GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BANGLADESH
Prime Minister's Office
BANGLADESH ECONOMIC ZONES AUTHORITY

SABRANG TOURISM PARK

DETAILED MASTER PLAN

DECEMBER 2020

FINAL REPORT

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Government of the People's Republic of Bangladesh

Prime Minister's Office

Bangladesh Economic Zones Authority

DETAILED MASTER PLAN
OF
SABRANG TOURISM PARK

Volume I: Master Plan
Volume II: Infrastructure Plan
Volume III: Development Management Plan
Volume IV: Detail Cost Estimate

CONSULTANTS:

Development Design Consultants Limited (DDC)

DOHWA Consultants Limited

EXECUTIVE SUMMARY

The Detailed Master Plan (DMP) for Tourism Park of Sabrang is first initiative with a vision to meet the present and impending demand on Tourism Industry of Bangladesh. Bangladesh Economic Zones Authority (BEZA) with their own fund initiated to prepare Detailed Master Plan for Sabrang Tourism Park under the project 'Preparation of Detailed Master Plan for Sabrang and Naf Tourism Park' (proposal package no. PS05-BEZA-2017). DMP is a three-tier plan package of which 1st two tiers are Master Plan and Infrastructure Plan. These two reports are prepared for 2021-2036 time period. To ensure timely implementation of these reports, a well-documented Development Management Plan has also been prepared under this project. The jointly organized team of Consultants from home and abroad as well as counterpart experts employed by BEZA are dedicatedly prepared this Master Plan. A list of activities and deliverables have been followed to prepare this Detailed Master Plan for Sabrang Tourism Park.

This Detailed Master Plan Report contains four volumes. Each volume describes different perspective of the master plan with varied data, analysis and outcomes. This report contains Volume - I: Master Plan, Volume - II: Infrastructure Plan, Volume - III: Development Management Plan and Volume – IV: Detail Cost Estimate.

The **Volume – I: Master Plan** comprises with description of master plan and land use zoning plan. This volume also describes the tourism design guidelines for future development of the tourism park. The master plan was composed of seven categories of services and modern facilities. These are: Residential/Hospitality Facility (Beach side Resort and hotel, Lake side Resort and Hotel (South), Lake side Resort and Hotel (North), Service Studio Apartment & General Hotel); Common Facilities (Park, Shopping District, Heritage and Liberation War Museum, Amphitheatre, Amusement Park, Watch Tower and Restaurant, Golf Course & South Tower); Administrative Facilities (Administration Office, Law Enforcement, Hospital, Fire station, Security Staff & Disaster Management Centre); Utility facilities (STP, Solid Waste and e-waste Plant, Power Plant Station, Electrical Sub Station, Bio Gas Plant, Water Reservoir); Institutional Facilities (Welfare Centre & Old home and Community Centre); Transportation Facilities (Bus Depot, Transportation Hub, Jetty Station, Helipad) and Water body, open space and Beach Area (Lake, reserved pond, Road/ Pedestrian/ Bicycle lane, Sea Beach, Green/park & Reserve Area)

Land use zoning of this tourism facilities is broadly divided into seven categories. Most of the land of the park is kept for open space and green area. Almost 60 percent land has been designated as open space and greeneries. Besides, 19.40 percent land is designated for Residential/Hospitality zone, 11.78 percent as Common Facilities zone, 2.47 percent as utility zone, 2.21 percent as Administrative Zone, 1.12 percent as Institutional Zone and 1.06 percent as Transportation Zone. In Master Plan, 50 percent area of Hospitality/Residential Zone is proposed for building footprint in the Sabrang Master Plan and it is projected that 41361 tourists can be accommodate per day in this tourism park whereas 14639 people will be directly employed to serve those tourists. The maximum permissible building height will be G+9 and the function of the building will be accommodated from first floor and the ground floor will be kept vacant as an emergency response.

The **Volume - II: Infrastructure Plan**, contains the assessment of demand of different infrastructure and utility facilities. It also describes the overall utility network of the tourism park.

Transportation Development Plan is prepared for on-site and off-site transportation development. two categories' roads (Arterial Roads and Feeder Roads) are proposed which is 14.572 km under on-site transportation network development. No heavy vehicles are allowed in the Sabrang TP. Road geometry and alignment have been designed considering BUS-12 (Intercity Bus) with a design speed of 25 km/hr. Existing Marine Drive is the main entry point to the Tourism Park. Jetty and Helicopter services are proposed to reach the Tourism Park.

Power Generation and Distribution Plan briefly describes the electricity demand, generation and distribution throughout the tourism area. It also shows the carefully prepared generation and distribution plan with phasing. The total power demand of Sabrang Tourism Park is expected to be 78 MW after the full implementation of Master Plan. Two 1.5 acres land have been allocated for installation of Sub-stations and 8.45 acres land has been allocated for power plant. Apart from that the Proposed Lake bank has been recommended to installation of Solar Panels. The Sabrang Tourism Park is divided into Three Distribution Zones; North, South and Parking zone. North and South Zone will be supplied from two 33 KV power plant and 11 KV sub-stations-1. Central Zone will be supplied from the 11 KV Sub-station-2. PBS supply will be sufficient to meet the power demand of the parking zone. Flood lights, Street lights and Watch tower lights of each zone will be supplied from their respective zone substation.

Water Supply Plan is prepared for on-site water distribution with phasing plan. The on-site water demand for Sabrang Tourism Park is 15,135 m^3/day and 30,270 m^3/2 days. Water collected from Deep tube-well/surface treated water/nearby others source will be stored at first into central underground water reservoir (CUGWR), from where water will be supplied through pipe line network in phase by phase into each plot by pumping. Around 2.05 acres land is reserved for CUGWR and 14.89 km underground pipe line are proposed to distribute the water to the individual plots.

Environmental and Drainage Plan is prepared to drain out the rain water from the tourism park and also some mitigation measures are proposed to make environmentally friendly tourism park. The proposed Lake and Bay-of-Bengal will be used as a Natural Drainage system for Sabrang TP and it's also used as outfall for the Sabrang TP. Road side drainage system is proposed to drain out rain water from the side. Total 16.86 Km road side drains are proposed in the Sabrang TP.

Sewerage Treatment Plan includes sewage treatment on primary, Secondary or biological and tertiary treatment process to improve quality of wastewater for recycle. The consultant team proposed the minimum size for sewers should be 100 mm diameter, minimum velocity 0.6m/sec & maximum velocity will be 2.5m/sec to reduce the chance of blockage and to facilitate cleansing. Total quantity of sewer waste will be generated 12,865 m3/day which will be treated by 3 Sewerage Treatment Plant (STP). About 13.89 Km soil and waste water pipe lines are proposed to collect sewer water from different facilities to STP.

Waste Management Plan is prepared to manage generated solid waste from Sabrang Tourism Park. Total 8750 m^3 waste need to be disposed in the Tourism Park which required 4.6 acres of land. Solid

waste center and Bio-gas plant are proposed for the Sabrang Tourism Site and recommended to establish "Reduce, Reuse, Repair Recycle" concept at hotel level.

Firefighting Plan is prepared considering the devastating consequences and life of the occupants of the building. It is very important to have an effective and reliable fire detection and firefighting system for the Sabrang Tourism Park. 1.96-acre land is reserved for Fire station which is located near the entrance of the tourism park.

Telecommunication and Internet Network is prepared considering the requirement of fixed telephone landlines of the total hotels, apartments, cottages and other buildings. It is calculated by the consultant that total 45Gbps internet and 1100-1200 nos. landlines connection will be required inside the tourism park.

Land Development is essential part of any development project. Almost 4,284,983 m^3 land filling will be needed for the development of the land of Sabrang Tourism Park.

The **Volume-III: Development Management Plan** is prepared to provide a guideline for the Development of Master Plan for Sabrang TP. The purpose of the volume is to provide development guidelines to implement the Sabrang TP. This volume also describes the regulatory context of the plan implementation. The current tourism related rules & regulations and BEZA's practice regulations like National Tourism Policy 2010, Bangladesh Economic Zones Act 2010, Bangladesh Economic Zones (Construction of Building) Rules 2017, Bangladesh Environmental Policy 2013 and Environment Conservation Rules 1997 are reviewed in this volume. This volume also discusses about the implementation mechanism of this Master Plan. Implementation of the master plan is a long-term process and BEZA will play the pivotal role in long-term monitoring and other financial support by coordinating with all-public agencies. Design restrictions like Set-back, building heights, ground coverage etc. are also defined in this volume.

Policy for landuse development management is also described here. The Sabrang TP area is divided into three blocks to provide a systematic way of plot allotment to investors. Every plot has a unique plot number so that tourist can identify plot's location easily. This volume further describes the proposed landuse zones description with value proposition, permitted use of zones and also the environmental policies of those zones. The infrastructure management policies for the transportation, drainage and utilities are also addressed in this volume.

The Master Plan for Sabrang TP has been prepared for development and development control of physical growth of the tourism park in a planned manner for a period of 15 years. The implementation of the Master Plan proposals will be in three phases. The first phase will be for 3-year period for partially operation of the Sabrang TP, 2nd phase will be next seven year and 3rd phase will be implemented after 10 years of development.

The **Volume IV: Detail Cost Estimate** is prepared to provide detail cost of the infrastructure proposed in the Master Plan. Proposed road, drain, land development works, power supply and distribution works, water supply works and sewerage works cost and reference schedule are given in this volume. Preliminary BDT 1216.67 core will need to develop infrastructure of the Sabrang TP, among this BDT 634.54 crore will be required for 1st phase implementation, BDT 332.02 crore will be required for 2nd

phase implementation and BDT 250.12 crore will be required for 3rd phase implementation of the Sabrang TP.

ABBREVIATION AND ACRONYMS

AoI	:	Area of Influence
BMD	:	Bangladesh Meteorological Department
BWDB	:	Bangladesh Water Development Board
B.S	:	British Standards
BBS	:	Bangladesh Bureau of Statistics
BEZA	:	Bangladesh Economic Zones Authority
BM	:	Bench Mark
BNBC	:	Bangladesh National Building Code
BOD	:	Biological Oxygen Demand
BREB	:	Bangladesh Rural Electrification Board
CUGWR	:	Central Underground Water Reservoir
COD	:	Chemical Oxygen Demand
dBA	:	decibel
DDM	:	Department of Disaster Management
DEM	:	Digital Elevation Model
DLRS	:	Directorate of Land Record Survey
DO	:	Dissolved Oxygen
DoE	:	Department of Environment
DPHE	:	Department of Public Health Engineering
EC	:	Electric Conductivity
FC	:	Fecal Coliform
GCP	:	Ground Control Points
GI	:	Galvanized Iron
HDPE	:	High density Polyethylene
HGL	:	Hydraulic Grade Line
IUCN	:	International Union for Conservation of Nature
KM	:	Kilometer
MG Railway	:	Meter Grange Railway
mPWD	:	Meter in Public Works Department
Mn	:	Manganese
MVA	:	Mega Volt Ampere
MW	:	Mega Watt
NFPA	:	National Fire Protection Association
NO	:	Nitric Oxide
NO2	:	Nitrogen Dioxide
NOx	:	Nitrogen Oxides
NH3	:	Ammonia
NH4+	:	ammonium
NPC	:	National Plumbing Code
OHWR	:	Over Head Water Reservoir

ORP	:	Oxidation-reduction potential
PGCB	:	Power Grid Company of Bangladesh
PM	:	Particulate Matter
RoW	:	Right of Way
RTK GPS	:	Real-time kinematic - Global Positioning System
SRDI	:	Soil Resources and Development Institution
SOx	:	Sulphur Oxides
STP	:	Sabrang Tourism Park
SEZ	:	Special Economic Zone
SPM	:	Suspended Particulate Matter
STP	:	Sewerage Treatment Plant
TVS	:	Traffic Volume Survey
TC	:	Total Coliform
TP	:	Tourism Park
TDS	:	Total Dissolved Solids
ToR	:	Terms of Reference
TSM	:	Transportation System Management
TSS	:	Total Suspended Solids
UPC	:	Uniform Plumbing Code
uPVC	:	Unplasticized Polyvinyl Chloride
UTM	:	Universal Transverse Mercator
WASA	:	Water and Sewerage Authority

SABRANG TOURISM PARK

VOLUME-I:

MASTER PLAN

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1 BACKGROUND

1.1 INTRODUCTION

The Detailed Master Plan (DMP) which is the outcome of the last several extensive activities related to physical plan preparation of any area. The inscriptions of completion of the process undertaken by the Bangladesh Economic Zones Authority (BEZA) with their own fund to prepare Detailed Master Plan for Sabrang Tourism Park under the project 'Preparation of Detailed Master Plan for Sabrang and Naf Tourism Park' (proposal package no. PS05-BEZA-2017). DMP is a three-tier plan package of which 1st two tiers are Master Plan and Infrastructure Plan are prepared for 2020-2049 period and Development Management Plan also be prepared for same duration by the joint team of Consultants from home and abroad and counterpart experts employed by BEZA.

The Sabrang Tourism Park is the 1st initiative to prepare a special economic zone especially tourism. The tourism park site is situated on the bank of Bay of Bengal of Sabrang Union under Teknaf Upazila, Cox's Bazar District. Sabrang Union is bounded north-eastern side of the tourism park, Shahporir dwip area is located south-eastern side and Bay of Bengal situated south-western side of the Sabrang Tourism Park.

1.2 PROJECT BACKGROUND

The economic contribution of the global travel & tourism (T&T) sector continues to grow in value and importance relative to the rest of the economy. According to World Travel and Tourism Council, investment and income of tourism sector boosting very fast. In 2018, the total economic contribution of travel and tourism was 10.4% of global GDP, supporting one in 10 of all jobs which is 9.9% total global employment. In 2015, the total economic contribution was 9.8% of global GDP, supporting one in 11 of all jobs in the world. The forecasts of WTTC show that 100 million additional jobs will be created across the world over the next ten years in travel and tourism sector. One in every four new jobs will be created by the sector over the next decade. Among the regions, Asia-pacific will account for 68% of all jobs generated during this period. [Source: World Travel and Tourism Council (WTTC), 2018]

According to Travel and Tourism Global Economic Impact and Trends 2019 of WTTC, the world's top 20 fastest growing travel and tourism economics, Bangladesh is in 11th position (11.6% of total GDP growth). Bangladesh government takes different initiatives to boost up tourism sector which will fall significant impact on National GDP. Government takes policy and planning level strategies to promote tourism facilities to attract international visitor spending their leisure tour in Bangladesh.

