শুরুর তারিখ:	০১/০৭/২০২২

১১। মালিকের বর্তমান ঠিকানা			মালিকের স্থায়ী ঠিকানা		
হোল্ডিং নং	:	৪২/১/গ	হোল্ডিং নং	:	
রোড নং	:		রোড নং	:	
গ্রাম / মহল্লা	:	সেগুনবাগিচা	গ্রাম / মহল্লা	:	
পোস্টকোড	:	১০০০	পোস্টকোড	:	ঐ
থানা	:	শাহবাগ	থানা	:	
জেলা	:	ঢাকা	জেলা	:	
বিভাগ	:		বিভাগ	:	

১২। ট্রেড লাইসেন্স/নবায়ন ফি(বার্ষিক)					
লাইসেন্স/নবায়ন ফি	:	**৩৫০০**	সাইনবোর্ড কর	:	**৮০০**
সারচার্জ	:	**০**	ভ্যাট	:	**৬৪৫**
আয়কর / উৎসেকর	:	**০**	ফর্ম ফি	:	**৫০.০০**
বকেয়া ()	:	**০**			
সংশোধনী ফি	:	**০.০০**	সর্বমোট	:	**৪৯৯৫.০০**

অত্র ট্রেড লাইসেন্স এর মেয়াদ ৩০ শে জুন, 2023 পর্যন্ত

লাইসেন্স ও বিজ্ঞাপন সুপারভাইজার

কর কর্মকর্তা

Annexure - 32

Agreement between DSEPL and FDPL for Land filling

Ref: DSEL/FDPL/2022-022
Date: 06-10-2022

To,
Managing Director & CEO
Fatema Dredging Prokolpo Ltd.
Tanaka Tower, (Bagicha Restaurent)
42/A-GA, Segunbagicha, 2nd floor, Dhaka-1000

Attention:Mr. Naharul Islam Pappu (01832-061424)

Subject: Work Order for supply Filling Sand

Dear Concern,

Thank you very much for your quotation. We are pleased to place an order for the following items on the terms and conditions agreed upon. We would be grateful if you supply the items.

Description of Items:

Sl	Item	Specification	Qty	Unit	Rate	Amount
1	**Filling Sand**	**Sand filling at our project site by using pipe line**	9,000,000	CFT	12.00	108,000,000
	Total		9,000,000	CFT		**108,000,000**

In word: Taka ten crore eighty lac only.

Conditions:

1) Made of Payment:

- When all equipment reached at our site we will pay taka 25,00,000 (Twenty five lac taka only) as advanced. This amount of taka will deduct from last submitted invoice
- Bill will submit on after 15,00,000 CFT sand filling and it will pay within 10 days after submitting the bill. Apply 10% security money it will pay after satisfactory the completion of the work.

2) **Quantity Measurement: The Bulkhead measurement shall be executed by both party and to confirm the quantity.**
3) **Delivery Start Date &liability:** Within 20 days from the date of WO and delivery point will be project site by vendors own responsibility.
4) **Minimum Quantity:** Minimum 80,000 CFT per day (If our site ready)
5) **Sourcing requirement:** Fatema Dredging Prokolpo Ltd. must supply sand from Govt. approved Balu Mahal/Source.
6) **Penalty:** It will be applied if Fatema Dredging Prokolpo Ltd. delivery fail as per our required quantity 0.50% on short qty.
7) **Accidental Liability**: any unusual events due to this work full liable by Fatema Dredging Prokolpo Ltd.
8) No allowed rate enhancement within agreement period.

Thanking you

Kazi Md. Firoz Morshed
Sr. General Manager.
&
Head Of Supply Chain

Annexure - 33

EHS Policy of DSEPL

SOLAR SAFETY, HEALTH AND ENVIRONMENT CODE OF PRACTICE

EHS GUIDELINES

DYNAMIC SUN ENERGY PRIVATE LTD.

DYNAMIC SUN ENERGY PRIVATE LTD.
SOLAR SAFETY, HEALTH AND ENVIRONMENT CODE OF PRACTICE

STATEMENT OF AUTHORITY

The Constitution of Bangladesh, OSH POLICY-2013, BANGLADESH LABOUR ACT-2006, OTHER POLICIES & LAWS, SUMMARY OF OSH PROVISIONS, Renewable Energy Safety, Health and Environment Rules and Regulations, and in order to ensure adequate safety and protection of health, life, property, and the environment against the hazards of solar operations, the following Solar Safety, Health and Environment Code of Practice, (this "Solar Code") is hereby promulgated.

GENERAL PROVISIONS

Section I. Safety, Health and Environment Policy Statement

1. Providing a safe workplace while protecting the health of the Employees and the surrounding environment must be the principal responsibility of the Employer. To achieve this, safety, health and environmental concerns must be thoroughly integrated in the Employer's management policy.

2. The Employer, as a matter of policy, shall:

    a. Issue a general safety, health and environment policy statement in writing.

    b. Give importance to the safety, health, and environmental aspect of their operation by creating a safety, health and environment organization under the direct supervision of top management;

    c. Establish a system to implement and monitor compliance of their contractors and sub-contractors to safety, health and environmental policy and related requirements of the company;

    d. Implement programs to ensure that relevant government safety, health and environmental rules, regulations and codes are complied with; and

    e. Establish an emergency plan to address any incident that may pose serious and imminent danger to the company's personnel, the environment and the community.

Section II. Definition of Terms

Terms and expressions that are generally defined in other existing regulations or in the Occupational Safety and Health Standards (OSHS) shall have the same meaning in this Solar Code. For purposes of this issuance, however, the following terms shall be defined as follows:

1. **Accessory Valves**- refer to valves used for vent, sampling point, pressure tapping point and drain valves;

2. **Authorized Personnel**- refers to an Employee who has been trained and licensed/certified to do the task, as duly authorized by the Employer.

3. **Balance of System (BOS) -** refers to the components of a Solar Energy System other than the Solar PV and Solar Thermal Collectors. This includes wiring, switches, support racks, inverter, and batteries and charge controllers in the case of off-grid systems;

4. **Confined Space** – refers to any area that has hazardous atmosphere, with restricted means for entry and exit and/or not designated for continuous employee occupancy;

5. **CSEP** – refers to Confined Space Entry Procedures

6. **Employee**- refers to any person who works for wage or salary in the service of an Employer;

7. **Employer**- refers to the service/operating contractor referred to in a RE Service/Operating Contract, and other entities, whether government or private, engaged in RE Operations, whether acting alone or in consortium with others, that hires one or more persons to work for wages or salaries;

8. **Environment –** refers to the Workplace Environmental Measurement as provided in Rule;

09. **Meteorological Station** - refers to a facility where meteorological data such as irradiation, temperature and wind speed and direction were gathered, recorded and released;

10. **Procedure** – refers to a formal step-by-step instruction describing how a specific task or work activity should be done.

11. **Program** – refers to a plan under which action may be taken toward a goal.

12. **Solar Energy Operation** refers to the solar energy exploration, development, production and utilization, including the construction, installation, operation and maintenance of solar energy system which converts solar energy to electrical power and transmission of such electrical power and/or other non-electrical uses.

13. **Solar Energy System** refers to the energy systems that convert solar energy into thermal or electrical energy.

14. **Solar Photovoltaic (PV)** refers to a cell, module, panel or array that converts solar energy to DC electrical energy.

15. **SDS**- refers to Safety Data Sheet, which is intended to provide workers and emergency personnel with procedures for handling or working with that substance in a safe manner, and includes information such as physical data (melting point, boiling point, flash point, etc.), toxicity, health effects, first aid, reactivity, storage, disposal, protective equipment, and spill-handling procedures.

16. **Standard –** refers to specifications or guidelines on how things should be done.

17. **Stroking** – refers to a process done on the valve to check problems, like hard to operate and valve sticking by closing and opening by few turns.

18. **System** – refers to an organized scheme of how things are done; includes procedures, policies describing how an organization works.

Section III. Safety, Health and Environment Practices

A. General Safety

1. Office Safety

a. An office maintenance and housekeeping program shall be in place regularly.
b. Only Authorized Personnel shall operate equipment and appliances;
c. Electrical equipment and appliances shall be immediately shut-off when not in use;
d. Smoking shall only be allowed in the designated smoking area; and
e. An ergonomics program shall be in place to address work procedures to minimize stress to the muscular-skeletal system to prevent repetitive stress injury.

2. Personal Protective Equipment (PPE)

a. Employers shall have a PPE program in place;

b. Employers shall provide adequate PPE available at all times, in conformity with the approved design and specification appropriate for the exposure and the work to be performed that meets at least the minimum OSHS requirements or applicable industry standards .

c. Employees shall be properly trained on the selection, use (fit-test) and maintenance of approved PPE;

d. All work activities/workplaces requiring the use of PPE shall be identified;

e. Employer shall communicate to concerned Employees the use of the required PPE. Adequate signs/warnings shall be posted in areas requiring PPE;

f. PPE shall be properly maintained in good condition;

g. All Employees shall comply with PPE requirements;

h. Hard hat shall be worn in designated "HARD HAT AREA";

i. Appropriate eye protection shall be worn while handling chemicals, while in areas or activities with exposure to dusts, or any operations that can cause eye injuries;

j. Face shields shall be worn as protection against flying particles, sprays or hazardous liquid, splashes of molten metals and hot solution;

k. Appropriate hearing protection shall be worn in areas where the noise level exceeds 85 decibels;

l. Appropriate respiratory protection shall be worn in areas where air-borne contaminants such as toxic materials, fogs, gases, fumes, mists, sprays or vapor and dusts are present;

m. Appropriate gloves shall be worn when handling toxic materials and working on energized electrical circuit or apparatus;

n. Aprons, welding gloves, leggings and welding masks shall be worn while performing welding jobs. Head protection shall be worn when necessary;

o. Employees working in areas with excessive temperature due to steam/hot water lines or other well appurtenances shall wear suitable protective clothing;

p. Full body harness and/or lifelines shall be properly worn while working at elevated structures (minimum of 6 ft.), in pits, tunnels, ducts and other confined spaces. Lifelines shall be surely fastened/anchored while in use; and

q. Safety shoes shall be worn in areas where they are required.

3. Housekeeping

Employers shall devise procedures or guidelines for the following concerns, in accordance with existing laws and regulations:

a. Obstructions (passageways, aisles, ingress and egress);

b. Domestic and process waste management (generation, collection, segregation, storage and disposal);

c. Storage of materials, tools and equipment;

d. Signage (directional/instructional);

e. Barricades and zoning;

f. Building and ground maintenance of offices and field facilities;

g. Pest and rodent control; and

h. Control for stray animals.

B. Workplace Monitoring and Control

1. Permissible Noise Exposure

a. Employers shall have a hearing conservation program in place for exposed Employees; and

b. Employers must comply with noise exposure levels as mandated by OSHS.

2. Illumination

a. As applicable, skylights and windows shall be located and spaced so that daylight conditions are fairly uniform over the working area;

b. All occupied offices and buildings, including perimeters, shall be properly illuminated during normal operation based on the Bangladesh Electrical Code;

c. Adequate automatic emergency lighting system shall be provided in all stairways, exits, workplaces and passages, as required by the Bangladesh Building Code and the Fire Protection Code; and

d. Adequate ground lighting shall be provided within the working premises.

3. General Ventilation

a. Suitable atmospheric conditions shall be maintained in all work areas by natural and/or artificial means. Measures shall be taken to minimize, if not eliminate, process-related airborne hazards such as dusts, gases, odor, vapor, or mists at the source.

4. Extreme Temperature

a. All Employees exposed to extreme temperatures shall wear suitable protective clothing;

b. All equipment and facilities shall undergo re-evaluation for possible redesign or engineering control to minimize temperature hazard; and

c. Risk assessment shall be done where there is possible exposure to extreme temperature.

5. Radiation

a. All potential sources of electro-magnetic radiation, such as switchyards, high voltage power lines and transformers, shall be identified and restricted to Authorized Personnel only;

b. Persons operating radiographic equipment and conducting radiographic inspections must be licensed and approved and must ensure work is being conducted in accordance with applicable regulations;

c. All works and materials emitting radiation, such as but not limited to radiographic testing and naturally occurring radioactive materials from drilling, shall be covered by appropriate permit and signage;

d. Radiographic testing area must be designated and identified as a Restricted/High Hazard area and roping off or barricading the area is required. Warning signs must be placed in conspicuous locations around the work area to ensure all personnel on site are made aware that hazardous work activity is taking place and must remain in place until all the radiographic activities have been completed;

e. Personal dosimeters such as thermos luminescent dosimeters and direct reading dosimeters should be worn by radiographers at all times when they are performing site radiography work;

f. Work should be conducted to the degree possible, when only a minimum number of personnel are in the vicinity such as after normal work hours; and

g. Vessels or pipes being tested must be adequately drained of all liquids prior to the tests being conducted.

C. Lock-Out, Tag-Out and Try Out (LOTOTO) Procedures

1. All LOTOTO shall be covered by safe work permits;

2. Only duly qualified and authorized Personnel shall be allowed to conduct LOTOTO;

3. Required PPE shall be used as prescribed in Section III.A.3 herein;

4. All affected Employees must be notified in a timely manner that a LOTOTO system is going to be utilized and the reason why. The Authorized Personnel shall know the type and magnitude of energy that the machine or equipment utilizes and shall understand the hazards;

5. If the machine or equipment is operating, shut it down by following the normal stopping procedure (depress stop button, open toggle switch, etc.);

6. Apply lockout and tag out on the energy isolating devices with assigned individual lock(s) and tag(s);

7. Activate or install the proper blocking, braking and securing devices of all equipment. After lockout devices have been placed on the equipment, all stored or residual electrical, gravitational, mechanical and/or thermal energy must be disconnected and drained to a zero-energy state by bleeding, venting, grounding, or other approved means or otherwise made safe by the blocking or repositioning of equipment;

8. After ensuring that no personnel are exposed and as a check on having disconnected the energy source, operate the push button or other normal operating controls to make certain the equipment will not operate;

9. Notify all affected employees, (including facility personnel where applicable), that the machine or equipment has effectively been isolated and that lockout and tag out devices are in place;

10. After completing the servicing or maintenance and the equipment is ready for normal production operations, check the area around the machines or equipment to ensure that no one is exposed;

11. After all tools have been removed from the machine or equipment, guards have been reinstalled and employees are in the clear, remove all lockout and tag out devices;

12. Operate the energy isolating devices to restore energy to the machine or equipment;

13. Notify all affected employees (including facility personnel where applicable) that the machine or equipment has effectively been energized and is ready for use; and

14. LOTO devices shall not be used for other purposes and should be used only for controlling energy.

D. Electrical Works Requirements

1. All electrical works shall be covered by safe work permits;

2. All electrical works and materials shall conform to the latest Bangladesh Electrical Code;

3. Only Authorized Person shall supervise all electrical works;

4. Only duly qualified and Authorized Personnel shall be allowed to carry out inspection, testing and repair of electrical installations and equipment;

5. There must always be two persons present when working on live equipment (120V and above);

6. Prior to any electrical task, persons working with electricity must remove all metal jewelry;

7. Required PPE shall be used as prescribed in Section III.A.3 herein;

8. Required clearance shall be observed when working near high-voltage lines or equipment in accordance with the Bangladesh Electrical Code;

9. Materials, tools and equipment shall be inspected for any wear and damages that may expose the Employees to electrical hazards;

10. Electrical tools and equipment shall be properly guarded and grounded;

11. Electrical tools and equipment shall be maintained in a safe reliable condition and shall be periodically inspected or tested;

12. Proper warning and instructional signs shall be visibly posted at all times when work is being performed, and shall be removed or recovered promptly after work is completed;

13. No circuits are to be energized without first informing and receiving clearance from a supervisor/site manager, manager or appropriate site personnel;

14. Appropriate lock-out, tag-out and try-out procedures shall be implemented and observed;

15. Areas and cabinets with electric power shall be properly marked with signs;

16. First aid and/or emergency response team shall be available during all electrical works;

17. Hazardous electrical wastes shall be properly managed; and

18. Electrical safety education and training shall be provided to ensure that personnel are knowledgeable in performing their tasks safely.

E. Demolition Requirements

1. Before any demolition work is started, a competent person experienced in demolition operations must be appointed in writing as the person responsible for all work on site. His duties shall include the direct supervision of the work force, ensuring that work permit requirements are met, and liaison with other contractors working in the general area and with operators and construction or maintenance engineers;

2. The original drawings of the structure to be demolished should be obtained. These should be examined to ascertain whether any major changes from the

original construction have been made and where utility connections may be found;

3. The method of demolition to be used should be decided upon in consultation with all Employees and/or contractors involved. The re-use of salvage materials should be considered prior to this decision;

4. All utility services such as steam, electricity, instrumentation, gas, and water must be shut off and the main supplies disconnected outside the line of the demolition work. Tanks, vessels, and pipelines must be completely disconnected from inlet, outlet, and overflow points;

5. Adjacent structures, buildings, pedestrian walkways, parking lots, etc. shall be protected from demolition debris that can likely cause hazards to the general public. Also, bracing must be installed to ensure stability of adjacent structures;

6. Barricades must be erected around the work area. Signs bearing the words "Danger - Demolition in Progress" in must be erected at each approach to the barricade;

7. Before demolition of structures and facilities with asbestos and insulation or removal of equipment containing Polychlorinated Biphenyl (PCBs) or any other hazardous material, the employee shall notify the Supervisor to ensure safe procedures are followed. Proper personnel protective equipment and hazardous materials disposal procedures must be utilized;

8. A safe means of access to and egress from all demolition areas and working places must be provided. Work places and the areas around ladders and stairways must be kept clear of material and debris;

9. Nails in timber must be removed or bent over, or the timber must be stacked where it will not be a source of danger. All glass in windows, doors, partitions, etc. should be completely removed prior to structural demolition;

10. All steel construction should be demolished column length by column length and tier by tier. A structural member being removed must not be under any stress other than its own weight. Members being cut or dismantled should be chained or lashed in place to prevent uncontrolled swinging or dropping;

11. No tank, vessel, or pipe work which has contained explosive or flammable material shall be subjected to welding or hot cutting operation until all steps have been taken to remove the substance and any vapors;

12. Mechanical equipment such as cranes and bulldozers should be equipped with wire mesh guards over windows and with solid protection over the driving position so that there is no danger of the operator being struck by flying debris; and

13. As work progresses, continuing inspections must be made to detect hazards arising through weakened or overloaded floors, unsupported walls, or loose

material. Immediate steps shall be taken by bracing or by other means to prevent the premature collapse of the whole or any part of the structure.

F. Working in Confined Spaces Procedures

1. Develop, implement and maintain standard work processes ensure that work involving the entry of Employees into confined spaces has been assessed and approved of by an appropriately competent person;

2. The entry into the confined space shall be administratively controlled using a safe work permit;

3. The confined space has been properly isolated and all hazardous energy sources controlled;

4. Approved types of breathing apparatus and other personal protective equipment shall be provided and made available for use by the worker or workers entering a confined space;

5. No Employee or Employees shall enter a confined space unless a watcher is available who is familiar with the job and in contact with the men at regular intervals and equally provided with breathing apparatus for ready use in case of emergency;

6. Each entry point shall have one dedicated Attendant to control access to the space. Access shall be restricted only to Authorized Entrant;

7. Each Entrant shall wear a properly calibrated and functioning personal multigas monitor;

8. Where necessary, a six-man rescue team must be in place;

9. All personnel involved (Entrants, Attendants, Entry Supervisor, Rescue Team) must have attended an appropriate confined space entry training course;

10. No smoking or open lights, torches, arcs or flames shall be permitted in confined spaces until an inspection has been conducted to ensure that fire or explosion possibilities have been eliminated;

11. No spraying or painting using volatile solvents of oil shall be undertaken in confined spaces unless the necessary respiratory and other adequate protections are provided;

12. Any manhole, tank opening, or other opening which is left unattended should be protected during the day by barricades, and at night by barricades and lanterns, with appropriate warning signs; and adequate means of ingress and egress from any confined or enclosed space shall be provided;

13. Activities involving welding or cutting in confined spaces shall conform with relevant Rule; and

14. Other applicable procedures in accordance with Safety in Confined Space Manual which shall be adopted.

G. Safe Work Permit Procedures

1. Established work permit procedures shall be implemented in the following works:

    a. Electrical and Mechanical LOTOTO;
    b. Confined Space Entry;
    c. Hot Work;
    d. Excavation;
    e. Hazardous Materials Handling;
    f. Work at Heights;
    g. Critical Lifts;
    h. Radiation;
    i. Blasting;
    j. Demolition;
    k. Bypassing Critical Protection;
    l. Simultaneous Operation; and
    m. Any activity that may adversely affect the safety and health of people and the environment and has a significant potential for injury or environmental incident.