In Perspective Plan of Bangladesh (2010-2021) gives priority on private sector investment by incentives such as warehouse facilities, duty drawback and infrastructure facilities through establishment of EPZs and SPZs. Simultaneously it also targets to developing Bangladesh as an exotic tourist destination in Asia and increase contribution in GDP through protection of ecologically attractive areas and promote environment-friendly tourism.

In Seventh Five Year Plan (2016-2020) defines *Tourism* as a service sector and proposed different policy and strategy to develop tourism as a service sector. In seventh five-year plan, new strategy is

taken to diversification and export-led economic growth through establishment of Export Processing Zone (EPZs) and Special Economic Zones (SEZs). On the other hand, the promoting tourist as a service sector policies and strategies are proposed, those are: i) **increase and focus marketing**: Devise and ensure the right level of marketing support in the priority markets; ii) **ensure an adequate supply of qualified human capital**: introduce measures to address issues pertaining to the supply and quality of workforce in the tourism industry; iii) **improve the tourism environment**: improve offerings and accessibility for key tourism enablers (such as taxi services), access to funding, security and regulations as well as improving the service quality of front-line staff; and iv) **rollout of visa facilitation services**: ensure that tourists from our target markets are not subject to overly strict visa procedures.

Bangladesh government has taken major initiative to implement the proposed policies and strategies of Perspective plan and Seventh five-year plan, establishment of Bangladesh Economic Zones Authority (BEZA) in 2010 is one of the implementing initiatives for national plans. BEZA initiated to development of three special economic zones for tourism purpose; those are Naf Tourism Park, Sabrang Tourism Park and Sonadia Eco-Tourism Park. The main focus of those tourism park is not establishment of conventional concept of hotels and motels, BEZA planned to attract tourists from both home and abroad and it will also create scope of investment for foreign and local investor. BEZA aims to establish economic zones in all potential areas in Bangladesh including backward and underdeveloped regions with a view to encouraging rapid economic development through increase and diversification of industry, employment, production and export. BEZA targeted to establish 100 economic zones within 2030, create 1 core new employment and generate additional USD 40 billion for export for the economy.

Establishment of Sabrang Tourism Park is initiates to accomplish the target of BEZA. Provision of adequate facilities will attract people who want to enjoy their vacations in a calm and peaceful environment. After the preparation of master plan and initial development, government will hand over the project to private investors for further development. Proposed Sabrang Tourism Park will be located in once neglected area of Sabrang Union and proposed development will help to get rid of illegal occupation of local inhabitants. Total area of the park is 1048 acres and it will host various tourism and entertainment related facilities. Facilities like hotel complexes, eco-tourism elements, floating jetty, marine aquarium, eco-cottage, floating aquarium and floating restaurant will be located to operate as an exclusive tourism park. Development of river-based transportation system is also a crucial part of the project to ensure easy connectivity between coral island Saint Martin and other eco-tourism parks.

1.3 PURPOSE OF THE DETAILED MASTER PLAN

The Detailed Master Plan (DMP) provides guidance for development of Tourism Park of the Sabrang area. It is concerned with whole range of planning matters for the area declared by gazette of Sabrang. DMP also setting out in detail the changes the authority intends to take place in them and giving guidance on the form of new development. It shows the location of roads, infrastructure, community facilities and acceptable land use zones. Consequently, it can serve as an effective tool to control development.

The specific purposes of the DMP are:

- Set out the planning policies of the tourism park site;
- Intensify the 30 years planning features in Tourism Park;
- Provide a detailed analysis of the area and design of good quality;
- Serve as a reference document for investor attraction and investment;
- Serve as a document for land use and development control;
- Provide infrastructure plan to facilitate Tourism Park as a sustainable manner;
- Provide guidelines for public and private investment priorities;
- Offer clarity and accuracy regarding future development to investors;
- Make recommendations on land development techniques.

1.4 OBJECTIVE OF THE PROJECT

Some objectives of the Detailed Master Plan (DMP) are general and some are more specific in nature. These are separately mentioned below.

1.4.1 GENERAL OBJECTIVES

Two Special Economic Zones (SEZ) is to establish in the Sabrang & Naf Tourism Park with large-scale tourism development containing both public and private investment. This project is to be developed over the long-term, so that it can into a tourism park containing different tourism related facilities.

The general objective of the project is mentioned below:

- To facilitate private investment;
- To promote tourism in Bangladesh and
- Align tourism facilities with regard to best practices, international compliance, quality standards, building codes, good social and environmental practices.

1.4.2 SPECIFIC OBJECTIVES

The specific objectives of this project are mentioned below.

- To examine the Sabrang and Naf Tourism Park site;
- To documentation of its existing facilities of the area;
- To identify opportunities and constraints of the site for Tourism Park and
- To prepare a thirty-year Detailed Master Plan and Development Management Plan for Sabrang and Naf Tourism Park.

1.5 CUSTODIAN OF THE DETAILED MASTER PLAN

Section 17 (1) of the Bangladesh Economic Zones Act, 2010 (Act No. 42 of 2010) empowers Bangladesh Economic Zones Authority (BEZA) to 'Prepare a Master Plan for the land connected with any economic Zones dividing into export processing area, domestic processing area, commercial area and non-processing area (specified for residence, health, education, amusements, etc.)'. At present three tier Detailed Master Plan in the form of Master Plan, On-site and Off-site Infrastructure Plan and

Development Management Plan is prepared by BEZA. BEZA was gazette an area for "Sabrang Tourism Park Economic Zone" on 29th May, 2018 (SRO No. 160-Act/2018). BEZA is the custodian of those lands; as such BEZA is the custodian of the Detailed Master Plan of those area as well. As the custodian of all the three-tier plans for Sabrang Tourism Park area prepared under the present project, BEZA has the responsibility of development control of its jurisdiction area either by itself or with the co-operation of other agencies of the government responsible for carrying out development activities within Special Economic Zones jurisdiction.

1.6 DURATION OF DETAILED MASTER PLAN

Usually, a plan is prepared for a period of 20 to 25 years. According to ToR of the Sabrang and Naf tourism park project, the detailed master plan has to be prepared for 30 years from 2021-2051 period. The consultant's team proposed the Master Plan of Sabrang Tourism Park will be implemented within 15 years (2021-2036) in 3 phases. Each phase has 5 years duration. However, every plan requires periodic review and updating which is usually done every five years. The Consultants propose that the plan should be reviewed at the end of 2026. The master plan will implement 5 years phasing, if any proposed works are remained incomplete during the specific 5 years, the next 5 years phasing plan will be revised according to works.

1.7 REPORT OVERVIEW

This report is submitted as final deliverables among the 4 deliverables under the contract for consultancy services between the Bangladesh Economic Zones Authority (BEZA) and the consultants with joint venture of DDCL, Bangladesh and DOHWA, Korea for the Preparation of Detailed Master Plan for NAF and SABRANG Tourism Park project.

The final report is divided into four volumes, those are:

- Volume I: Master Plan
- Volume II: Infrastructure Plan
- Volume III: Development Management Plan and
- Volume IV: Detail Cost Estimate

This part of the Final Report is **Volume I: Master Plan Report** is describing the Proposed Master Plan for Sabrang Tourism Park. This report describes the planning considerations, Proposed Master Plan, Proposed Land use Plan and the planning guideline needs to be taken to implement the master plan.

1.8 FORMAT OF DETAILED MASTER PLAN

The Detailed Master Plan consists of

a) The Explanatory Report

b) The Integrated Planning Map

a) The Explanatory Report

The Explanatory Report provides an account of the planning process, demographic and socio-economic data, tourist and transport aspects, information of line agencies and a description of the

detailed master plan and infrastructure plan maps. The report contains maps on a scale that is appropriate to the information they carry and convenient for inclusion in a report (A4 and A3 sizes).

b) The Integrated Planning Map

The Integrated Planning Map shows different layers of information like the cadastral base, administrative boundaries, geo-physical features (contour line, water bodies), infrastructures and proposed land use. Integrated maps incorporated in folder.

1.9 DESCRIPTION OF THE PROJECT AREA

1.9.1 INTRODUCTION

Bangladesh Economic Zones Authority (BEZA) has been taken initiative to develop Special Economic Zone (SEZ) on Tourism Development by an official gazette on 2018. The gazetted location Sabrang Tourism Park is Teknaf Sadar Union of Teknaf Upazila under Cox's Bazar district. This chapter describes detail description of the Sabarng Tourism Park site, its connectivity with other area of the country and special features of the Sabrang Tourism Park and its influence area.

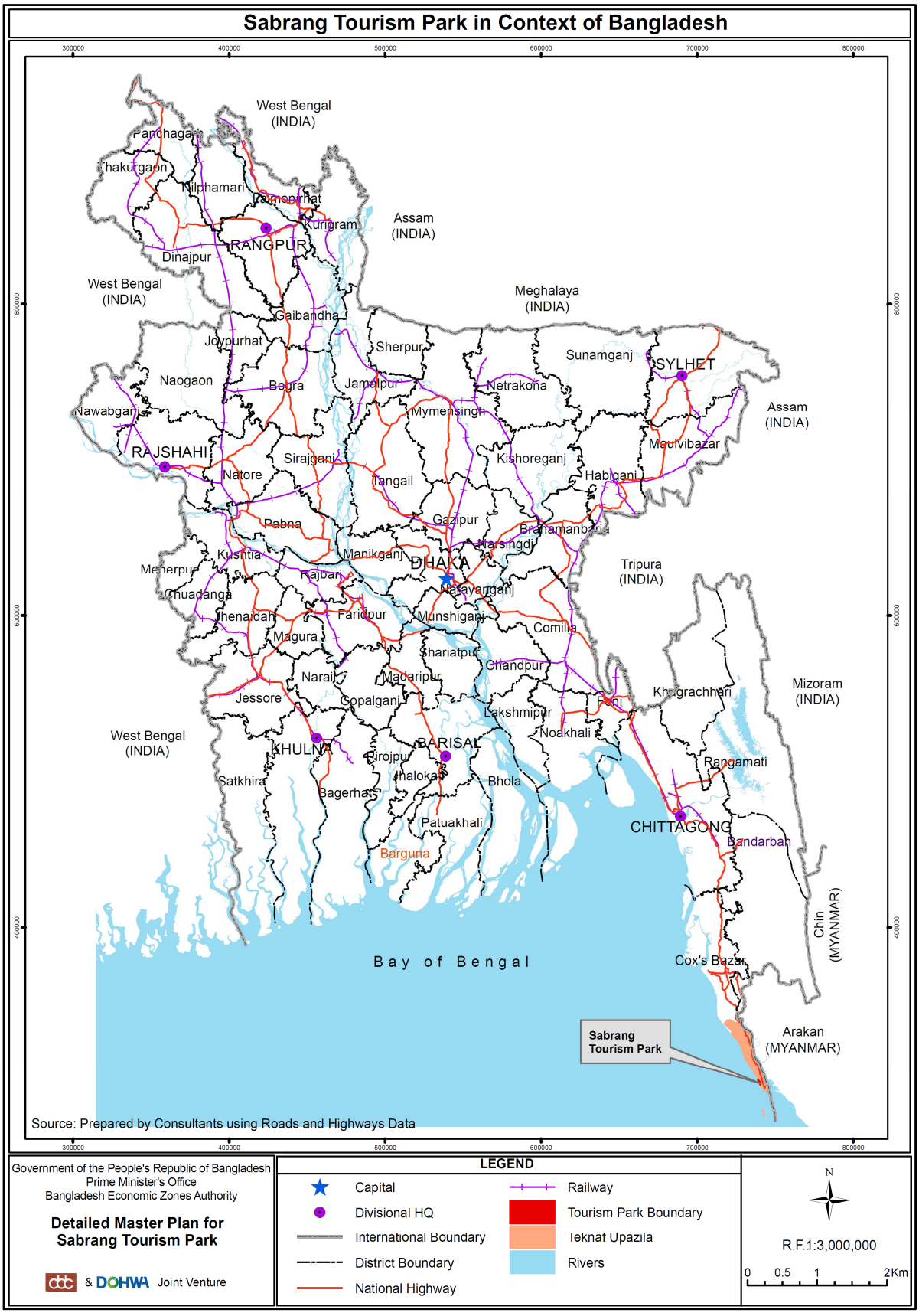
1.9.2 BRIEF HISTORY

Teknaf is an Upazila of Cox's Bazar District in the Division of Chittagong, Bangladesh. It forms the southernmost point in mainland Bangladesh (St. Martin's Island is the southernmost point). The Teknaf Thana was formed in 1930 and it was turned into an upazila in 1983. This upazila is bounded by Ukhia Upazila on the north, the Bay of Bengal on the south, Arakan state of Myanmar on the east, the Bay of Bengal on the west. The name of the region comes from the Naf River which forms the Eastern boundary of the upazila.

Teknaf Peninsula is one of the longest sandy beach ecosystems (80 km) in the world. It represents a transitional ground for the fauna of the Indo-Himalayan and Indo-Malayan ecological sub-regions. Important habitats at the site include mangrove, mudflats, beaches and sand dunes, canals and lagoons and marine habitat. Mangrove forest occurs in Teknaf peninsula both as natural forest with planted stands and mostly distributed in the inter-tidal zone. The Teknaf peninsula mangroves support the habitat of 161 different species of fish. Teknaf reserved forest is one of the oldest reserved forests in Bangladesh.

1.9.3 ADMINISTRATIVE BOUNDARY

As stated earlier the Sabrang Tourism Park is situated southernmost part of the Bangladesh and it's an Island under Teknaf Union of Teknaf Upazila under Cox's Bazar District. The Sabrang Tourism Park in national context area shown in Map 1-1. The Regional administrative context of Sabrang Tourism Park is shown in Figure 1-1 and Figure 1-2.



Map 1-1: Sabrang Tourism Park in Context of Bangladesh

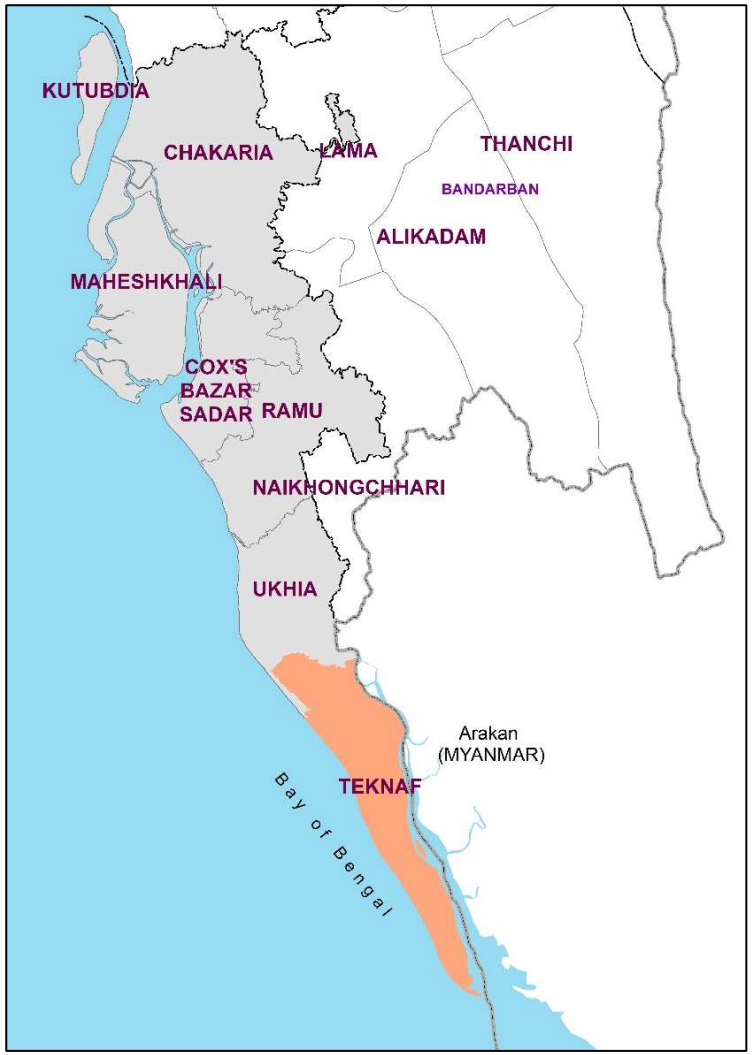


Figure 1-1: Teknaf Upazila in Context of Cox's Bazar District

Figure 1-2: Sabrang Tourism Park in Context of Teknaf Upazila

1.9.4 AREA CONNECTIVITY

1.9.4.1 INTERNATIONAL CONNECTIVITY

- **Air Connectivity**

Cox's Bazar Airport is 306 km away from Dhaka International Airport and Chattogram International Airport is 103 km by air. Cox's Bazar Airport is 82 km driving distance from the Sabrang Tourism Park. The Airport is being considered to upgrade International Standard by the Civil Aviation and Tourism Ministry. The existing Air connectivity to Cox's Bazar is Dhaka International Airport - Cox's Bazar Airport or Chattogram International Airport to Cox's Bazar by road.

1.9.4.2 NATIONAL CONNECTIVITY

- **Rail Connectivity**

The Cox's Bazar district does not possess any railway connectivity. Nearest existing railway station is Chattogram railway, which is 150 km away from Cox's Bazar (approx.). The Chattogram railway Station 320 Km railway distance from Dhaka Kamlapur Railway Station. A new railway station has been proposed at Gundum, which is 50 km away from the Sabrang TP.

- **Road Connectivity**

The Cox's Bazar town is 398 Km roadway distance from Capital City Dhaka and 150 km roadway distance from Chattogram city.

- **Air Connectivity**

The Shahjalal International Airport (Dhaka) is 50 minutes air travel time from Chattogram Airport and 60 minutes air travel time from Cox's Bazar Airport. The Sabrang Tourism Park is 82 Km Roadway distance from Cox's Bazar Airport and around 210 km from Chattogram Airport. (Figure 1-3)

1.9.4.3 REGIONAL CONNECTIVITY

- **Rail Connectivity**

The Chattogram Railway Station is 227 Km away from Sabrang Tourism Park which is existing nearest Rail Station from Park.

- **Road Connectivity**

Sabrang Tourism Park is 227 km roadway distance from Chattogram City and 82 Km roadway distance from Cox's Bazar town (Figure 1-4).

- **Air Connectivity**

The Cox's Bazar Airport is 82 Km Away from Sabrang Tourism Park.

1.9.4.4 LOCAL CONNECTIVITY

- **Rail Connectivity**

Proposed Ghundhum Rail Station is 50 km away from the Sabrang TP.

- **Road Connectivity**

Sabrang Tourism Park is about 82 km away from Cox's bazar town and 7 km away from Teknaf town on the side of Marine Drive (Figure 1-5).

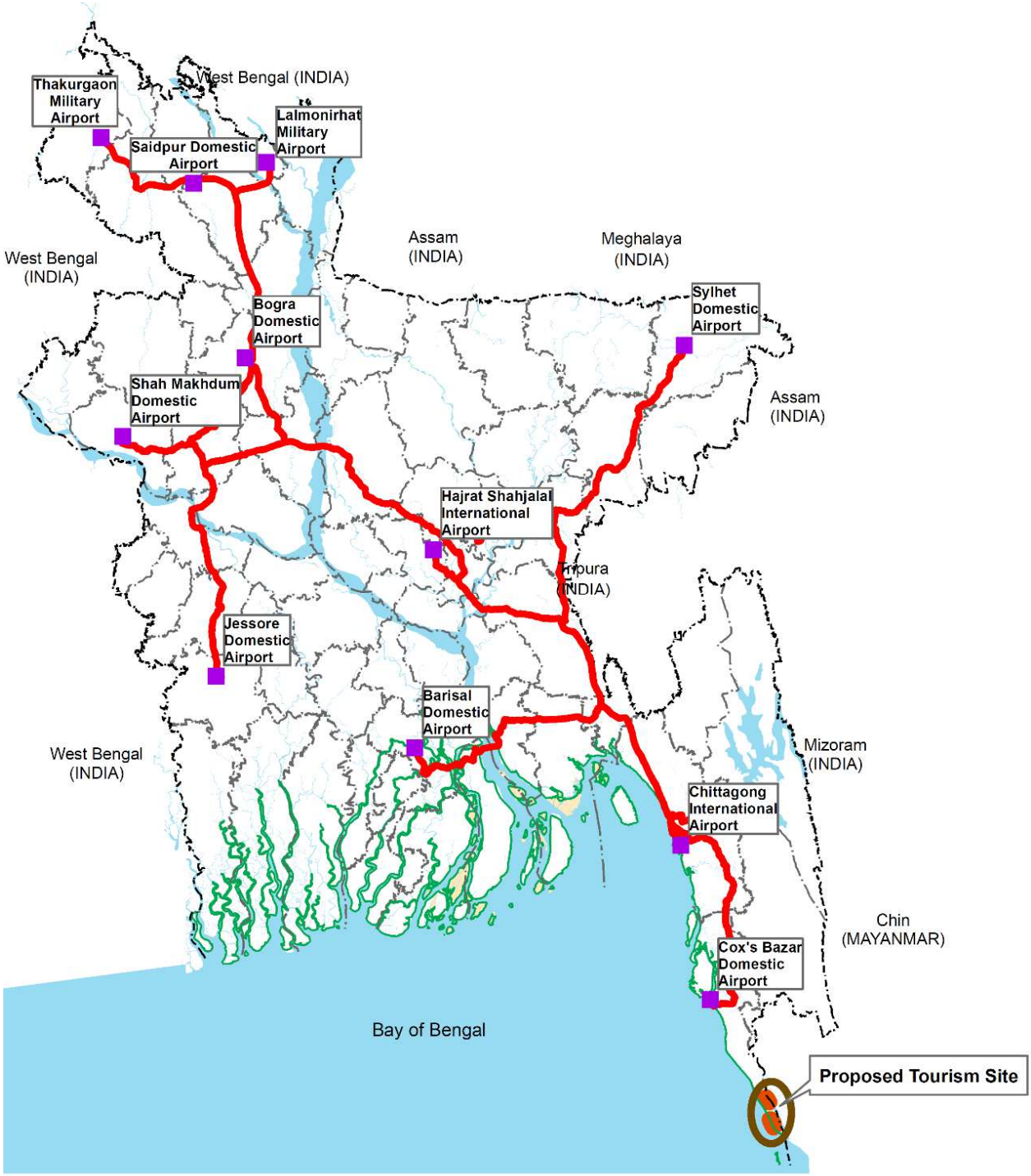


Figure 1-3 Highway Network and Air Connectivity

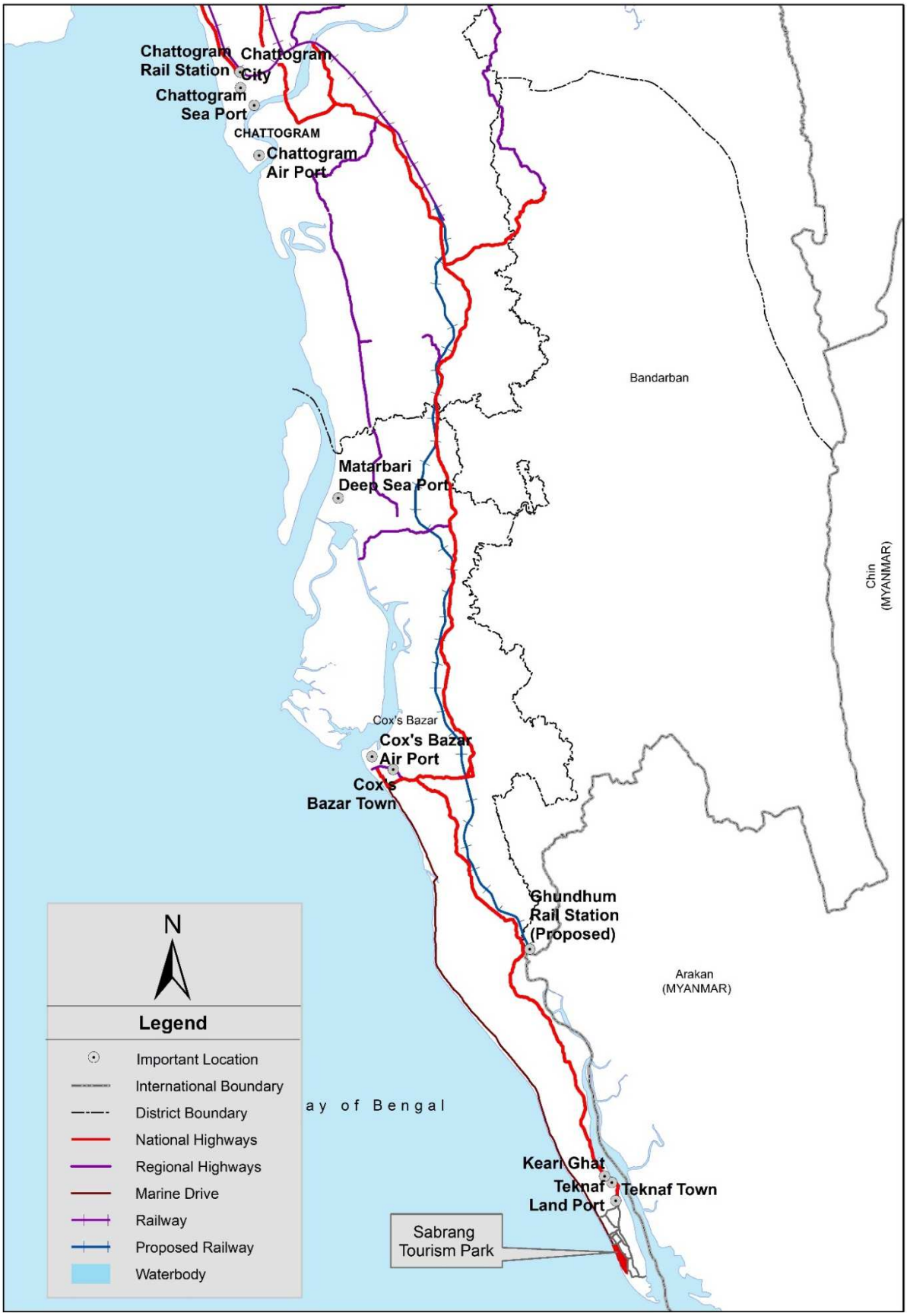


Figure 1-4: Regional Connectivity around Proposed Sabrang Tourism Park.