2. The above permit shall include the minimum applicable requirements:

    a. Permit Number;
    b. Authorized permit Requestor and Issuer/Approver;
    c. Date of Issue;
    d. Work Description (Area/ Activity Covered);
    e. Period of Validity of Permit (Date and Time);
    f. Work Precaution Checklist;
    g. Protective Measure Checklist;
    h. Work Party Acceptance;
    i. Emergency Response/Equipment;
    j. Environment Monitoring;
    k. Job Hazard Analysis and Control;
    l. Work Carry Over (Turnover of Unfinished Work); and
    m. Sign Off (Closing)

3. Control for issuance and recording of all permits shall be established;

4. Permits shall be properly posted in the work area;

5. Work covered by permit shall be immediately stopped if permit conditions are not complied with/violated or emergency incident/accident occurs;

6. Control for the recording and monitoring of all permits that were stopped and revalidation and resolution of action items to address the compliance issues or violations shall be established;

7. An assessment shall be conducted to determine the need for safe work permits on other facilities and equipment on site;

8. Employees affected by the safe work permit procedures shall be trained on the application procedures. Permitting authorities shall likewise be identified and properly trained; and

9. A periodic safety audit shall be in place to determine its adequacy on compliance and effectiveness.

H. Hazardous Materials Handling and Storage

1. Toxic chemicals and hazardous waste/substances shall be properly managed (handling, storage, transport and disposal) in accordance with RA 6969;

2. All related SDS shall be readily available and communicated to workers for information and reference;

3. Provide a register on site detailing the movement, storage, use and disposal of all hazardous materials and dangerous goods, including hazardous wastes and other by-products;

4. The following details must be made known:

   a. Material description including:
      i. Product Name
      ii. Source or Manufacturer
      iii. Use or Purpose
      iv. Quantity stored, used and disposed

   b. All potential hazards to health or risks to the environment, resulting from the work being undertaken;

   c. A copy of risk assessment relating to its specific use;

   d. Work procedures and methods of safe handling required for safe storage, use and disposal so that any human exposures, emissions to atmosphere, or discharge to land or water are avoided or minimized;

   e. Required permits of use, storage and disposal by local and national regulations;

   f. Information and training requirements on the hazardous substances;

   g. Method of removal of any unused materials or by-products from the site upon completion of work;

h. Method of disposal that meets health, safety and environmental regulations; and

i. Emergency response measures required if an incident involving such materials happened onsite or offsite.

5. All workers that maybe exposed to chemicals shall be trained on the recommended hazard controls of various chemicals used in the workplace;

6. Chemicals, especially those which exhibit peculiarities such as but not limited to ammonia, hydrogen peroxide and caustic soda, shall be stored in a cool and dry area;

7. Wear the appropriate PPE as prescribed in the safe work permit, as stated in the instruction/procedure or as advised by the supervisor; and

8. All exposed workers shall be given immediately proper medical attention for any untoward effects from handling toxic chemicals and hazardous wastes/substances.

I. Flammable Liquids Handling, Storage, Labelling and Disposal

1. Flammable liquids shall be properly stored, labeled, handled and disposed of according to recommended controls, as specified in the SDS in accordance with OSHS Rule (Flammable and Combustible Liquids);

2. Approved safety pumps and similar devices shall be used when transferring liquids from one container to another. Motorized pumps shall be properly grounded;

3. Appropriate safety containers shall be used in handling or transporting flammable liquids;

4. Adequate fire control and fire fighting equipment shall always be available in areas where flammable liquids are present;

5. Flammable liquids shall not be discharged into the sewers, drainage, canals or natural waterways; and

6. Empty flammable containers shall be disposed of in accordance with the manufacturer's instructions and local regulatory requirements.

J. Explosives Storage, Use and Transportation

1. The government laws pertaining to the use, storage and transportation of explosives shall be strictly observed. Manufacturer's instructions for the safe handling and storage of explosives are to be followed;

2. Disposal of all empty explosive containers shall be in accordance with manufacturer's recommendations and local regulatory requirements;

3. Blasting machines and equipment are to be disconnected from firing circuit by switching to “safe” or “unarmed” position before and after a charge is fired;

4. Persons who handle, prepare, loads, fires, burns or destroys an explosive are certified blasters or working under the direct supervision of a certified blaster;

5. Explosives and explosive devices shall be transported in accordance with all applicable regulations and shall be provided with the appropriate security escort at all times;

6. The loss or theft of explosives from a worksite shall immediately be reported to the nearest authorities and to Supervisor in charge;

7. Warning signs about the use of radio transmitter must be posted on all access roads 1000 feet from the blasting area;

8. All access points to the blasting area shall be properly guarded until an “ALL CLEAR” signal is sounded;

9. Explosives or dynamites used for quarrying or road construction shall be stored in magazines as per regulatory standard;

10. Dynamites shall be separated from the blasting ingredients such as blasting caps or fuses when stored or transported;

11. For security reasons, vehicles transporting explosives shall not be marked unless required;

12. Only Authorized Personnel shall handle explosives;

13. Explosive magazine shall be constructed as per standards. Danger signs shall be installed to warn the public. Explosive magazine shall be provided with at least two ventilation outlets;

14. Stacking/piling of boxes of explosives shall only be on eye level;

15. Perimeter gates and doors of the storage magazine shall be provided with two (2) locks each. One for the military and one for the company custodian;

16. Only Authorized Personnel shall be allowed to enter the storage areas or near explosives;

17. Smoking is strictly prohibited in areas where there are explosives; and

18. Military escorts must be present during transport of explosives.

K. Warehouse Safety

1. Warehouses shall be well ventilated and well lighted;

2. If a warehouse is provided with fire sprinkler system, the maximum height of stock shall conform with OSHS stacking limit;

3. Storage areas shall be provided with adequate fire extinguisher located at strategic places;

4. Adequate clearance between stocks and wall, and between aisles, shall be provided for easy access;

5. Warehouse shall be provided with enough space for the operation of material handling equipment;

6. Materials stored in open areas shall be protected against the weather, and shall not be placed in direct contact with bare soil or ground;

7. Eye wash stations and emergency showers shall be regularly maintained and made available in designated areas; and

8. Shelves shall be labeled to indicate the capacity they can carry.

L. Ladder Safety

1. All ladders shall be inspected prior and after use to ensure its good state of repair. Damaged or defective ladders shall be taken out of service immediately, reported to management, and tagged with a warning sign on it so it won't be used until it can be properly repaired or replaced;

2. Maintain ladders free of oil, grease and other slipping hazards;

3. Do not load ladders beyond their maximum intended load nor beyond their manufacturer's rated capacity;

4. Use ladders only for their designed purpose;

5. Use ladders only on stable and level surfaces unless secured to prevent accidental movement;

6. Do not use ladders on slippery surfaces unless secured or provided with slip-resistant feet to prevent accidental movement;

7. Secure ladders placed in areas such as passageways, doorways or driveways, or where they can be displaced by workplace activities or traffic to prevent accidental movement. Or use a barricade to keep traffic or activity away from the ladder;

8. Use ladders equipped with nonconductive side rails if the worker or the ladder could contact exposed energized electrical equipment;

9. Always maintain a 3-point (two hands and a foot, or two feet and a hand) contact on the ladder when climbing. Keep your body near the middle of the step and always face the ladder while climbing

10. Do not carry objects or loads that could cause loss of balance and falling;

11. Ladder rungs, cleats and steps must be parallel, level and uniformly spaced when the ladder is in position for use;

12. Ladders must not be tied or fastened together to create longer sections unless they are specifically designed for such use

13. If the total length of the climb on a fixed ladder equals or exceeds 24 feet, the ladder must be equipped with ladder safety devices or self-retracting lifelines and rest platforms;

14. Ladders with structural defects—such as broken or missing rungs, cleats or steps, broken or split rails, corroded components or other faulty or defective components—must immediately be marked defective or tagged with "DO NOT USE" or similar language and withdrawn from service until repaired;

15. Never move, “walk” or “jog” a ladder while you are on it. Climb down first and the reposition the ladder;

16. Do not climb while holding something-use tool belt to carry tools. If need to move equipment to the roof that cannot be fastened or carried safety in a tool belt, tie of properly, using fall protection, and use a rope or hoist to raise and lower tools and other objects;

17. Only one person should be on ladder at one time;

18. Always move the ladder to avoid overreaching;

19. Use a fiberglass ladders when working on energized equipment or near power lines;

20. Raised ladders should never be left unattended;

21. Always work within an arm’s reach from the ladder, keep both feet on the rungs and use belt buckle as a guide to keep weight centered on the ladder during all times;

22. Be sure that the shoes are free of mud, grease or other substances which could cause a slip of fall; and

23. The areas around the top and base of ladders must be free of tripping hazards such as loose materials, trash and electric cords.