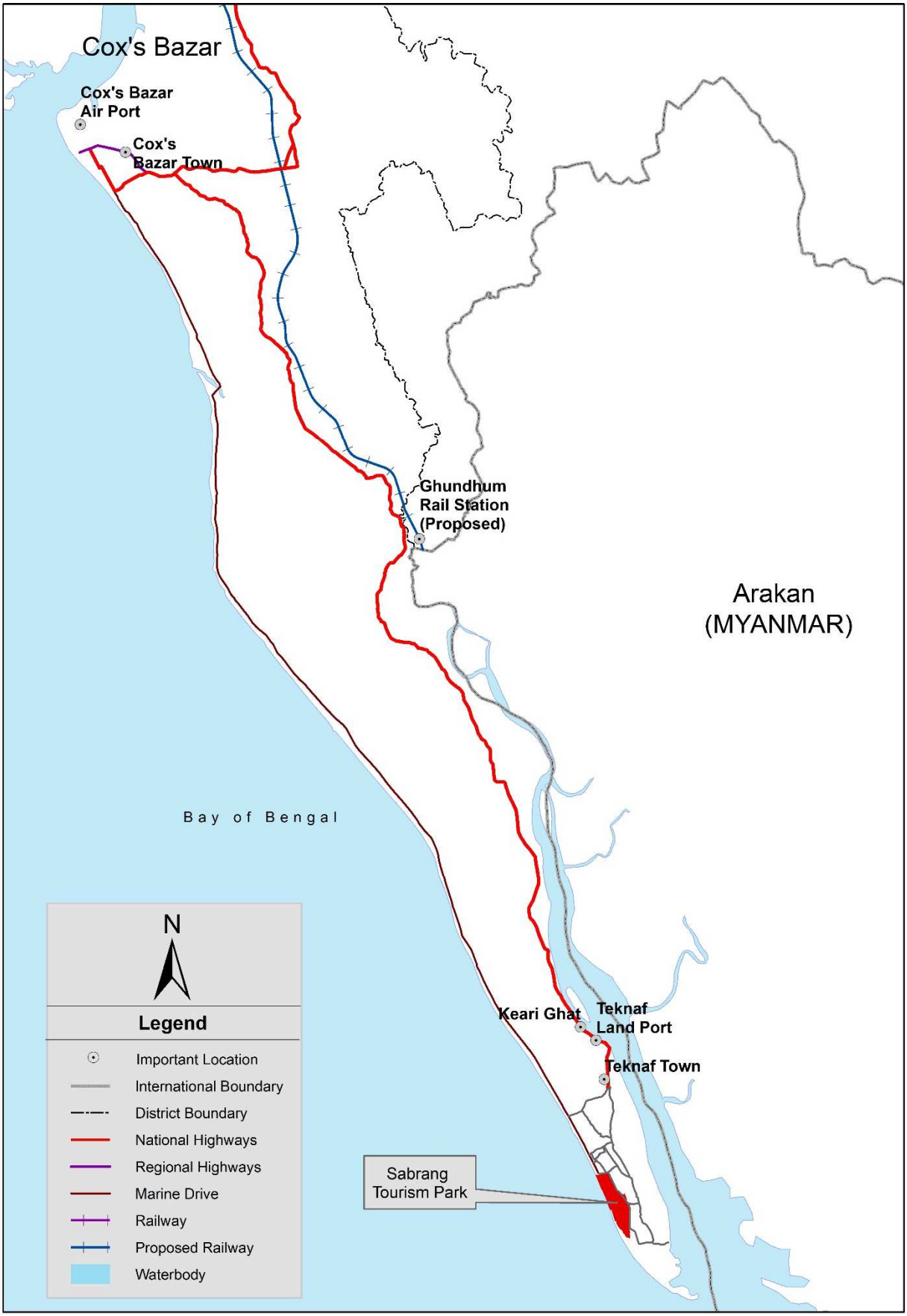


Figure 1-5 Local Connectivity around of Sabrang Tourism Park.

1.10 STAKEHOLDER CONSULTATION

Stakeholder consultation is an essential element of modern planning. Stakeholder involvement helps to get the measure about the aspirations of the stakeholders regarding development. In order to prepare the plan in line with the desire of the people several formal and informal meetings were arranged with the stakeholders. In the initial stage stakeholders were appraised about the techniques of the plan preparation process.

1.10.1 FIELD VISIT

Representatives from the consultants' team and BEZA officials have been visited to the Sabrang Tourism Park Site in several times. In the initial stage of project, a reconnaissance survey has been conducted to identify the existing problems, development constraints and future development potentialities of the Sabrang Tourism Park. Site Engineer of the contractors of this project from BEZA showed different aspects of the projects including the project boundary. The team had discussions with the Engineer so as to obtain full appreciation of Sabrang Tourism Park and to identify the scope of survey and investigations needed. The reconnaissance team looked into the site constraints of utilities, shifting of major utilities, availability of utility services (like electricity, water, sanitation, etc.) near and around the proposed site, probable road communication to the site, etc.

Honourable Executive Chairman Sir of BEZA also visited the Sabrang Tourism Park Site. The expert team of the Consultants was also given accompany and discussed several issues regarding the Master Plan. Photographs of several field visit are shown in Figure 1-6, Figure 1-7, Figure 1-8 and Figure 1-9.

Figure 1-6: Reconnaissance survey by Manager (MIS and Research), BEZA on 22 December 2018

Figure 1-7: Site visit by Executive Chairman, BEZA on 4th January, 2019

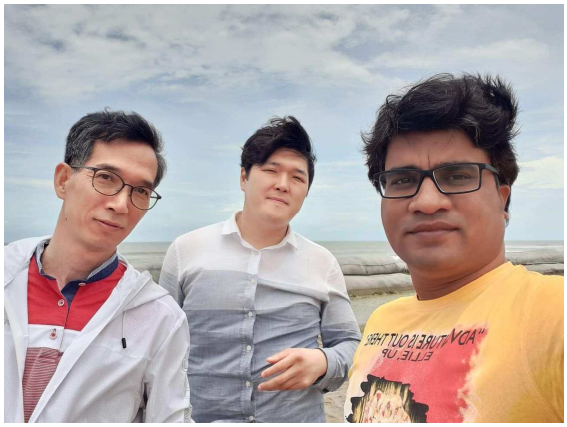



Figure 1-8: Site visit by Infrastructure Expert (International) on 1st August, 2019


Figure 1-9: Site visit by BEZA officials and Consultants Team on 22nd December, 2019

1.10.2 MEETING WITH BEZA

Several formal and informal meeting was conducted with Executive Chairman, BEZA; officials with BEZA. The following formal meetings noted in Table 1-1 which held different stages of the project. There was also continuous interaction between the DDC-DOHWA project team and BEZA. The informal meetings are not recorded in the table.

Table 1-1: Workshops, Presentations and Meetings

Date	DDC-DOHWA JV WITH	Subject
5th December, 2018	BEZA	Contract Signing and Kick-off meeting
7th February, 2019	BEZA	Presentation of Conceptual Master Plan with Executive Chairman, BEZA.
10th February, 2019	BEZA	Presentation on Inception Report
7th July, 2019	BEZA	Presentation on Interim Report
25th July, 2019	BEZA	Presentation of Draft Master Plan with Executive Chairman, BEZA.
30th September, 2019	BEZA	Presentation of Draft Final Report.
19th February, 2020	Honourable Prime Minister	Presentation of Master Plan.

Source: Prepared by the Consultants' Team, 2020

Presentation of Draft Final Report was held on 30th September, 2019 as stated in Table 1-1, detail discussion was carried out regarding the draft master plan, draft infrastructure plan and draft phasing plan. The participants on the Meeting gave their comments and views to enhance the quality of final report. The meeting minutes and compliance checklist of the comments are given in Appendix A, Appendix B, Appendix C and Appendix D.

Some photographs of several Meeting are shown in Figure 1-10 and Figure 1-11

Figure 1-10: Meeting with Honourable Prime Minister Sheikh Hasina on 19th February, 2020.

Figure 1-11: Presentation of Draft Final Report on 30th September, 2020.

1.10.3 COMMUNICATION WITH LINE AGENCIES

The consultants visited different governmental agencies to collect their present information, future plan and their aspirations regarding the project. The consultant's team communicate with following organization/agencies to ensure participation of different agencies. The stakeholder communication strategy is given in Table 1-2.

Table 1-2: Stakeholder Communication Strategy for Sabrang Tourism Park

Sl No.	Agency/Organization Name	Head of the Organization
Legal Authorities		
1.	Upazila Parishad, Teknaf under Ministry of Local Government, Rural Development and Co-operatives	UNO, Teknaf and Chairman, Teknaf Upazila

Sl No.	Agency/Organization Name	Head of the Organization
2.	Union Parishad, Sabrang and Teknaf under Ministry of Local Government, Rural Development and Co-operatives	Chairman, Sabrang Union/ Chairman (Teknaf)
Transport		
3.	Local Government Engineering Department, Cox's Bazar under Ministry of Local Government, Rural Development and Co-operatives	Chief Engineer, LGED
4.	Roads and Highways Department, Chittagong Zone under Ministry of Road Transport and Bridges	Chief Engineer, RHD
5.	Bangladesh Railway under Ministry of Railways	Director General, BR
6.	Bangladesh Inland Water Transport Authority under Ministry of Shipping	Chairman, BIWTA
7.	Bangladesh Road Transport Authority under Ministry of Road Transport and Bridges	Chairman, BRTA
Utilities		
8.	Bangladesh Land Port Authority under Ministry of Shipping	Chairman, Land Port Authority.
9.	Bangladesh Power Development Board under Ministry of Power, Energy and Mineral Resources.	Chairman, BPDB
10.	Bangladesh Rural Electrification Board under Ministry of Power, Energy and Mineral Resources	Chairman, REB
11.	Bangladesh Fire Service and Civil Defence under Ministry of Defence	Director General, Fire Service
12.	Department of Public Health Engineering under Ministry of Local Government, Rural Development and Co-operatives	Chief Engineer, DPHE
13.	Bangladesh Telecommunication Regulatory Commission under Ministry of Posts and Telecommunications	Chairman, BTRC
14.	Bangladesh Telecommunications Company Ltd. under Ministry of Posts and Telecommunications	Managing Director, BTCL
Environment		
15.	Bangladesh Meteorological Department under Ministry of Defence	Director, BMD
16.	Bangladesh Water Development Board, Cox's Bazar zone under Ministry of Water Resources	Director General, BWDB
17.	Department of Environment (DoE) under Ministry of Environment, Forest and Climate Change	Director General, DoE
18.	Forest Department under Ministry of Environment, Forest and Climate Change	Chief Conservator of Forest, Forest Department
19.	Department of Fisheries under Ministry of Fisheries and Livestock	Director General, Department of Fisheries
Aviation		

Sl No.	Agency/Organization Name	Head of the Organization
20.	Bangladesh Civil Aviation Authority under Ministry of Civil Aviation and Tourism	Chairman, Civil Aviation Authority
Tourism		
21.	Bangladesh Parjatan Corporation under Ministry of Civil Aviation and Tourism	Chairman, BPC
Health Service		
22.	Director General of Health under Ministry of Health and Family Welfare	Director General, DGHS
Security & Defence		
23.	Bangladesh Police under Ministry of Home Affairs	Inspector General of Police
24.	Bangladesh Coast Guard, East Zone under Ministry of Home Affairs	Director General, Bangladesh Coast Guard
25.	Boarder Guard Bangladesh, Cox's Bazar Sector under Ministry of Home Affairs	Director General, BGB

Source: Prepared by the Consultants' Team, 2020

2 PLANNING CONSIDERATIONS

2.1 INTRODUCTION

The Master Plan is envisioned as an ensemble of ecological and social projects in one multi-grid layout. The facilities provided will bring large scale conference and convention facilities to the part thereby attracting large scale events. A wide range of active and passive leisure activities will create a desirable community attracting tourist from all parts of the world. Tourism involves travel and the facilities that support travel; such as hotels, restaurants, shops and festive program space; is integrated in the Master Plan. Intangible elements such as education, culture, adventure, relaxation and a search for memorable experiences provide the motivation for travel and the desire to seek a destination. Sabrang Tourism Park will be an international standard travel destination for the world tourist. Tourism as an economic development strategy will create opportunities for business growth in Sabrang Tourism Park. Unique local assets will also serve as a rich resource for business development. Sector based planning issues are address in the master plan to prepared an international standard travel destination in Sabrang Tourism Park. The planning issues considered in preparation of Sabrang Tourism Park Master Plan are discussed below.

2.2 TRANSPORT AND COMMUNICATION

The Sabrang TP area is connected with other part of the country through marine drive. The marine drive which is connected directly with Cox's Bazar and situated on the bank of sea beach. National Highway No. 01 is started from Teknaf Town which is 7 Km away from Sabrang Tourism Park. The N01 is used for long route bus service with the other area of country. The existing condition of the major roads already have in Teknaf area and connected with other parts are moderate. There have 4 major roads which connects the Sabrang TP with other part the upazila as well as whole country. Those are:

- Marine Drive Road
- Cox's Bazar – Teknaf Highway
- Shapla Intersection – Beach Point Road
- Teknaf – Shahporir Dwip Road

Among those four roads, more than 50% RoW are now effectively used. As per the Traffic Volume Survey (TVS), level of service of those roads are 70% LoS-A which is good for the future development. According to BRTA data, type of vehicle used in this area are 38.31% easy bike and 29.18% Rickshaw which indicates non-motorized and slow-moving vehicle are used most in the existing situation. There has no separate lane for non-motorized/slow moving vehicle of the existing roads which reduce speed of motorized vehicle. As per transport assessment chapter-10 of Volume-1, the nearby Airport and Rail station from Sabrang TP are 82 Km and 50 km respectively. The Sabrang TP is designated for international/national tourist so that the communication with nearby airport, rail station and bus terminal should be smooth and comfortable. The major considerations of master planning regarding on-site and off-site transportation system of Sabrang TP and it's influence area are given below.

Both the National Highway (N1) and the Marine Drive have two lane in current situation which need to be developed 4 lane or more to meet the generated demand of proposed Tourism Park and facilitate all services related to transport for the next 30 years. As there is no direct rail, water & air connectivity available with the proposed tourism site, it is necessary to plan and develop rail, water & air communication to create direct linkage.

2.2.1 OFF-SITE TRANSPORTATION

The following recommendations are made to improve the existing roadway transportation system.

- Categorization of roads with proper road width (RoW) is the top priority to improving roadway transportation system;
- Road Transportation safety should be ensured for all tourists;
- All road infrastructure should be improved and modernized;
- All road markings, signs, signals and guard posts should be installed and modernize;
- Widening of existing major roads is essential;
- Dedicated tourist friendly facilities should be introduced in roadway transportation system;
- Road side parking on the major roads should be controlled;
- The Central Bus Terminal should be modernized;
- Clean and hygienic public toilets should be constructed in the bus stoppages;
- A modern truck terminal should be developed with all required facilities;
- Traffic rules are to be imposed strictly punishment and fine for breaking traffic rules should be harsh enough to really discourage violation of traffic rules;
- Traffic polices should be equipped with modern equipment like speed measuring device, high speed car etc.;
- Adequate number of zebra crossing should be provided along with pedestrian crossing signal;
- Segregation of low-speed vehicles from high-speed vehicles on major roads is essential;
- Land access from major roads should be controlled.