M. Lightning Protection

1. Lightning protection system shall be installed in wind project structures and lifting equipment, especially on facilities with sensitive electronic equipment;

2. Installation of lightning protection shall be done by trained and qualified lightning protection specialists;

3. For quality assurance, all materials and methods shall comply with nationally recognized safety standards for lightning protection as established by National Fire Protection Association/latest Bangladesh Electrical Code;

4. Other electrical works shall be in placed as prescribed in Section III.D hereof; and

5. Required PPE shall be used as prescribed in Section A.3 hereof.

N. Facility Improvement Works

1. Excavation and Filling Works

a. All excavation and filling works shall be covered with appropriate safe work permit;

b. Only Authorized Person shall supervise all excavation and filling works;

c. Roles must be clearly defined, and personnel must meet the training requirements for excavation and filling works;

i. A Civil Engineer/Qualified Professional/or Competent Person shall be employed for the analysis of soil types and conditions;
ii. Excavation in close proximity to building, roads, retaining walls and other structures or deeper than 6.1 meters must be reviewed and approved by a Civil Engineer or Qualified Professional or Competent Person; and
iii. Protective systems (Shoring, Bracing, Sloping, Benching, and Shields) for excavations 1.5 meters deep shall be designed by a Civil Engineer.

d. Before any excavation is started, available drawings, electronic and/or other appropriate equipment to locate underground pipelines, electrical lines, and other utilities are utilized. When all lines have been located, the excavation work area will be rechecked to ensure that no lines have been missed. When lines have been located they shall be exposed by hand before using mechanical excavators;

e. Required PPE shall be used while doing excavation and filling works;

f. Proper warning and instructional signs shall be visibly posted at all times when work is being performed, and shall be removed or recovered promptly after work is completed;

g. Excavation sites shall be properly barricaded, delineated and provided with proper safety and warning signs;

h. Excavation material shall be kept a distance as prescribed under Rule of OSHS;

i. Gangplanks with railing or metal plates shall be provided where an excavation crosses driveways or streets;

j. Approved access ladder shall be provided and regularly inspected. Ladders shall be extended three (3) feet above the level to be accessed;

k. Sloping, sheeting, shielding, benching, shoring, cutbacks, fencing, bracing or approved temporary protective structures that may be required for safe operations, are provided for and used, built in accordance with standard engineering practice;

l. Temporary railings, barricades, fencing, lanterns, reflective flagging or yellow illuminated warning devices and other warning systems are placed around excavations left open at night or where there is a hazard to personnel and the general public;

m. Spoils, materials or equipment that might fall or roll into an excavation or trench are kept at least 1 meter from the edge of excavations, or not less than one-third (1/3) of the depth for excavations deeper than 3.0 m;

n. Personnel must be protected from accumulation of water, gas and other elements that may be encountered during excavation. Risks associated with hazardous atmosphere inside excavations shall be analyzed and mitigated; and

o. Rescue plans must be developed for excavations. First aid and emergency response shall be available at all times.

2. Concreting and Structural Works

a. Work permits shall cover all structural works at heights and all works that require the use of oxy-acetylene cutting and any kind of welding works;

b. Roles must be clearly defined, and personnel must meet the training requirements for concreting and structural works;

c. Only Authorized Person shall supervise all concreting and structural works;

d. Required PPE shall be used while doing concreting and structural works in accordance with Section III.A.3 hereof;

e. Proper warning and instructional signs shall be visibly posted at all times when work is being performed, and shall be removed or recovered promptly after work is completed;

f. Work sites shall be properly barricaded, delineated and provided with proper safety and warning signs;

g. Standard scaffoldings and full body harness shall be provided when working at heights. Installation and dismantling of scaffoldings shall be performed in accordance with Rule of OSHS;

h. Lifting procedure shall be implemented for heavy and special lifting works. Lifting and rigging procedures shall be in accordance with Rule of OSHS; and

i. Rescue plans must be developed for works at height and lifting operations. First aid and emergency response shall be available at all times.

3. Road Works / Earth Moving

a. Only Authorized Person shall supervise all road works;

b. Roles must be clearly defined, and personnel must meet the training requirements for road works and earth moving;

c. Required PPE shall be used while doing road works in accordance with Section III.A.3 hereof;

d. Proper warning and instructional signs shall be visibly posted at all times when work is being performed, and shall be removed or recovered promptly after work is completed;

e. Traffic management plans shall be in place when work is being done;

f. Work place conditions shall be inspected to eliminate or control hazards that may expose the worker to injury;

g. Work sites shall be properly barricaded, delineated and provided with proper safety and warning signs;

h. Only duly qualified and Authorized Personnel shall be allowed to operate equipment;

i. Heavy equipment shall have spotter to assist the operator; and

j. First aid and emergency response shall be available at all times.

4. Piping and Insulation Works

a. Only Authorized person shall supervise all piping and insulation works;

b. Only duly qualified and Authorized Personnel shall be allowed to conduct piping and insulation works;

c. Required PPE shall be used while doing piping and insulation works in accordance with Section III.A.3 hereof;

d. Proper warning and instructional signs shall be visibly posted at all times when work is being performed, and shall be removed or recovered promptly after work is completed;

e. Work place conditions shall be inspected to eliminate or control hazards that may expose the worker to injury;

f. Work sites shall be properly barricaded, delineated and provided with proper safety and warning signs;

g. All coded piping and insulation works (i.e. high pressure pipe welding, hot tapping) shall have detailed and approved safe work procedures;

h. All piping and insulation works shall be covered with appropriate safe work permits;

i. All coded piping and insulation work wastes shall be properly disposed of according to environmental regulations; and

j. First aid and emergency response shall be available at all times.

5. Hot Works

a. Only Authorized Person shall supervise all hot works;

b. Only duly qualified and Authorized Personnel shall be allowed to conduct hot work;

c. Required PPE shall be used while doing hot works in accordance with Section III.A.3 hereof;

d. Proper warning and instructional signs shall be visibly posted at all times when work is being performed, and shall be removed or recovered promptly after work is completed;

e. Work place conditions shall be inspected to eliminate or control hazards that may expose the worker to injury and potential property damage;

f. All hot works shall have detailed and approved safe work procedures;

g. All hot works shall be covered with appropriate safe work permits;

h. Remove combustible and flammable materials from the work area;

i. Items that cannot be removed are covered with fire-retardant blankets;

j. Keep the floor clean;

k. Provide welding shields to contain sparks and splatters;

l. A Fire Watch with appropriate communication and fire extinguishing equipment shall be assigned whenever hot work is performed in locations where other than a minor fire might develop;

m. The hot work area shall be gas tested by an Authorized Gas Tester using approved and calibrated gas detection instruments. Atmospheric conditions in the work area must be acceptable before any work is allowed to start or continue. Flammable atmosphere should be less than 10% of the LEL; and

n. First aid and emergency response shall be available at all times.

6. Mechanical and Equipment Installation

a. Only Authorized Person shall supervise all mechanical and equipment installation;

b. Roles must be clearly defined, and personnel must meet the training requirements for mechanical and equipment installation;

c. Required PPE shall be used while doing mechanical and equipment installation in accordance with Section III.A.3 hereof;

d. Proper warning and instructional signs shall be visibly posted at all times when work is being performed, and shall be removed or recovered promptly after work is completed;

e. Work place conditions shall be inspected to eliminate or control hazards that may expose the worker to injury;

f. Only duly qualified and Authorized Personnel shall be allowed to install mechanical equipment;

g. All mechanical and equipment installation shall have detailed and approved safe work procedures;

h. All mechanical and equipment installation shall be covered with appropriate safe work permits;

i. All mechanical and equipment installation work wastes shall be properly disposed according to environmental regulations;

j. Appropriate lifting equipment and procedures shall be used in mechanical installation; and

k. First aid and emergency response shall be available at all times.

O. Motor Vehicle and Heavy Equipment Operations

1. Only duly qualified and Authorized Personnel shall be allowed to operate motor vehicles and heavy equipment;

2. Drivers and heavy equipment operators shall have valid driving license and mandatory government certifications appropriate for the equipment they will operate;

3. Drivers/operators under the influence of liquor and/or asleep inducing drugs or any medication that will affect vision, judgment and reflexes shall not be allowed to operate motor vehicles and heavy equipment;

4. All motor vehicles and heavy equipment shall be:
   a. Provided with basic emergency tools and equipment like early warning device, choke block, fire extinguisher etc.
   b. Subjected to a pre-use inspection.
   c. Loaded up to its rated capacity only.
   d. Subjected to scheduled preventive maintenance;

5. All drivers/operators shall immediately report any observed unsafe condition of the motor vehicles and heavy equipment;

6. All drivers/operators shall strictly follow all established company and government traffic rules and regulations;

7. All vehicles and heavy equipment deemed or reported to be unsafe shall be removed immediately from service and shall not be used until appropriate repair has been undertaken;

8. All drivers shall report immediately any vehicular incident to the company and appropriate authorities;

9. All motor vehicles and heavy equipment shall be equipped with the prescribed and approved seat belts for all driver and passenger seats;

10. Only qualified and Authorized Personnel shall conduct repairs to all motor vehicles and heavy equipment;

11. Any vehicle with restricted vision shall not be moved while in the vicinity of other workers, processing equipment or servicing/drilling equipment except under the direction of a designated signal man or spotter; and

12. A Journey Management Plan shall always be prepared for non-routine trips and journeys with high risks (oversized cargoes) to ensure that driving risks and exposures are minimized and managed.

P. Hoist and Lifting Works Operations

1. Only Authorized Person shall supervise hoist and lifting works;

2. Only duly qualified and authorized operator shall be allowed to operate hoist and lifting equipment;

3. Only duly qualified and authorized rigger shall be allowed to direct and guide hoist and lifting operation;

4. Operators under the influence of liquor and/or asleep inducing drugs or any medication that will affect vision, judgment and reflexes shall not be allowed to operate hoist and lifting equipment;

5. All hoist and lifting equipment shall conform to the requirements of all applicable industry and regulatory standards;

6. All hoist and lifting equipment shall be provided with basic emergency tools and equipment where applicable like horn, lights, outrigger matting, fire extinguisher etc.;

7. All hoist and lifting equipment shall be subjected to a pre-use inspection by authorized operator for safe operation;

8. All hoist and lifting equipment shall be loaded up to its rated capacity only;

9. All hoist and lifting equipment shall be subjected to scheduled preventive maintenance in accordance with manufacturer's recommendations;

10. All operators shall immediately report any observed unsafe condition of the hoist and lifting equipment;

11. All unsafe hoist and lifting equipment shall be removed immediately from service and shall not be used until appropriate repair has been undertaken;

12. All operators shall report immediately any incident/accident to the company and appropriate authorities;

13. All hoist and lifting equipment shall be equipped with the prescribed and approved seat belts;

14. A daily routine inspection of all heavy equipment deployed at the site shall be conducted by duly certified mechanics and operators and only qualified and Authorized Personnel shall conduct repairs of the hoist and lifting equipment;

15. All heavy equipment shall be regularly inspected and maintained in good condition;

16. All hoist and lifting equipment shall be subjected to load test inspection as recommended by the manufacturer and as prescribed by DOLE or its recognized organizations;

17. All critical lift works or jobs shall be covered by critical lift procedure;

18. The General Constructor or the equipment owner shall maintain a separate logbook for data on maintenance, repairs, tests and inspections for each heavy equipment;

19. Prior to performing a lift, the operator shall determine the weight of the object to be lifted and ensure that cables, lifting devices, slings, wire ropes, chains, etc. are of sufficient strength, in proper condition, and positioned to support the weight of the load. Load calculations shall be conducted for all critical lifts;

20. Always consider the following:

    a. Proximity to power lines;
    b. Proximity to other personnel and equipment;
    c. Wind velocity;
    d. Ground conditions for outriggers;
    e. Reach or extension of lifting equipment;
    f. Weight of the load including the rigging being used; and
    g. Outriggers placed on load bearing floats or pads that are adequate size and strength for loads being lifted;

21. One person shall be designated as a spotter (signal person or flagman) and the lifting device operator shall take direction or instruction from the spotter only; and

22. The operating area of the lifting device shall be barricaded and no worker shall allow any part of his body to extend underneath any load being lifted by a crane, side boom, or other lifting device. No person shall be allowed to work, walk through, stand, or stay beneath any suspended load being lifted, moved or lowered.

Q. Fire Hazards, Protection and Control

1. General Objective

All solar operators shall establish a fire prevention and control program in accordance to Fire Code of the Bangladesh.

2. Fire Extinguishers

a. Fire extinguishers shall be inspected once a month and shall be maintained in good operating condition at all times;

b. Fire extinguishers shall be kept in their designated places. If they are removed for refilling/repair, it shall be replaced immediately with the same type and capacity;

c. Durable inspection tags shall be attached securely to each extinguisher showing the servicing data properly recorded and signed by the designated safety engineer or end user;

d. Fire extinguishers shall be installed in strategic locations free from obstructions. Only fire extinguishers shall be placed inside the extinguisher box to avoid exposure to excessive heat;

e. Tampering of markings, tags and other emergency instructions labeled on all fire protection equipment shall be prohibited;

f. Fire extinguishers shall have hydro testing records according to manufacturer's specifications; and

g. Fire extinguishers shall conform to the fire protection standard as per Fire Code of the Bangladesh.

3. Fire Hydrants, Fire Hoses and Accessories

a. Fire hydrants, hoses and accessories shall conform to the fire protection standard;

b. Fire hydrants, hoses and accessories shall be kept in good condition. They shall be used properly and only for the purpose for which they are intended;

c. Fire hose installed at yard hydrant shall be kept in well-ventilated fire hose cabinet properly locked and marked "FOR FIRE USE ONLY";

d. Only Authorized Personnel shall conduct inspection and/or testing of fire hydrants, hoses and accessories at least once a month. Defective items shall be replaced immediately;

e. Fire fighting equipment shall be placed in strategic locations and must be free from obstructions; and

f. Tampering of fire alarms, valves and other accessories is prohibited. Recommend immediately for repair on any damaged parts.

R. Scaffolding Safety

1. General Requirements

a. Installation, dismantling and structural requirements of scaffolding shall conform to the requirements of all applicable industry and regulatory standards.

b. Every scaffold shall be of good construction of sound materials and strength for the purpose for which it is intended;

c. Timber used for scaffolds shall be in good condition, the bark completely stripped off, and not painted or treated in any manner that defects cannot be easily seen;

d. All materials and parts of scaffold not in use or intended for re-use shall be kept under good condition and separate from other materials unsuitable for scaffolds;

e. Scaffolds shall be erected, moved, dismantled, or altered only under the supervision and direction of a qualified in scaffold erection, moving, dismantling or alteration. Such activities shall be performed only by experienced Employees, trained and certified by any government accredited training and trade test centre;

f. Scaffolds and scaffold components shall be capable of supporting, without failure, its own weight and at least 4 times the maximum intended load;

g. Scaffold products from different manufactures shall not be mixed on a scaffold, unless they are specifically designed to be used together;

h. Never erect a scaffold within 10 feet of power lines;

i. Do not ride on rolling scaffold;

j. Guardrails, midrails, and toeboards shall be installed on all open sides and ends of platforms 6 ft. above the working surface (floor);

k. Guardrails shall be 2" X 4" or the equivalent (2" nominal diameter for tubular scaffolds) approximately 42" in ht. with a midrail. Supports shall be at intervals not to exceed 8 ft.;

l. Toeboards shall be of 4" in height;

m. Scaffold planks shall extend over their end supports not less than 6 inches nor more than 12 inches;

n. Any scaffold including accessories such as braces, brackets, trusses, screw legs, ladders, etc. damaged or weakened from any cause shall be immediately repaired or replaced;

o. Timber planking is allowed for the scaffold and shall have a minimum of 1,500 fiber (stress grade) construction grade lumber;

p. Scaffolding will be inspected for safe conditions on a daily basis. The contractor responsible will maintain a daily inspection permit and must conform to the requirements on the project site;

q. It must be tagged by a competent person. This inspection tag shall be attached on the scaffold at all times. Scaffold identification tags are color coded for each reference and should be located at the point of access;

r. All personnel using a rolling scaffold must engage the wheel locking devices or block the scaffold against movement when the scaffold is stationary and personnel are working from the scaffold. Moving scaffolding with personnel on the scaffold is strictly prohibited;

s. Tools and equipment shall be raised to the work site in a bag or utility belt designed for that purpose. Straight access ladder attached to scaffolding should not exceed 20 feet without a break or offset that would limit a potential fall exposure. Access ladder that exceed 20 feet from the ground level should be place inside the scaffolds frame with trap door conditions at access levels;

t. Ladders shall not be used on scaffolds to increase the working level height of employees, except on large area scaffolds where employees have satisfied some reasonable criteria;

u. Makeshift devices, such as but not limited to boxes and barrels, shall not be use on top of scaffold platforms to increase the working level height of employees;

v. Scaffold tower, single-section, or rolling scaffolds must not exceed a 4:1 base-to-height ratio without structural bracing. Nor shall any section of the scaffold exceed a 4:1 ratio without structural bracing;

w. Cantilevered or outrigger scaffolds must have documentation to demonstrate safe loading conditions;

x. All suspended scaffolds require independent safety lines for each employee. Employees must use a full body harness when working from any suspended scaffold. Personal fall arrest system used on scaffolds shall be attached by a lanyard to a vertical lifeline, horizontal lifeline, or scaffold structural member;

y. Personal fall arrest system/Safety harnesses meeting an approved standard must be worn. Only full body safety harnesses (i.e. with chest and leg straps) will be permitted; and

z. Overhead work should not be carried out above other workers unless the workers below are adequately protected by the installation of an overhead barrier. Every area where a worker could be struck by a falling object shall be clearly marked by barriers, notices, warning lights or other warning devices.

2. Scaffolding Components and Requirements

a. Materials
   i. Materials to be used in erecting scaffolding should be in good condition;
   ii. Steel items should be free from rust; and
   iii. Mandatory inspection by experienced and competent person to all materials before use.

b. Foundation
   i. Scaffold shall be capable of supporting without failure at least 4 times the maximum intended load;
   ii. Timber sills at least 23 cm wide by 3.8 cm thick will be required to spread the load. A sill shall extend under at least two post;

iii. Where scaffolding is erected on a solid bearing such as rock or concrete, small timber pads may be used in place of sills and nailed to prevent the base plates sliding off;
iv. If used to compensate variations in ground levels, the screw jacks shall not be adjusted more than two-thirds of the total length of the thread;
v. Scaffolds shall be anchored or secured to permanent or rigid structures. In the absence of permanent structures, guys and sway bracing and/or outrigger shall be used; and
vi. The foot of any standards or upright should be adequately founded on a suitable base plate in order to prevent slipping or sinking.

c. Posts
i. Posts shall be pitched on 15 cm (6 in.) by 15 cm (6 in.) steel and at least 0.64 cm (1/4in.) thick. All post shall be vertical; and

ii. The inner row posts shall be placed as closed as possible to the face of the building structure. The outer row shall be positioned depending on the load requirements of the scaffold.

d. Runners
i. Runners shall be securely fixed to post with standard couplers and shall be horizontal; and
ii. Runners shall be vertically spaced no more than 2.0 meters (6 ft. 6in.) to give adequate headroom along the platform;

e. Bearers
i. Bearers should be installed between post and securely fixed to the post with standard couplers; and
ii. Board bearers shall be installed between bearers to accommodate differences in planks length.

f. Bracing
i. Longitudinal diagonal bracing shall be installed at approx 45˚ angle from near the base of the first outer post upward to the extreme top of the scaffold.

g. Ties
i. All supported scaffolds except tower and mobile shall be securely tied to a building or structure throughout their length and height to prevent movement of the scaffold;
ii. Space ties every other lift and every 6M along the face of the scaffold;
iii. Ties should be fixed with load bearing couplers, as close to the node point as possible;
iv. Take full advantage of any structural features of the buildings e.g. pillars, columns, lintels, rebates, etc. to provide additional strength and stability to the tie;
v. Make sure that the building is strong enough to support the tie and the load imposed on it by the scaffold; and

vi. Do not remove tie for any reason until the overall stability of the scaffold has been confirmed.

h. Platform Units

i. All platform units shall be closed planked for the full width of the scaffold structure;
ii. Planks shall be extend over their end supports by not less than 15 cm (6 in. and not more than 30.5 cm (12in.);
iii. Planks shall be secured in position to prevent displacement by strong winds;
iv. Mid rails must be installed halfway between the top rail and platform and can withstand force of 150 lbs.; and
v. Toe boards shall not be less than 10 cm. (4in.) in height by 2.5 cm (in.) thick.

i. Access

i. Access to a working platform is best achieved by providing a separate ladder tower or a cantilevered access platform so as not to obstruct the working platform and to minimize the risk of persons falling through gaps in the guardrail system or platform units. Access should be provided to working platforms; and
ii. Working platform shall be provided per level during erection. This working platform shall not be removed unless the succeeding level is installed.

j. Workmanship

i. Scaffolding shall be erected, altered and dismantled by experienced men working under the direction of a competent supervisor; and
ii. Scaffolds of more than 6 meters in height shall be designed by a structural engineer and shall be erected, installed and dismantled by certified erectors.

k. Inspection

i. All scaffolds shall be inspected by a competent supervisor, safety officers, and/or civil engineers before it is used and after adjustments, modifications, adverse weather conditions, etc., to measure that is safe:

i.i **Green** tags shall be hanged at each scaffolds access that have been inspected and are safe for use.

i.ii **Yellow** tags shall be placed whenever special requirements for safe use are required. Situation requiring yellow tags may include whenever scaffold has been modified to meet work requirements, and as a result could present a hazard to the user. Situation requiring Yellow tags shall be closely supervised.

i.iii **Red "DANGER - UNSAFE FOR USE"** tags shall be used during erection and dismantling when the scaffold is left unattended. Red tag shall be used when all green or yellow tags has been removed or during erection of scaffolds

ii. All the records of the inspection shall be available on site and made available to proper authority upon request.