2.2.2 ON-SITE TRANSPORTATION

The Sabrang TP is situated in Sea shore that's why the area is environmentally sensitive area. There has some Jhau forest area into the park. On-site road network and transportation system should be high priority at the time of master plan preparation. The considerations regarding transportation in the Master Plan preparation are given below.

- To maintain beach area and make environment friendly transportation system, outside bus is not allowed in the tourism park. Own tourist bus service will be considered to development of road network in Master Plan;
- Jetty and Helipad will also alternative mode of Transport to reach in Sabrang TP;
- Adequate Parking Facilities will be provided according to the proposed plots and facilities;
- Proper and effective traffic management system will be encouraged.
- Consultants considered to make the road connectivity and spatial pattern more interactive.
- Multiple transportation hub, a bus depot, helipads and a jetty station are considered to develop road, air and water connectivity.

2.3 EXISTING LANDUSE

There is no residential land use inside the Sabrang Tourism Park. This area is predominantly a vacant land but occasionally people utilize this shoreline area for agricultural and fish cultivation activities. Based on the field survey 2019, the existing land use of the Sabrang TP has been categorized into six classes; those are open space (41.85%), vegetation (2.43%), road network (1.10%), waterbody (34.87%), administrative (0.11%) and Sand filling (19.54%). The consultant's team are considered existing administrative block, waterbody and Road Network (especially Embankment) alignment and prepared a Master Plan. Average spot height was 1.41 meter, maximum 6.98 meter, and minimum -2.1 meter. Majority of spot heights data was between -0.369 meter and -0.4465 meter which is also considered in Master Plan Preparation.

2.4 EXISTING INFRASTRUCTURE

The Sabrang TP area is situated on the bank of the Bay of Bengal. There have limited infrastructure facilities available in the existing park area. The existing infrastructure facilities considered in the preparation of Master Plan are discussed below.

2.4.1 ELECTRICITY

The nearest 33/11KV sub-station from Sabrang Tourism Park is Teknaf -1 which is located at a distance of 9.3 km. Capacity of Teknaf-1 is currently being upgraded from 15MVA to 25MVA. Teknaf-3 substation is currently being developed which is located at a distance of 6.8 km from Sabrang TP. Bangladesh Rural Electrification Board (BREB) has a plan of installing three new substations (Teknaf-4, 5, 6) of 10/14 MVA capacity each. Among these three Teknaf-4 will be at close proximity to Sabrang Tourism Park.

2.4.2 WATER SUPPLY

The area is situated in the coastal region of Bangladesh. The water of the Sabrang TP and its surrounding area is saline and it's not suitable for drinking purpose. According to Socio-economic survey, the local inhabitants mainly collected water from Tube wells which is 74.29 percent household and some household collected water from piped water installed by NGO which is only 15.5 percent respondents' use for drinking purpose. 49.61 percent household responses the arsenic available in the water and 37.21 percent households' responses the saline availability in the drinking water. Those data represents that the water condition of the Sabrang TP and its surrounding area is poor quality. This is considered as important issues to prepare a master plan for an International Standard tourism park. BEZA engaged IWM to identify the available water source outside of the site. The master plan will focus on-site water distribution facilities.

2.4.3 SOLID WASTE

Solid waste will be generated after operation of the tourism park. There have not available any specific solid waste management system around the proposed Sabrang TP. The local inhabitants dump their generated solid waste into the family hole or nearby khals and rives. No waste collection system

available in this locality. Proper and eco-friendly solid waste management system is considered to prepare master plan for a sustainable and eco-friendly tourism park.

2.5 SEWERAGE SYSTEM

Sanitation means the disposal of human excreta. Swerage system is not available in this area. Naturally the disposal is individual household basis. However, open air disposal is still continuing in parts of the region. Most of the people adjacent area are used Semi-pucca and katcha latrines for sanitation purpose. Most of the household used katcha latrines for sanitation and sewerage line is completely absent in this area. The efficient and environmentally friendly sewerage system is an important element for smooth functioning of any area especially for Tourism Park.

2.6 DRAINAGE

The Sabrang TP is situated on the bank of Bay of Bangal. A natural canal are passes on the tourism park. Natural drainage is a prime consideration to Master Plan for Sabrang Tourism Park. The Bay of Bengal and natural canal plays a vital role as a natural drainage for this area. According to Topographic Survey, Sabrang TP area is low lying area. There have some water body to drain out rain water to the Bay of Bengal. Natural drainage and Road side man-made drainage is considered as drainage system in the preparation of master plan.

2.7 SOIL CONDITION

It is observed that Sabrang Tourism Park is situated in Grey Piedmont type soils as per the Geological Map of Bangladesh. They have been formed in the out-wash alluvium at the foot of hills, having a cambic B-horizon which has a grey matrix and is medium or very strongly acid in reaction. They are mainly included in Dystric or Eutric Gleysols. That's why, special measure should be taken at the time of design structure.

2.8 HEALTH FACILITIES

Households excepting a negligible number took various types of medication against ailment. Highest 83.22 percent went to Upazila Health Complex for treatment, 2.80 percent go to government hospital, 0.70 percent took treatment from Homeopathic doctor. The facilities or the system of treatment is not good. Respondents reported about many problems they face while taking treatment against ailment. The survey findings reveal that 19.7 percent responds Long Distance of Hospital, Short Supply of Essential Medicine (4.4%) and Lack of Specialist Doctor (5.8%). The Sabrang Tourism Park area is developed for international standard tourism facilities, treatment facilities for the emergency need also need to be available in the tourism park. Health facilities also considered in the Master Plan preparation.

2.9 ENVIRONMENTAL ISSUES

According to environmental study of the Sabrang TP, the ambient air quality, sound level are within the standard level of DoE. This standard level should be sustained after establishment of the tourism park. The parameter to assess surface water quality (temperature, TSS) is not fulfilled the national

standard which means the quality of surface water is not good. Surface water treatment is essential for water supply of the Sabrang TP.

Jhau species are available into a Sabrang TP site, proper measures should be taken to preserve the present ecosystem of the area.

The Sabrang TP is fallen in High-risk zone of the Cyclone affected area of Bangladesh. The master plan also considered the tidal surge to proposed zones and structures.

Teknaf Wildlife Sanctuary is approximately 10 km of Sabrang TP which is great advantage for the tourism development of this area. At the same, the conservation of the forest area and it's wild life also a big challenge for the master plan. The forest area should be undisturbed, to achieve this master plan should be self-sustain and the area should harmonize with the forest area.

The Sabrang TP is situated under DoE declared Ecological Critical Area (ECA) in April 1999. Special exemption has been given for the Sabrang Tourism Park by the circular no. PBM/4/7/87/99/245. However, the consultant's team also consider the area as ecological sensitive and provide proposal environmental friendly and sustainable proposal.

2.10 SAFETY AND SECURITY

Safety and security is a vital issue to tourism development. The Sabrang TP area is developed for international tourist, the safety and security of the tourist must be ensured to sustain the tourism park. The international border with Myanmar is situated near of the Sabrang TP which is about 10 km from the Sabrang TP. The Sabrang TP is situated on the bank of Bay of Bengal which also create risk for Terrorist attacks, smuggling of drugs & weapons, illegal immigration of Burmese & other nationalities poses some serious problems which need to be contained from the very beginning of the development.

Due to Bay of Bangal, Bangladesh Coast Guard station should be considered in the Master Plan. Teknaf Port, the nearest mainland access point is located 14 km away from the Sabrang TP and presently houses a station of the Bangladesh Coast Guard.

From the beginning of the Sabrang TP, full-proof solutions need to be found to solve possible security threats such as terrorist attacks, smuggling of drugs & weapons and illegal immigration of rohingyas & other nationalities. The nearest Rohingya camp is Camp 27 which is 20 km away from Sabrang Tourism Park. Increased presence of enough representatives from the relevant authorities in and around Sabrang Tourism Park will guarantee national-international tourists and employees security. Additionally, acceptance of the project should be sought from the local population by promoting its advantages for region and residents. Boundary wall & several security posts of law enforcement authority are proposed in master plan to secure the site.

2.11 SOCIO-CULTURAL ISSUES

The increase in population of Rohingya refugees in Bangladesh has fall effects on natural resources, infrastructure, public services and the local economy. The most affected area has been in Teknaf and Ukhia Upazilas. This socio culture mixture is creating problem in this area, the proposed master plan will address to alleviate problems of Tourist Park.

In Teknaf area, 97 percent population belongs to Islam religion believers and 87.89 percent peoples' education level is below secondary school. Most of the children take their primary education from local madrasah. The local people are not well known about tourism sector and their livelihood pattern are not match with the modern world. It may create social conflict between local people and tourist visited the tourism park. After the establishment of Tourism Park, well trained and international standard hospitality management should be introduced to well-functioning of the Tourism Park. This issue is considered into the master plan for smooth and effective function of Tourism Park.

2.12 TOURIST ASSESSMENT

According to the Tourist assessment survey, it's found that 92.02 percent people wants to visit Cox's Bazar and its surrounding area more than one time. The natural beauty of the region attracted tourist to visit this place many times. The tourist also comments on problems of the Cox's Bazar and its surrounding area and 23.19 percent tourist give objection regarding poor communication/transportation system of this area, 17.71 percent responses bad environment management of the areas, 17 percent tourist responses on low hospitality management of the tourist spot and accommodation facilities. The tourists also recommended facilities should be improved in the region. Those are:

- Introduce more entertainment facilities according to age groups;
- Natural environment should be preserved;
- Hospitality management should be improved and introduce standard management system;
- Communication system should be improved for smooth transportation system;
- Security and safety of this area should be improved.

2.13 SKILLED WORKFORCE

There are no international standard educational facilities and technical institutions in this area. Many people are getting education from madrasa and they may not accept the international tourist or non-Islamic activities in this region. This may create unacceptable situation in the locality.

There is no international accommodation facility available in the vicinity of the proposed TP. However, there are good resorts, star hotels and budget hotel available at Cox's Bazar and St Martin's Island which are located at around 90 Km and 20 Km away respectively from the Sabrang TP. Several multiple hotels & resorts areas proposed in the master plan. As per the workforce projection, only 4 percent people will be engaged on service at the end of 2051. 27 percent people will be engaged on direct farming activities. From this data, it can be said that local few numbers of local people will be worked in the tourism park due to lack of knowledge and education. The employment opportunity generated due to establishment of Tourism Park may be necessary to engaged from the outside the Teknaf Upazila. The accommodation facilities for the employee also consider in the Master Plan.

3 MASTER PLAN

3.1 PLANNING PRINCIPLES

The planning principles are sets out on the basis on the planning considerations from the survey activities and analysis. The aim of the Master Plan is to develop Tourism Park for recreation and tourism that provide International Standard accommodation facilities, hospitality facilities, environmentally sustainable infrastructure facilities, and ensure safety & security for tourist.

The basic planning principles to prepare master plan for Sabrang TP are:

- Develop an inclusive and independent area for tourism development;
- Develop of Tourism Park as it's natural characteristics and uniqueness;
- Develop a tourism park for foreign and local investors to undertake the development of the project and subsequent operation of their businesses;
- Develop a set of planning standards to be adopted;
- Designate broad land-use distribution of the whole site;
- Develop a mix facilities land use like accommodation facilities, commercial facilities, social amenities, general infrastructure, specialized & specific infrastructure, road, open and green space etc.
- Position the zone to accommodate various types of target facilities to ensure compatibility;
- Provide an integrated infrastructure-system network to support the development;
- Develop requirements of various public utilities;
- Development of phasing of the project;
- Comply with various planning norms and guidelines of the Bangladesh Government.

3.1.1 GUIDING PLANNING PRINCIPLES

According to the Pre-feasibility study for Anowara-II and Sabrang Tourism Park of BEZA report, were suggested some basic planning principles to development of Sabrang Tourism Park. Those are:

- **Make a strong attraction, "Bring the people"**

Strong attractions in harmony with the waterfront environment are required to develop a unique tourism park. A new tourism concept distinguished from existing items is developed to promote voluntary visiting of people in the basis of an underling question "What will make people voluntarily visiting the place on a long trip?"

- **Water-friendly Environment, "On the water"**

The project site is a place where strong marine tourism resources such as beach and island, are located to attract tourists. The project is targeting a tourism spot actively promoting beach and marine leisure activities.

- **Using site-specific characters, "Tell the story of the place"**

Maximizing the use of natural assets and its characteristics (access to the beach and island, connection to the Cox's Bazar town, etc.) is a basic approach for the establishment of a concept. This approach of

concept development is expected to enhance the accessibility and approachability of tourists by the locational appropriateness of the development and provide a better living environment with improved infrastructure and urban amenity. In the meantime, the development impact to native flora and fauna should be minimized by adopting an environment friendly development concept.

- **Generating local economy, "Something for everyone"**

A tourism park is a large-sized economic zone with mainly tourism industries so that introduced facilities of the project site should consist of urban service facilities for not only visitors but also native people. Traditional and cultural facilities for tourism have a role of improving unique local culture and making synergy with local economy.

3.1.2 DEVELOPMENT PRINCIPLES

The Master Plan of Sabrang Tourism Park is prepared with considering some major issues which should be incorporate into the Master Plan. The major development principle to preparation of Master Plan is discussed here.

- This site is located beside the Bay of Bengal which is the main attraction of this tourism site. The Bay of Bengal is given priority to prepare this Master Plan. Land Use and Features is proposed to best use of Sea and its Beach;
- There have an existing Jhau Forest into the tourism park area. Conservation of existing Jhau forest and promoting different nature lover's activities within the Jhau Forest;
- There have an existing Canal into the site. Preservation of existing waterbody is considered as major planning issue to protect natural drainage system;
- Development of transportation system for tourists without interruption of local natural habitats. Provide pedestrian and Bi-Cycle lane to protect environment;
- The tourism park is designated for nature lovers, wildlife observational users etc. Around 50 percent of the area should be reserved green without intervention of natural environment so that biodiversity of the area preserves and can create a natural abode for the birds as well as ensure Sustainable Development;
- Provision for new and exclusive facilities related to tourism to attach national and international tourist;
- Encourage zero waste generation and ensure proper solid waste and e-waste management system in Master Plan;
- Encourage people to know about heritage and Liberation War of Bangladesh;
- Encourage renewable energy and rain water harvesting for protection of environment and social/cultural systems and promote sustainability;
- Development of infrastructure and utility facilities providing priority on Environment;
- Measure should be taken to protect international tourist's security and safety and provide surveillance and Security for international, national and local tourist.
- Measure should be taken to protect from erosion. Primary buffer with deep vegetation and embankment around the Island may protect Island from erosion as well as security;
- Strengthening of employment opportunity for local people and trained up people for create human resources;

- Create business opportunity for local and international investors.

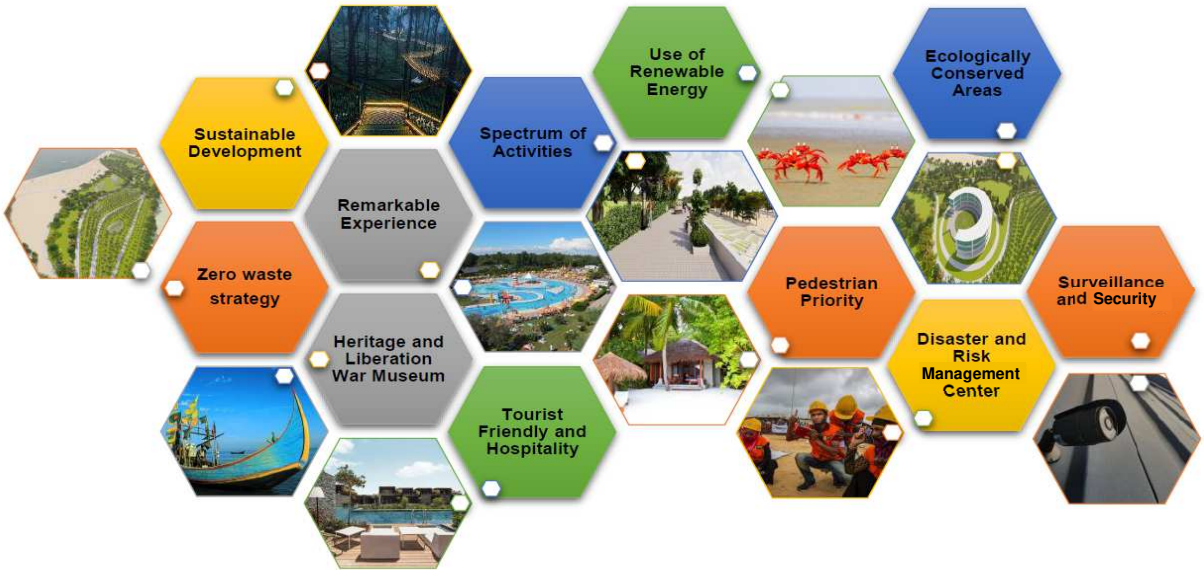


Figure 3-1: Development Principle of Sabrang Tourism Park

3.2 PROPOSED MASTER PLAN

The Master Plan is prepared by considering different income group, local, national and international tourist aspiration, existing road network, existing water body, environmental issues, and locational advantage of the site and also consider the natural advantage of the site. The facilities proposed in master plan, all have their own uniqueness, aesthetic view and have some traditional nature to attract domestic and international tourist.

The facilities of proposed Master Plan are divided into seven different sectors. Those are:

1. Residential/Hospitality Facility;
2. Common Facilities;
3. Administrative Facilities;
4. Utility facilities;
5. Institutional Facilities;
6. Transportation Facilities; and
7. Water body, open space and Beach Area

3.2.1 RESIDENTIAL AND HOSPITALITY FACILITY

Different categories of Hotels, resorts are proposed to give international level accommodation facilities for the tourist. It is expected that international tourist will be attracted to the tourism sites for its natural beauty and at the same the facilities recommended in the Master Plan. Those facilities are recommended for long stay tourist, short stay tourist, bag packing tourist and budget tourist also. The beach side and Lake side plots shows in Figure 3-2 and Figure 3-3 and the program number 1A, 1B, 1C, 1D, and 24 shown in Figure 3-22. The proposed Residential, and Hospitality Facilities are:

- Beach side Resort and hotel
- Lake side Resort and Hotel (South)

- Lake side Resort and Hotel (North)
- Economy Hotel
- Service Studio Apartment

Figure 3-2: Beach Side Hotels and Resorts

Figure 3-3: Lake Side Hotels and Resorts

3.2.2 COMMON FACILITIES

Proposed common facilities will provide to attract all categories tourist in the Tourism Park. Those facilities will attract International, National and Local tourist to visit Tourism Park. It will also encourage to visit Tourist Park for all age people. The features proposed under common facilities are:

- Park
- Shopping District
- Heritage and Liberation War Museum
- Amphitheatre
- Amusement Park

- Watch Tower and Restaurant
- Golf Course/Recreational Space
- South Tower

Two parks are proposed in the Master Plan, this is basically a Leisure Park with full of activity to keeping the tourists engaged with fun activities. The programs proposed in parks are: i) Field for all sorts of ground sports; ii) Platforms for enjoying cultural performances; iii) Boat club for boating facilities on the lake; iv) Tents for exhibition of local vendors; v) Botanic Reserve Park in the heart of Sabrang, a gem of natural resources displaying wide range of local and exotic plants; vi) Creating attraction for visitors and tree lovers beside the sea; vii) The conservation of plant diversity is critical for sustainable development and botanic gardens are playing a key role as centres of conservation action and viii) Aquarium etc. 300' high watch tower for sightseeing and restaurant for a pleasant meal are also proposed in the Master Plan. The bird's eye views of common facilities is shown in Figure 3-4, Figure 3-5, Figure 3-6, Figure 3-7 and proposed programs under common facilities are shown in Figure 3-22 of program no. 9A, 9B, 13, 15, 16, 17, 18, 21, 29, 30, 31 & 36.

Figure 3-4: Bird's Eye View of Park - 1

Figure 3-5: Bird's Eye View of Park - 2

Figure 3-6: Amusement Park

Figure 3-7: Heritage and Liberation War Museum

3.2.3 INSTITUTIONAL FACILITIES

There have some institutional activities proposed in Sabrang Tourism Park to give facilities for old age and disable people into the park. The area also can develop for future development of the tourism park. Those facilities will provide mental refreshment and also can enjoy the provided recreational facilities with the mainstream people. The bird's eye views of institutional facilities are shown in Figure 3-8, Figure 3-9. The proposed programs under institutional facilities are shown in Figure 3-22 and program no. 22 & 23. The facilities are:

- Welfare Centre
- Old Age Home/Future Developed Area/Service Area

Figure 3-8: Old Age Home/Future Developed Area/Service Area

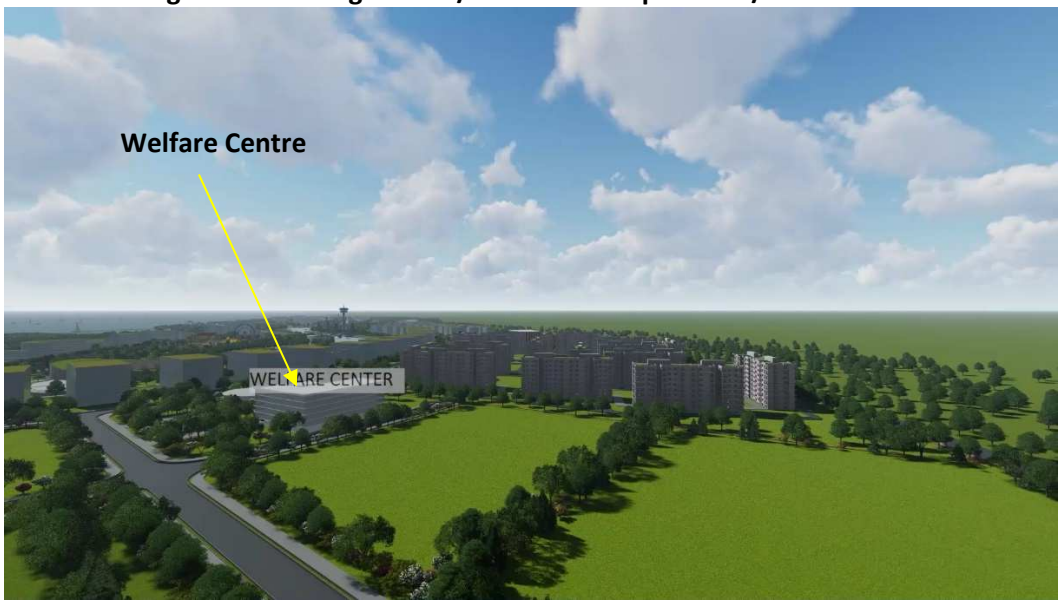


Figure 3-9: Welfare Centre

3.2.4 ADMINISTRATIVE FACILITIES

Administrative facilities are prerequisite to smooth functioning of any master plan. It becomes more important if the master plan is prepared for Tourism Park. In this proposed master plan, few uses are proposed to provide safety, security, emergency response etc. (Figure 3-10). Proposed programs under administrative facilities are shown in Figure 3-22 program no. 2, 3, 4, 5 & 28. The facilities are:

- Administration Office
- Law Enforcement
- Hospital
- Fire station
- Security Staff
- Disaster Management Centre

Figure 3-10: Administrative Building

3.2.5 UTILITY FACILITIES

Utility facilities are important to smooth functioning and operation of the tourism park. The utilities are proposed in such a manner that the park will be self-sufficient in case of energy. Renewable energy, rain water harvesting is given priority to plan utility facilities. The bird's eye views of utility facilities are shown in Figure 3-11, Figure 3-12 and proposed programs under utility facilities are shown in Figure 3-22 program no. 6A, 6B, 6C, 7, 10A, 10B, 12, 14, 23 & 33. The facilities are:

- STP (Sewerage Treatment Plant)
- Solid Waste and e-waste Plant
- Power Plant Station
- Electrical Sub Station
- Bio Gas Plant
- Water Reservoir

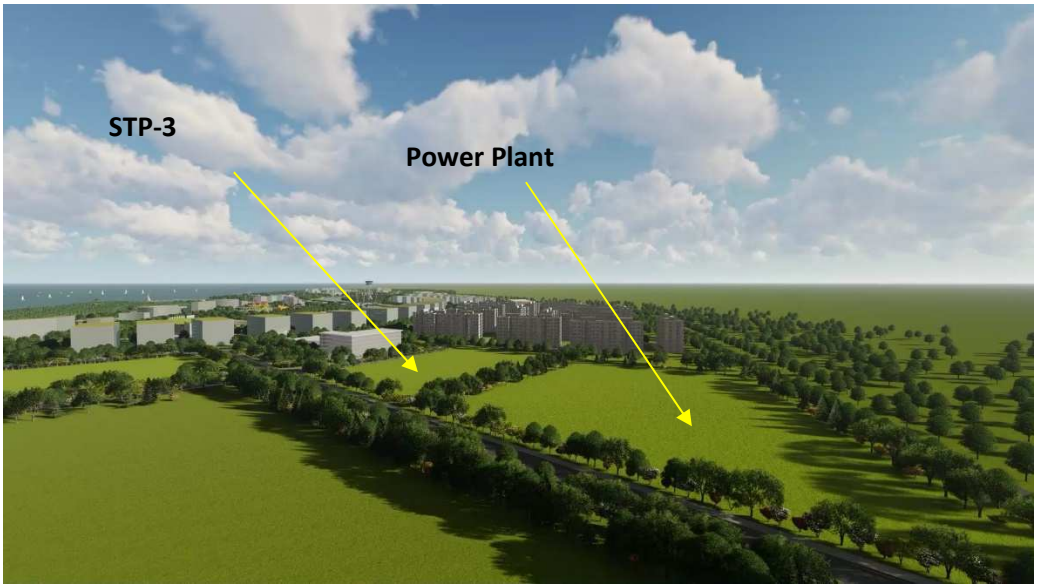


Figure 3-11: Location of Power Plant and STP-3

Figure 3-12: Location of STP 1

3.2.6 TRANSPORTATION FACILITIES

Transportation is also a vital issue to well-functioning of Tourism Park. Tourist can use different mode for transportation. A well-planned transportation system also introduces in this master plan. The bird's eye views of transportation facilities is shown in Figure 3-13, Figure 3-14, Figure 3-15 and proposed programs under transportation facilities are shown in Figure 3-22 program no. 8, 11A, 19 & 20. The facilities are:

- Bus Depot
- Transportation Hub
- Jetty Station
- Helipad

Figure 3-13: Bus Depot

Figure 3-14: Jetty Station

Figure 3-15: Helipad

3.2.7 WATER BODY AND GREEN AREA

Water body and green area is important to attract tourist at the same water body is used as a natural drainage system of the tourism park. The bird's eye views of water body and green area is shown in Figure 3-16, Figure 3-17, Figure 3-18, Figure 3-19, Figure 3-20, Figure 3-21 and proposed programs under water body and green area are shown in Figure 3-22 program no 26, 27A, 27B, 32, 36. The facilities are:

- Water Body (Lake)
- Water Body (others)
- Road/ Pedestrian/ Bicycle lane
- Sea Beach
- Green /park
- Reserve Area