3. Training and Competency Requirement

a. Competent Person

i. All scaffolds competent person must undergo the standard scaffold training and assessment prescribed by regulators.

ii. The competent person shall have the following certification:

ii.i Training Certificate from relevant authorities or its accredited safety training organizations.

ii.ii Must be a holder of prescribed Scaffold Erection Certificate

ii.iii. At least 2 years' experience in scaffold erection.

b. Scaffold Erector

i. All scaffolds erectors must undergo the standard scaffold training and assessment prescribed by relevant authorities

ii. Scaffold erectors shall have the following certifications:

ii.i One Day Workers Safety Organization from regulators or its accredited safety training organizations.

ii.ii. Must be a holder of regulators prescribed Scaffold Erection NC

S. Machine Shop Safety

1. Only Authorized Personnel are allowed to use the machine shop;

2. Required and appropriate PPE shall be used while working in the shop;

3. Never work alone. Use the "buddy system" while working in the shop;

4. No food or drink allowed in the machine shop area;

5. Keep the work area clean and always keep the floor free of grease, oil or any other liquids;

6. Horseplay and/or running are not allowed;

7. Loose jewelry and clothing including longsleeves and ties should not be worn in the shop;

8. Long hair must be tied back;

9. Seek for your co-worker's assistance in handling large, long, or heavy pieces of material or machine attachments;

10. Report any unsafe acts and conditions to the shop supervisor and/or safety officer;

11. Eye wash and first aid kit station shall be available in a designated place; and

12. Post the machines user's guide and/or safety manuals in a strategic location for easy reference.

T. Tools, Equipment and Machinery Operations

1. Employees must only work with tools and machines that they have been authorized to use;

2. Appropriate tools shall be used on a specific job;

3. Examine each tool for damage before use and do not use damaged tools. Damaged tools shall be reported to proper authorities and repaired before using it again or disposed;

4. All equipment and tools necessary to complete the task must be kept in good condition with regular maintenance;

5. Operate tools according to the manufacturers' instructions;

6. Keep all tools cleaned and stored appropriately when not in use;

7. All portable electrically driven tools shall be properly grounded before use;

8. Iron or steel hand tools may produce sparks that can be an ignition source around flammable substances. Where this hazard exists, spark-resistant tools made of non-ferrous materials should be used where flammable gases, highly volatile liquids, and other explosive substances are stored or used;

9. Air supply shall be shut off when pneumatic tools are not in use;

10. Pointed or sharp tools shall be provided with cover;

11. Do not talk to others while they are operating a machine;

12. Never leave tools unattended, put the tools in the designated toolboxes or cabinets after using them;

13. Never leave a machine while its running;

14. Only one person may work on a machine at a time;

15. When working with another person, only one should operate the machine or switches;

16. Never push a cutter towards your body parts;

17. Work piece must always be secured with a clamps or a vise;

18. Never use compressed air without a safety nozzle to clean the machines and/or clothing;

19. Never remove metal chips, turnings or shavings with your hands;

20. Disconnect tools when not using them, before servicing and cleaning them, and when changing accessories such as blades, bits, and cutters;

21. Wear proper apparel for the task. Loose clothing, ties, necklaces, or jewelry can become caught in moving parts;

22. Electrical hand tools shall not be used in a combustible environment until the Supervisor certifies that conditions are safe and a Hot Work Permit has been issued; and

23. Follow the machines user's guide and/or safety manuals. Never overload the capabilities of the machinery.

U. Machine Guarding

All moving parts of prime movers, transmission equipment and all dangerous parts of driven machinery shall be effectively guarded, unless so constructed or located to prevent any person or object from coming or brought into contact with them;

1. No person shall remove or make ineffective any safeguard, safety appliance, or safety device guarding a dangerous machine or machine part unless such it authorized and the machine is stopped for the purpose of immediately repairing and adjusting such machinery, guard, appliance or device;

2. Warning signs with standard color shall be installed near the machine being repaired or its guards removed;

3. Upon completion of the repairs or adjustment, such guards, appliances or devices shall immediately be reinstalled before the machine is used;

4. Guards shall be designed, constructed and used that they will:
   a. Provide positive protection
   b. Prevent all access to the danger zone during operations
   c. Not interferes unnecessarily or inconvenience operation or production
   d. Operates automatically or with minimum effort
   e. Be suitable for the job and the machine
   f. Not obstruct or interfere with machine oiling, inspection, adjustment and repair
   g. Withstand long use with minimum maintenance
   h. Resist normal wear and shock
   i. Be durable, fire and erosion resistant
   j. Not constitute a hazard by themselves; and
   k. Give protection against operational contingencies and not merely against normally expected hazard

5. Standard guards or enclosures shall be made of materials suitable for the purpose for which they are designed and constructed; and

6. All machinery guards shall be securely fastened to the machine or to the floor, wall or ceiling and shall be kept in place whenever the machine is in operation.

V. Biological Safety

1. General Requirements

a. All field activities/works shall be covered with appropriate safe work procedures;

b. Required PPE shall be used while doing field activities such as long pants, long-sleeves shirts, shin guards, heavy high top shoes or hiking boots to cover expose body parts and provide some protection and use walking sticks; and

c. Staff training should always include information on safe methods and prevention for highly hazardous procedures that are commonly encountered during outdoor field work.

2. Workplace Inherent Biological Hazards

a. To avoid bees and wasp stings:

i. Avoid known areas of concentration such as hives and nests;
ii. If flying insects are around, leave the area and refrain from swatting at them;
iii. Avoid sugary foods, drinks and strong fragrances or perfumes because some insects may be attracted to them;
iv. Wear long pants, and long-sleeves shirts to provide some protection;
v. Wear heavy high top shoes or boots, protective gloves and use walking sticks; and
vi. If stung by bees or wasp seek immediate medical attention.

b. To avoid snake bite:

i. Always ask about snakes from local residents and employ local resident as a guide;
ii. When walking, keep your eyes on your path and avoid stepping into clumps of vegetation;
iii. Don't step over logs or large rocks if you cannot see over them;
iv. Wear long pants, and long-sleeves shirts to provide some protection;
v. Wear heavy high top shoes or boots, protective gloves and use walking sticks;
vi. Do not kill non-poisonous snakes, they keep the food supply low and keep the population of poisonous snakes down;
vii. Never pick up an apparently dead snake with your bare hands. Even severed snake head can inflict a deadly bite for 15 - 30 minutes after separation from the body. Should it be necessary to move the dead snake, use a stick; and
viii. If bitten seek medical assistance at the nearest clinic or hospital, vials or antivenin shall be approved and supplied by the Research Institute for Tropical Medicine (RITM).

c. To avoid leeches:

i. Wear long pants, and long-sleeves shirts to provide some protection;
ii. Wear heavy high top shoes or boots, protective gloves and use walking sticks;
iii. During rest, find a spot with direct sunlight, leech do not exist in dry and hot places;
iv. Avoid connecting your tents with trees and branches; and
v. Avoid going into warm and wet places, leech likes warm and wet places.

W. Emergency and Disaster Management

Emergency preparedness and an effective execution of response actions help protect employees, contractors, the public and the environment in the event of an accident.

a. Develop site specific emergency and disaster response plans to ensure the safety of our employees, contractors, operations and affected communities

and prevent loss of life, serious injury, or significant environmental or public health impacts;

b. Provide the necessary human, equipment, and material resources to execute the emergency response plans;

c. Communicate emergency response plans to employees, contractors, communities, regulatory agencies and other stakeholders. Coordinate these plans with outside authorities and establish clear roles, responsibilities, and resources;

d. Plan and conduct periodic emergency and evacuation drills to ensure a constant state of operational readiness to respond to actual incidents;

e. Review and revise, where necessary, emergency plans after a critique of drills or actual emergencies. Apply corrective and improvement actions and monitor to ensure completion. Share best practices and lessons learned with others;

f. Align and integrate emergency plans with business; and

g. Implement, as and when required, site specific emergency and disaster response plans with a sense of urgency to ensure the safety and health of people, operations and affected communities and prevent loss of life and property, serious injury, or significant environmental or public health impacts.

X. Communication

Establish a culture that encourages and promotes open communication and informed decision making shall be maintained. Health and Safety information will be shared in a timely manner with management, employees, business partners, the public and key stakeholders through the various channels available.

To strengthen and reinforce an effective health and safety culture. The Health and Safety Communication Program may include, but is not limited to:

a. Monthly safety meetings;
b. Use of Health and Safety Bulletin Boards;
c. Safety posters, announcements and other materials used
d. to support the on-going safety programs and activities;
e. Use of Company intranet and Health and Safety webpage;
f. Health and Safety Performance Awards for Individuals, Groups, and Contractors;
g. Lessons Learned Bulletins and First Alerts;
h. Contests (slogans, posters, suggestions, etc.); and
i. Surveys and Questionnaires

Y. Incident Reporting and Investigation

Develop, implement and maintain standard processes for reporting and investigation of hazards, injuries, illnesses, incidents and any other systems failures that may affect the health and safety of staff, contractors and the community and

which may adversely impact on the environment. Procedures shall enable the Employers to:

a. Every Employer shall report to the Bureau in writing, the result of the investigation of all Lost Time Accidents with major loss / damages in accordance with relevant Laws, Rules

b. Every employer shall utilize the fastest available means of communication and shall be made within twenty-four (24) hours after occurrence of any, but not limited to, the following incidents:

   i. Fatal accidents;
   ii. Hospitalization of three (3) or more persons;
   iii. Accidental detonation of explosives including blasting agents;
   iv. Explosion or blowout;
   v. Accidental or over-exposure to ionizing radiation;
   vi. Accidental exposure to immediately dangerous to life and health levels of toxic substances; and

c. Investigate incidents (including near misses) by trained and competent personnel to identify and analyze root causes and system failures;

d. Identify and implement corrective actions and continual improvement opportunities in order to prevent future incidents, based on generated incident data and incident investigations;

Z. Health, Environment and Safety Plan

Health, Environment and Safety planning begins with anticipating and understanding health, environment and safety hazards in the workplace and assessing consequent risks and opportunities to protect people, the environment and the business. Risks are addressed by levels of management appropriate to the nature and magnitude of the risk. The early recognition, identification and understanding of applicable laws and regulations, stakeholder expectations and emerging issues during the business planning phase are helpful in evaluating risks and opportunities.

a. Prior to the performance of work, Employers shall submit a HES Plan, duly signed by the Project Manager and specific to the project. The HES Plan shall describe the health, environmental and safety issues and risks associated with the work;

b. HES Plan shall be based on, and comply with, applicable laws, decrees, administrative rules and regulations, relevant Employer policy and operating procedures, and relevant best practices;

c. If a HES Plan is required by local regulations, Employer shall not start work without an HES Plan that has been accepted by local authorities having jurisdiction;

d. Prior to starting work, all Employees personnel shall participate in a health, environmental, and safety (HES) protection orientation with a designated Employer representative; and

e. Prior to starting any work, Employer shall perform a Job Hazard Analysis (JHA). The JHA shall (i) carefully study and record each step of a job, (ii) identify existing and/or potential equipment, environmental, or action-generated job hazards, and (iii) determine the best way to perform the job to reduce or eliminate hazards. During a daily pre-task tool box meeting, Employer shall ensure that the JHA is communicated to and fully understood by all persons who will participate in the performance of the work. Employer shall ensure that the JHA has been communicated to and fully understood by all employees as indicated by the signatures of the employees concerned in an attendance sheet of that meeting.

AA. Geohazards Requirements

1. The Employer shall establish a geohazard assessment team and mandate;

2. The team shall identify the presence of geohazards within the contract area and/or nearby vicinities, thru the inventory of landslides, flooding, and rock fall prone areas;

3. The Employer shall initiate mitigating engineering and administrative measures and formulate emergency/contingency plans;

4. The team shall meet annually or as the need arise;

5. All Employees and the communities shall be properly informed of the major geohazards, thru posting of illustrations in the form of schematics (maps, posters, signages and drawings) in public places; and

6. In the occurrence of geohazard events such as landslides, earthquakes and floodings, the Disaster Emergency Preparedness/Contingency Plan and Response Team shall be deployed to the concerned area.

Section IV. Power Plant and Control Room Safety

A. Power Plant

1. Power Plant Safety

   a. All plant personnel shall be qualified and trained in their respective job assignments;

   b. All plant personnel shall undergo occupational safety and health orientation and training;

c. All plant personnel shall immediately report any observed unsafe condition, incident and accident in accordance with the established company safety reporting procedures and guidelines;

d. All plant personnel shall be required to wear appropriate and prescribed PPE's;

e. Only qualified and Authorized Personnel shall conduct repairs and calibration to any plant equipment and instruments;

f. All power plants shall establish work procedures for:

i. Start-up and Shut-down
ii. Emergency
iii. Normal and Abnormal Operation
iv. Maintenance Work for the following:
- Pressure Vessel
- Pumps
- Condensers
- Cooling Towers
- Turbines and Generators
- Electrical and Instrumentation

Such procedures shall include hazard identification, analysis, mitigation and emergency response; and

g. All works shall be covered with appropriate safe work permits.

B. Control Room Safety

1. Unauthorized personnel are prohibited from manipulating control panel knobs, buttons, and switches. Bystanders are not allowed inside the control room unless authorized;

2. Keep air conditioning unit running 24 hours a day to maintain the control room temperature and to keep the air clean and filtered;

3. Control rooms are NO SMOKING areas and such policy shall be observed at all times;

4. LOTOTO procedure and proper clearance from the authority shall be strictly complied with;

5. Automatic/emergency lighting system shall be provided at all access and means of egress; and

6. Keep the door of circuit breaker/panel always closed.

C. UPS and Battery Bank Room Requirements

1. Unauthorized personnel are not allowed to enter the room;

2. Air conditioning unit must be operated 24 hours a day at temperature not greater than 15^0C for electronic equipment cooling;

3. Keep battery bank free from leaking solutions;

4. Do not use battery room as dressing room;

5. The exhaust ventilation must be placed in the proper portion of wall ceiling to eliminate the explosive gas emitted by the battery;

6. The DC system shall be readily available whenever the DC power is interrupted to the system;

7. Eyewash station must be provided near the battery room;

8. Check-up of battery electrolyte leak and specific gravity should be done regularly; and

9. Proper handling/storage/disposal of unserviceable batteries should be observed in compliance with regulatory requirements.

D. Electrical Power Facilities and Equipment Repair and Troubleshooting

1. Never attempt to execute troubleshooting and repair of any line conductors and electrical equipment and circuitry at compressor control panel board without permission and proper coordination with FCRS supervisor;

2. Always wear safety rubber shoes when performing troubleshooting and repair of any faulty line conductors encased in metallic cable tray;

3. Place warning tags (indicating reasons for isolation) on any circuit cut-out/breakers with the requested “DE-ENERGIZE” line associated;

4. Insulate all dangling and bare terminals of power conductors right after disconnection;

5. De-energize all power line conductors, when troubleshooting and repairing of a particular line running and encased with other lines in metallic cable tray;

6. Ensure all electrical tools/equipment used are properly insulated and must be capable to handle the voltage of the work piece;

7. Conduct insulation resistance testing on any line conductors and equipment being repaired and/or replaced prior to re-energization to determine the di-electric strength of the insulation; and

8. Advise superior immediately any faults, tripping or hazards observed on any electrical equipment or installation.

Section V. Solar Energy Operation

A. Solar Energy Operation Requirements

1. All solar energy operations shall comply with the following requirements:

    a. Orientation/Training;
    b. Work Permits;
    c. Standard Operating Procedure;
    d. Close Supervision;
    e. Monitoring Tools/Instruments;
    f. Communication Tools/Equipment;
    g. Emergency Response Team; and
    h. Personal Protective Equipment.

2. All solar energy operations shall comply with the local, national, and international standards such as but not limited to the following:

    a. Relevant laws & rules & this Code of Practice;
    b. Bangladesh Electrical Code;
    c. Bangladesh Grid and Distribution Code;
    d. Environmental Impact Assessment;
    e. Occupational Safety and Health Standards;
    f. National and Local Building Code;
    g. National and Local Fire Protection Code and Standards; and
    h. Applicable IEC and UL Standards.

B. ON-SITE SOLAR RESOURCE ASSESSMENT

1. Only Authorized Personnel shall supervise and conduct on-site solar resource assessment;

2. All devices, tools, and equipment shall be used, handled, installed, maintained, calibrated and stored only by a duly qualified and Authorized Personnel;

3. Meteorological stations and its equipment shall be constructed or installed and maintained free from electrical, mechanical, health and environmental hazards;

4. All meteorological stations shall follow proper grounding and lightning protection in accordance to the Bangladesh Electrical Code;

5. All data shall be recorded and be protected from damage or loss; and

6. Decommissioning of meteorological station shall be in accordance to the Abandonment and Termination Plan.

C. SOLAR PHOTOVOLTAIC (PV)

1. General Rule

a. Only Authorized Personnel shall be allowed to supervise the manufacturing, handling, storing, installing, operating and maintaining of Solar PV and its components.

2. Manufacturing

a. All Solar PV and its components shall be manufactured in compliance to applicable IEC Standards.

3. Handling, Storage, and Disposal

i. Handling, Storage, And Disposal of PV Module

a. Always handle solar modules by their long side and keep away from the module surface when handling;

b. Wear gloves to avoid injury by sharp edges;

c. Transport solar panels onto and around the work site using mobile carts or forklift;

d. Never climb ladders while carrying solar panels. To get solar panels onto rooftops, use properly inspected cranes, hoists or ladder-based winch systems; and

e. Always carry PV with both hands. Do not use the junction box as a handle to hold or transport the PV.

ii. Handling, Storage, and Disposal of Battery

a. Do not place metal objects on top of batteries and insulate terminals to prevent short circuit;

b. Wear protective clothing such as chemical splash goggles and a face shield when handling batteries

c. Wear acid-resistant equipment such as gauntlet style gloves, an apron and boots;

d. Keep batteries away from potential sparks or flames. Store batteries in a cool, dry, well-ventilated area;

e. Cover maintenance tools with several layers of electrical tape to avoid sparking;

f. Batteries should then be wrapped in a heavy duty plastic or encapsulated with concrete; and

g. The storage place should have restricted access and be identified as a hazardous material storage place.

4. Installation

a. When working with PV exposed to light, follow all applicable regulations regarding working with live electrical equipment;

b. Always use equipment, connectors, wiring and support frames suitable for PV system;

c. For roof-top installation, PV should be mounted over a fire resistant covering which is rated for the application;

d. Always observe appropriate clearances between the module back surface and structure (roof or ground) for rear ventilation and module cooling, and between module to module for thermal expansion;

e. Do not touch electrical terminals or the ends of any wire while installing the PV. Do not open electrical connections or unplug connectors while the PV system circuit is under load;

f. Do not install PV near equipment or locations where flammable gases can be generated or collected;

g. Do not use PV with different electrical performance or physical property in the same system;

h. To reduce the possibility of electrical shock and protect the PV system from lightning, all module frames and mounting racks must be properly earth grounded in accordance with the Bangladesh Electrical Code before wiring the circuit;

i. Do not wear metallic rings, watchbands, ear, nose, or lip rings or other metallic devices while installing or troubleshooting photovoltaic systems;

j. Completely cover all modules with an opaque material during installation to prevent electricity from being generated;

k. Observe the instruction and safety precautions for all other components used in the system, including wiring and cables, connectors, DC-breakers, mounting hardware, inverters, etc.;

l. Keep spectators well away from system while transporting and installing mechanical and electrical components;

m. Never attempt to modify a solar module or take it apart. Never remove any markings or labels applied or parts fitted by the manufacturer;

n. Do not apply any paint or adhesive to a solar module;

o. Never leave module unsupported or unsecured; and

p. Do not install or handle the modules when they are wet or during periods of high wind.