Figure 3-16: Elevated Walkway into Jhau Forest

Figure 3-17: Birds Observatory in Jhau Forest

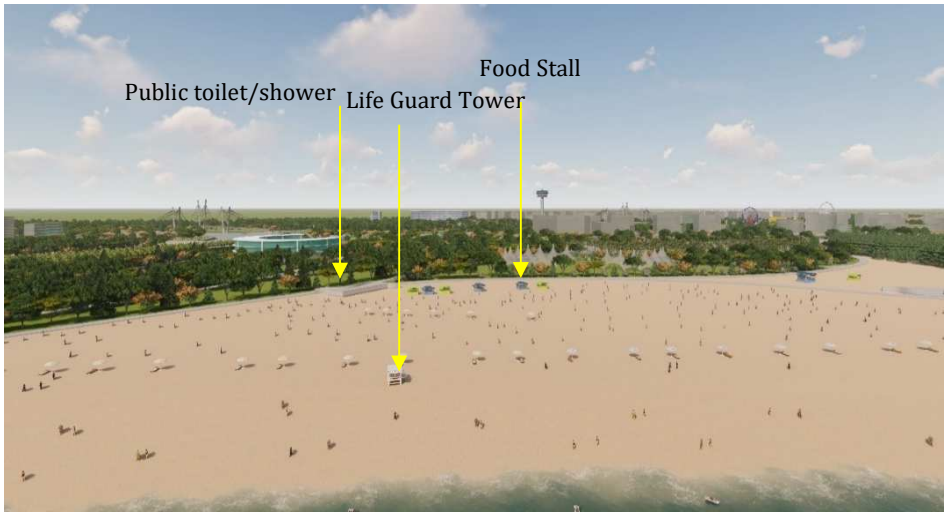
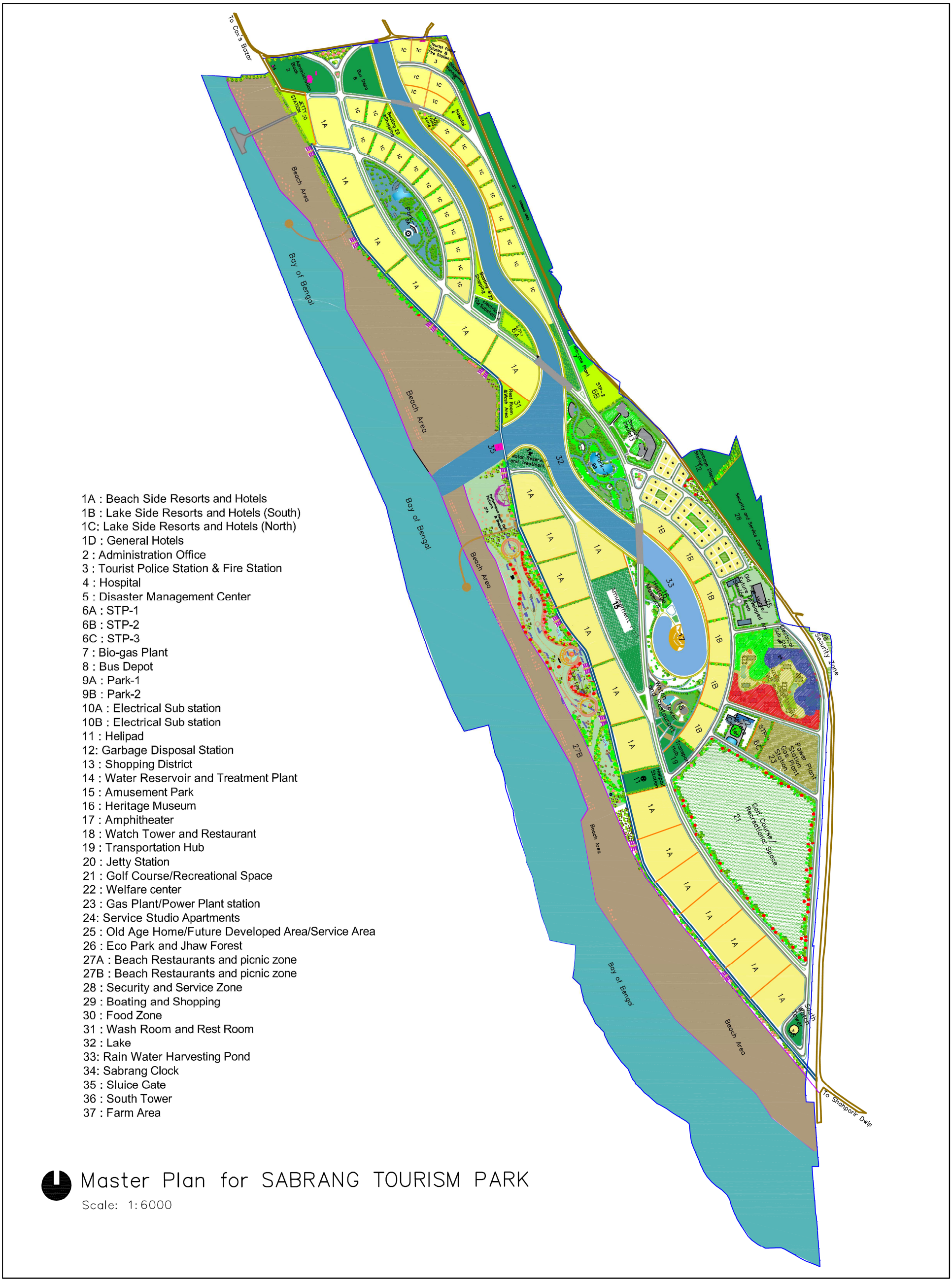


Figure 3-18: Beach Activities

Figure 3-19: Performance Platform on Beach Area

Figure 3-20: Lake

Figure 3-21: Lake Side walkway and bi-cycle lane



1A : Beach Side Resorts and Hotels
1B : Lake Side Resorts and Hotels (South)
1C: Lake Side Resorts and Hotels (North)
1D : General Hotels
2 : Administration Office
3 : Tourist Police Station & Fire Station
4 : Hospital
5 : Disaster Management Center
6A : STP-1
6B : STP-2
6C : STP-3
7 : Bio-gas Plant
8 : Bus Depot
9A : Park-1
9B : Park-2
10A : Electrical Sub station
10B : Electrical Sub station
11 : Helipad
12: Garbage Disposal Station
13 : Shopping District
14 : Water Reservoir and Treatment Plant
15 : Amusement Park
16 : Heritage Museum
17 : Amphitheater
18 : Watch Tower and Restaurant
19 : Transportation Hub
20 : Jetty Station
21 : Golf Course/Recreational Space
22 : Welfare center
23 : Gas Plant/Power Plant station
24: Service Studio Apartments
25 : Old Age Home/Future Developed Area/Service Area
26 : Eco Park and Jhaw Forest
27A : Beach Restaurants and picnic zone
27B : Beach Restaurants and picnic zone
28 : Security and Service Zone
29 : Boating and Shopping
30 : Food Zone
31 : Wash Room and Rest Room
32 : Lake
33: Rain Water Harvesting Pond
34: Sabrang Clock
35 : Sluice Gate
36 : South Tower
37 : Farm Area

Master Plan for SABRANG TOURISM PARK
Scale: 1:6000

Figure 3-22 : Proposed Master Plan of Sabrang Tourism Park

4 ZONING PLAN

Zoning is a form of legal power which is delegated to authorities through enabling legislation to ensure the welfare of the community by regulating the most appropriate use of land. Zoning is a classification of land uses that limits what activities can or cannot take place on a land parcel by establishing the Master Plan.

Zoning has been defined as an action through legislation provided to an authority to control

- The heights to which buildings may be erected
- The area of lots that must be left un-built upon and
- The uses to which buildings and lots may be put.

Depending on the land use, gross population density and the maximum height of built-form an area may fall under any or all of the followings.

4.1 LAND USE ZONING

According to ToR, the area of the master plan is 967 acres, after Mauza Maps collection and planning area demarcation in GIS environment, the area of the Sabrang Toruism Park earmarked 1047.68 acres. The zones are made in a pattern to serve and facilitate the tourists. It is divided into 7 broad categories. Those are: Residential/Hospitality Zone, Common Facilities Zones, Institutional Zone, Administrative Zone, Utility Zone, Transportation, Water Body, Open Space, Road Network and Beach Area. (Table 4-1 and Map 4-1)

Table 4-1: Broad Land use category of Sabrang Tourism Park

Sl. No.	Land use Category	Area in acre	Percentage
1	Administrative Zone	23.12	2.21
2	Common Facilities	117.97	11.26
3	Institutional Zone	11.78	1.12
4	Residential/Hospitality Zone	203.24	19.40
5	Transportation Zone	11.09	1.06
6	Utility Zone	25.91	2.47
7	Water Body, Open Space, Road Network and Beach Area	654.58	62.48
Total		**1047.68**	**100.00**

4.1.1 RESIDENTIAL/HOSPITALITY ZONE

The Master Plan is divided into 4 categories for accommodation. These zones are separated through lakes and roads to maintain security and tranquillity of the more privileged zones. The economic hotel zone is the first zone, it targets the local investors of the region and the land allotted for each plot will be around 1 bigha or 0.33-acre. The middle category zone targets the corporate level investors and the land allotted for each plot will around 1-2 acres. The semi exclusive zone is given the area around 3 acres mostly lakeside areas. The exclusive zone targets the global investors and the land allotted for each plot will be 5-6 acres or above which are mostly sea facing. 203.24 acres (87 plots) lands are

proposed in Master Plan for the Residential/Hospitality Zone which represents 19.40% of total land. (Table 4-2 and Map 4-1).

It is also important to keep the hotels and resort near the main arterial road so that tourist can easily get access into facilities and quickly evacuated during the emergency climatic condition. A special resort zone is also created at the end beside the sea side where local material will be used to portray our heritage and culture.

The first priority is to accommodating the hotel, motel and resort into Master Plan is to ensure the visibility of tourist to either the sea or the lake side landscape. General public facilities are proposed at the middle of the site so that tourist can easily accessibly form each side of the tourism park. Functions related to management and services are proposed near the locality.

Table 4-2: Residential and Hospitality Zone

Types of Plots	Number of Plots	Area in acre	% as per specific Zone	% as per Total Area
Beach Side Resort and Hotel	20	118.19	58.16	11.28
Lake Side Resort & Hotel (North)	25	38.07	18.73	3.63
Lake Side Resort & Hotel (South)	6	17.82	8.77	1.70
Economy Hotel	32	9.40	4.62	0.90
Service Studio Apartment	4	19.75	9.72	1.89
Total	**87**	**203.24**	**100.00**	**19.40**

4.1.2 COMMON FACILITIES ZONES

Common facilities include all the programs where large-scale people will expected like the central park, convention centre, heritage and liberation museum, amphitheatre, shopping districts, amusement park and food zone. Most of these places are proposed in the centre and beside the leisure activity zone so that people can fully enjoy all the entertainment facility in one zone. 117.97 acres (11.26%) land of total area proposed for common facilities zone (Table 4-3 and Map 4-1).

Table 4-3: Common Facilities Zones

Types of Plots	Number of Plots	Area in acre	% as per specific Zone	% as per Total Area
Amphitheatre	1	2.16	1.83	0.21
Amusement Park	1	10.49	8.89	1.00
Boating and Shopping	2	2.29	1.94	0.22
Food Zone	1	0.51	0.43	0.05
Golf Course/Recreational Space	1	55.94	47.42	5.34
Liberation War and Amusement Museum	1	2.23	1.89	0.21
Park-1	1	10.57	8.96	1.01

Types of Plots	Number of Plots	Area in acre	% as per specific Zone	% as per Total Area
Park-2	1	13.04	11.05	1.24
Rest Room & Wash Room	1	2.07	1.75	0.20
Shopping District	1	7.70	6.52	0.73
South Watch Tower	1	1.18	1.00	0.11
Watch Tower and Restaurant	1	9.80	8.31	0.94
Total	**13**	**117.97**	**100.00**	**11.26**

4.1.3 INSTITUTIONAL ZONE

Institutional zone is designated for welfare centre and old home which helps to ensure the availability of all sorts of facilities for all aged people. 11.78 acres (1.12%) land is designated for this category in which 0.74 % for old home and 0.38% for welfare centre. The description of this zone shown in Table 4-4 and the location of this zone shown in Map 4-1.

Table 4-4 : Institutional Zone

Types of Plots	Number of Plots	Area in acre	% as per specific Zone	% as per Total Area
Old Age Home/Future Developed Area/Service Zone	1	7.76	65.90	0.74
Welfare Centre	1	4.02	34.09	0.38
Total	**2**	**11.78**	**100.0**	**1.12**

4.1.4 ADMINISTRATIVE ZONE

The administrative zone is proposed to provide administrative and security services for the tourism park. Administrative office of the Tourism Park, law enforcement, hospital, fire station, security staff and disaster management centre are the major use of this zone. 23.12 acres (2.21%) are designated for this purpose (Table 4-5 and Map 4-1).

Table 4-5: Administrative Zone

Types of Plots	Number of Plots	Area in acre	% as per specific Zone	% as per Total Area
Administrative Area	1	5.97	25.81	0.57
Disaster Management Centre	1	0.94	4.08	0.09
Hospital	1	1.32	5.70	0.13
Security and Service Zone	1	11.12	48.10	1.06
Security Zone	1	1.81	7.81	0.17
Tourist Police Station and Fire Station	1	1.96	8.49	0.19
Total	**6**	**23.12**	**100.0**	**2.21**

4.1.5 UTILITY ZONE

Utility is one of the major issues for need to be address in any area's master plan. Electricity, Water supply, Drainage, Sewerage, Gas etc. must be address in Master Plan to the area liveable and vibrant. The make the tourism park well-functioning and self-sufficient, there have proposed 25.91 acres (2.47%) land for utility purpose. (Table 4-6 and Map 4-1)

Table 4-6: Utility Zone

Types of Plots	Number of Plots	Area in acre	% as per specific Zone	% as per Total Area
Bio-Gas Plant	1	1.04	4.00	0.10
Electrical Sub-station	2	2.54	9.81	0.24
Power Plant and Gas Station	1	8.45	32.62	0.81
Solid Waste Centre	1	4.54	17.54	0.43
STP	3	7.28	28.09	0.69
Water Reservoir	1	2.05	7.93	0.20
Total	**9**	**25.91**	**100.0**	**2.47**

4.1.6 TRANSPORTATION ZONE

Transportation is important for smooth movement from one to another. Three ways of transportation system is considered in Master Plan. Bus depot & transportation hub, Jetty station for vessel and Helipad for air traveling. 11.09 acres (1.06%) area is designated for transport related infrastructure. (Table 4-7 and Map 4-1)

Table 4-7: Transportation Zone

Types of Plots	Number of Plots	Area in acre	% as per specific Zone	% as per Total Area
Bus Depot	1	4.40	39.68	0.42
Helipad Station	1	2.61	23.50	0.25
Jetty Area	1	2.27	20.51	0.22
Transportation Hub	1	1.81	16.30	0.17
Total	**4**	**11.09**	**100.0**	**1.06**

4.1.7 WATER BODY AND GREEN AREA

Leisure and tourism facilities provides a large number of water sport centre, water & amusement park, multiplex and a floating cinema; all these recreational facilities will play an important role in flourishment of the tourism park. All the international standard recreational program will also attract tourist.