5. Operation and Maintenance

i. PV Module

a. Periodic inspection of the PV system for tight electrical and mechanical connection and free of corrosion should be performed;

b. Periodic cleaning of PV is not required, but is recommended, as periodic cleaning can result in better performance of the PV system, especially in regions with low levels of annual precipitation;

c. Do not remove the dirt by scraping or rubbing away from the module front surface when dry as this may cause micro-scratches on the glass and lead to module performance degrading;

d. Only water and ambient temperature can be used for regular washing or rinsing of the module front glass to remove dust, dirt or other deposits;

e. Mild detergent or glass cleaner may be used to clean ingrained dirt, but harsh cleaning materials such as scouring powder, steel wool, scrapers, blades, or other sharp instruments must not be used to clean the module;

f. Always wear rubber gloves for electrical insulation while maintaining, washing or cleaning panels;

g. Never attempt to clean a PV module with broken glass or other signs of exposed wiring, as this presents a shock hazard;

h. Check the electrical and mechanical connections periodically to verify that they are clean, secure and undamaged;

i. To avoid possible thermal shock clean the modules during early morning, when the module is still cold;

j. Do not touch any damaged cables on your solar system; and

k. Inspect solar panel regularly for dirt such as dust or bird droppings.

ii. Battery

a. Safety googles must be worn when performing battery maintenance;

b. Keep all sparks, flames and cigarettes away from the battery;

c. Never try to open a battery with non-removable vents. Keep vents tight and level except when servicing electrolyte;

d. Only connect together batteries of identical make and model. Never mix different battery types;

e. Never lean over a battery when boosting, testing or charging;

f. Use tools with insulated handles to carry out any maintenance;

g. Check for damaged or leaking batteries;

h. Neutralize with baking soda any electrolyte that spills on a work area. After neutralizing, rinse contaminated area clean with water;

i. Always pour the concentrated acid slowly into the water. Never pour water into the acid;

j. Clean the battery terminals with a plastic brush because wire brushes could create static and sparks;

k. Always stir the water while adding acid. If noticeable heat develops, allow solution to cool before continuing to add the acid; and

l. Exercise caution when working with metallic tools or conductors to prevent short circuit and sparks.

6. BALANCE OF SYSTEMS (BOS)

a. Only Authorized Personnel shall be allowed to supervise the manufacturing, handling, storing, installing, operating and maintaining of Solar PV BOS equipment; and

b. All mounting system and wiring methods shall be designed in accordance with the Bangladesh Electrical Code.

Section VI. Non-Power Applications of Solar Energy

A. Solar Water Heater

1. Only Authorized Personnel shall be allowed to supervise the manufacturing, handling, storing, installing, operating and maintaining of Solar Collectors and its components; and

2. All Solar Collectors operations shall observe strict compliance to all applicable IEC Standards.

Section VII – Separability Clause

In the event that any provision of the Solar Code or the application of such a provision to any person or circumstance is declared invalid, the remainder of the Solar Code and the application of such a provision to other persons or circumstances shall not be affected by such declaration.

Section IX – Resolution of Conflicts and Overlapping Jurisdictions

In case any provision of the Solar Code conflicts, duplicates or overlaps with rules and regulations being implemented by other government agencies, such conflict, duplication or overlapping shall be resolved by coordination or any other means of cooperation among such agencies.

Section X – Repealing Clause

All solar safety and health rules and regulations, orders or parts thereof which are inconsistent with or contrary to the Code are hereby repealed, amended, or modified accordingly.

Md. Robiul Islam	AHM Abdur Rahman	Shakhawat Hossain
Company Secretary	Director	Managing Directo

Annexure - 34

Completed Training Schedule
(Jun 2023 – Aug. 2023)

Dynamic Sun Energy Private Limited

100 MW ac Solar Park

Bhabanipur, Hemayetpur, Pabna, Bangladesh

Completed Training Schedule (June 2023 - August 2023)

Occupational Health and Safety Training						
Sl. No.	**Date**	**Location**	**Duration**	**Trainer/Instructor**	**Nature of Participants**	**No. of Participants**
1	05-Jun-23	Power Plant Site	2 hrs.	Md. Omar Faruk AGM (Admin & Operation)	Power Plant Workers	59
2	12-Jun-23	Power Plant Site	2 hrs.	Md. Omar Faruk AGM (Admin & Operation)	Power Plant Workers	46
3	19-Jun-23	Power Plant Site	2 hrs.	Md. Omar Faruk AGM (Admin & Operation)	Power Plant Workers	57
4	26-Jun-23	Power Plant Site	1.5 hrs.	Md. Omar Faruk AGM (Admin & Operation)	T/L Workers	26
5	03-Jul-23	Power Plant Site	2 hrs.	Md. Omar Faruk AGM (Admin & Operation)	Power Plant Workers	42
6	10-Jul-23	Power Plant Site	2 hrs.	Md. Omar Faruk AGM (Admin & Operation)	Power Plant Workers	58
7	17-Jul-23	Power Plant Site	1 hr	Md. Omar Faruk AGM (Admin & Operation)	Power Plant Workers	45
8	24-Jul-23	Power Plant Site	2 hrs.	Md. Omar Faruk AGM (Admin & Operation)	Power Plant Workers	49
9	31-Jul-23	Power Plant Site	1.5 hrs.	Md. Omar Faruk AGM (Admin & Operation)	T/L Workers	35
10	08-Aug-23	Power Plant Site	2 hrs.	Md. Omar Faruk AGM (Admin & Operation)	Power Plant Workers	57
11	14-Aug-23	Power Plant Site	1 hr.	Md. Omar Faruk AGM (Admin & Operation)	Power Plant Workers	40
12	21-Aug-23	Power Plant Site	1 hr.	Md. Omar Faruk AGM (Admin & Operation)	Power Plant Workers	61
13	28-Aug-23	Power Plant Site	1 hr.	Md. Omar Faruk AGM (Admin & Operation)	T/L Workers	29
Fire Fighting Mock Drill						
1	21-Jun-23	Power Plant Site	2 hrs.	Md. Omar Faruk AGM (Admin & Operation)	Power Plant Workers	63
2	25-Jul-23	Power Plant Site	2 hrs.	Md. Omar Faruk AGM (Admin & Operation)	Power Plant Workers	57
3	27-Aug-23	Power Plant Site	2 hrs.	Md. Omar Faruk AGM (Admin & Operation)	Power Plant Workers	48
Emergency Situation Handling Training						
1	08-Jun-23	Power Plant Site	1.5 hrs.	Md. Rafiqul Islam Security Supervisor	Power Plant Workers	55
2	22-Jun-23	Power Plant Site	2 hrs.	Md. Lablu Mia Security Supervisor	Power Plant Workers	62
3	10-Jul-23	Power Plant Site	2 hrs.	Md. Rafiqul Islam Security Supervisor	Power Plant Workers	45
4	27-Jul-23	Power Plant Site	1.5 hrs.	Md. Rafiqul Islam Security Supervisor	Power Plant Workers	52
5	03-Aug-23	Power Plant Site	2 hrs.	Md. Lablu Mia Security Supervisor	Power Plant Workers	53

6	31-Aug-23	Power Plant Site	2 hrs.	Md. Lablu Mia Security Supervisor	Power Plant Workers	43
Site Security Training						
1	15-Jun-23	Power Plant Site	1 hr.	Md. Zahurul Islam Security In-Charge	Site Security Guards	24
2	13-Jul-23	Power Plant Site	1 hr.	Md. Lablu Mia Security Supervisor	Site Security Guards	30
3	20-Aug-23	Power Plant Site	1 hr.	Md. Rafiqul Islam Security Supervisor	Site Security Guards	28
PPE Training						
1	03-Jun-23	Power Plant Site	1 hr.	Md. Omar Faruk AGM (Admin & Operation)	Power Plant Workers	47
2	10-Jun-23	Power Plant Site	1 hr.	Md. Omar Faruk AGM (Admin & Operation)	Power Plant Workers	56
3	17-Jun-23	Power Plant Site	1 hr.	Md. Omar Faruk AGM (Admin & Operation)	Power Plant Workers	42
4	24-Jun-23	Power Plant Site	1 hr.	Md. Omar Faruk AGM (Admin & Operation)	T/L Workers	33
5	03-Jul-23	Power Plant Site	1 hr.	Md. Omar Faruk AGM (Admin & Operation)	Power Plant Workers	61
6	08-Jul-23	Power Plant Site	1 hr.	Md. Omar Faruk AGM (Admin & Operation)	Power Plant Workers	45
7	15-Jul-23	Power Plant Site	1 hr.	Md. Omar Faruk AGM (Admin & Operation)	T/L Workers	25
8	22-Jul-23	Power Plant Site	1 hr.	Md. Omar Faruk AGM (Admin & Operation)	Power Plant Workers	44
9	27-Jul-23	Power Plant Site	1 hr.	Md. Omar Faruk AGM (Admin & Operation)	T/L Workers	29
10	05-Aug-23	Power Plant Site	1 hr.	Md. Omar Faruk AGM (Admin & Operation)	Power Plant Workers	40
11	12-Aug-23	Power Plant Site	1 hr.	Md. Omar Faruk AGM (Admin & Operation)	Power Plant Workers	54
12	19-Aug-23	Power Plant Site	1 hr.	Md. Omar Faruk AGM (Admin & Operation)	T/L Workers	20
13	26-Aug-23	Power Plant Site	1 hr.	Md. Omar Faruk AGM (Admin & Operation)	Power Plant Workers	36
14	31-Aug-23	Power Plant Site	1 hr.	Md. Omar Faruk AGM (Admin & Operation)	T/L Workers	27
PV Panel Cleaning Training						
1	11-Jun-23	Power Plant Site	1.5 hrs.	Md. Shamsur Rahman Civil Supervisor	PV Panel Cleaners	34
2	04-Jul-23	Power Plant Site	1.5 hrs.	Md. Shamsur Rahman Civil Supervisor	PV Panel Cleaners	36
3	13-Aug-23	Power Plant Site	1.5 hrs.	Md. Shamsur Rahman Civil Supervisor	PV Panel Cleaners	42