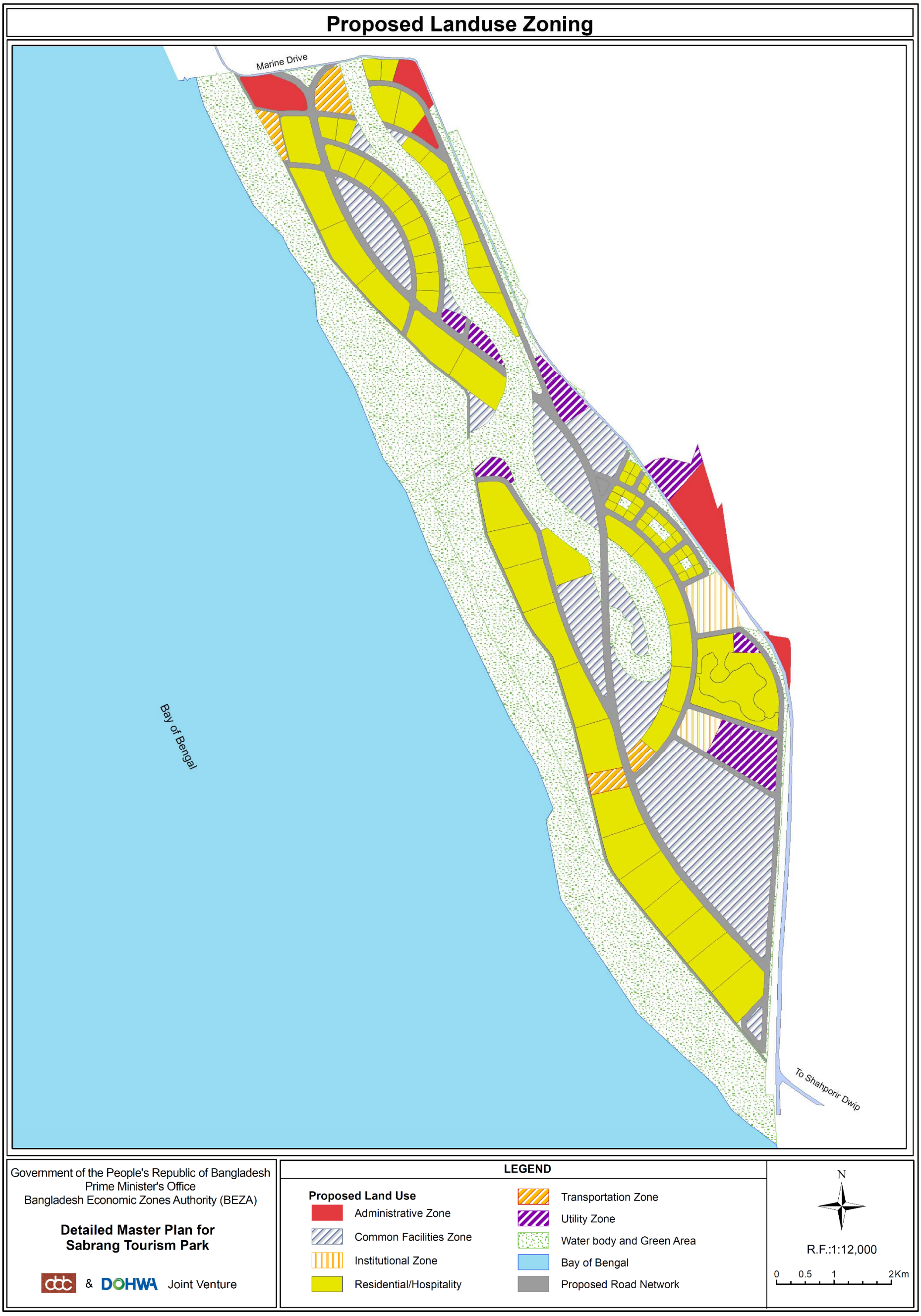
Road network is considered to be one of the keys to regional development. Proper connectivity, orientation and pedestrian is proposed into the master plan. In master plan of Sabrang Tourism Park, an attempt has been taken to make spatial pattern road network for more interactive and attractive

for the tourism purpose. The transport network covers the whole site with one main arterial road which will served by several access roads to keep direct access to plot. Boats and other water rides cover the site through lakes for transportation purpose. Plaza and public platform for roadside performances are also in the design to make the road more enjoyable and vibrant.

Natural Jhau forest also a lucrative element in the tourism site. The 40.56 acres Jhaw forest is proposed to preserve and provide some natural element to make more attractive for tourist. 654.81 acres (62.50%) land is designated for lake, road, pedestrian way, bicycle lane, Jhaw forest, Sea beach, Green Park and reserve area (Table 4-8 and Map 4-1).

Table 4-8: Water body and Green Area

Types of Plots	Number of Plots	Area in acre	% as per specific Zone	% as per Total Area
Beach Area	2	177.92	27.17	16.98
Farming Area	1	6.24	0.95	0.60
Green Area	19	19.54	2.98	1.87
Jhau Forest	1	40.56	6.19	3.87
Lake	2	58.58	8.95	5.59
Rain Water Harvesting Pond	1	15.23	2.33	1.45
Sea	1	253.50	38.71	24.20
Embankment	3	8.93	1.36	0.85
Road	2	74.31	11.35	7.09
Total	**32**	**654.81**	**100.00**	**62.50**



Map 4-1: Proposed Land use Plan of Sabrang Tourism Park

4.2 DENSITY ZONING

The aim of density zoning is to provide an acceptable population density which is related to the designed facilities and amenities especially in the accommodation areas. This ensures a healthy and enjoyable living of the tourist.

According to Bangladesh Economic Zones (Construction of Building) Rules, 2017, Floor Area Ratio (FAR) is the only tool to control population density but this rule is applicable for the industrial plot. But there have no specific guidelines for Tourism Park. Apart from FAR, there are several standards to achieve desired population density such as number of dwelling units per acre, maximum room occupancy etc. each with their comparative effectiveness. The density is varying according to the purpose and facilities of the plots. The proposed Density Zoning of the master plan is given in Figure 4-1 and Table 4-9. The density zoning is divided into 3 categories for the Sabrang Tourism Park. Those are:

- High Density Area: Population density is above 250 per acre.
- Medium Density: Population density is 100 PPA to 250 PPA and
- Low Density: Population density is below 100 per acre.

In Sabrang Tourism Park, 17% area are designated as High-Density Area, 3% area are designated as Medium density area and 25% area covers as low-density area. High density and medium density area main consist of Beach Side Resorts/Hotels, Lake side Hotels/Resorts, economy hotels and service studio apartment. Low density area consists of Utility, common facility and service area. 55% area of Sabrang Tourism Park is fall under beach area, Proposed Lake, Road Network and Sea area (Figure 4-1 and Map 4-2). The facility wise employment and tourist accommodation capacity of Sabrang Tourism Park in given in Table 4-9.

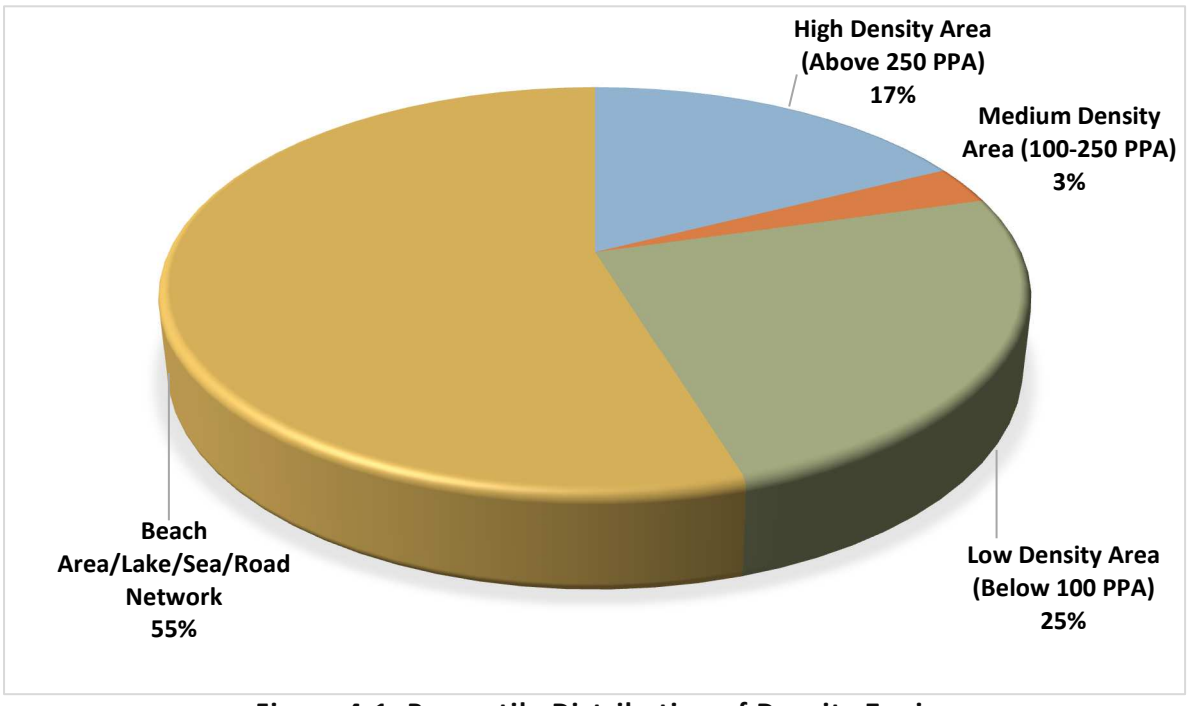


Figure 4-1: Percentile Distribution of Density Zoning

Table 4-9: Density Zoning

Broad Land use	Types	Area Acre	Night Stay Tourist	Staff per Facility	Total Population	Density (PPA)
Residential/ Hospitality	Beach Side Resort and Hotel	118.19	20967	8387	29354	250
	Lake Side Resort & Hotel (South)	17.82	3296	1268	4564	250
	Lake Side Resort & Hotel (North)	38.07	12326	3006	15333	400
	Economy Hotel	9.4	1978	742	2720	300
	Service Studio Apartment	19.75	1998	266	2264	150
Institutional Zone	Welfare Centre	4.02	271	54	325	100
	Old Age Home/Future Developed Area/Service Area	7.76	524	87	611	100
Common Facilities	Park-1	10.57		50	50	
	Park-2	13.04		70	70	
	Amphitheatre	2.16		12	12	
	Amusement Park	10.49		100	100	
	Golf Course/Recreational Space	55.94		50	50	
	Food Zone	0.51		7	7	
	Boating and Shopping	2.29		5	5	
	Liberation War and Amusement Museum	2.23		15	15	
	Watch Tower and Restaurant	9.8		30	30	
	Shopping District	7.7		100	100	
	Rest Room & Wash Room	2.07		5	5	
	South Watch Tower	1.18		5	5	
Administrative Zone	Disaster Management Centre	0.94		15	15	
	Hospital	1.32		18	18	
	Security and Service Zone	11.12		10	10	
	Security Zone	1.81		5	5	
	Tourist Police Station and Fire Station	1.96		100	100	
	Administrative Area	5.97		50	50	
Transportation Zone	Bus Depot	4.4		25	25	
	Helipad Station	2.61		10	10	
	Jetty Area	2.27		16	16	
	Transportation Hub	1.81		5	5	
Utility Zone	Electrical Sub-station 2	1.33		9	9	
	Electrical Sub-station-1	1.21		9	9	

Broad Land use	Types	Area Acre	Night Stay Tourist	Staff per Facility	Total Population	Density (PPA)
	Bio-Gas Plant	1.04		7	7	
	Power Plant and Gas Station	8.45		20	20	
	Solid Waste Centre	4.54		32	32	
	STP 1	1.96		10	10	
	STP 2	3.57		15	15	
	STP-3	1.75		10	10	
	Water Reservoir	2.05		8	8	
Water body and Green Area	Farming Area	6.24		5	5	
Total			**41361**	**14639**	**56000**	

4.3 HEIGHT ZONING

Minimum building area is recommended to development of international tourist attractions and securing the flexible investment of the national and international investor. The maximum permissible height of the buildings is proposed G+9 storied for Sabrang Tourism Park. The skyline of Sabrang Tourism Park should be achieved through the integration of the existing geographical features and artificial architecture. In order to avoid designing for monotonous skyline, the number of floors and layout of the resort and commercial area must be regulated. A flexible and variable cityscape should be created. A balance between the natural landscape and artificial cityscape must be encouraged. Skyline to promote the creation of the urban image and amenities should be formed. In special permission from BEZA, 30% beach view plots may be developed G+14 storied with proper maintenance of public access.

Map 4-2: Density Zoning

5 TOURISM DESIGN GUIDELINES

5.1 INTRODUCTION

For development of international tourist attraction and securing the flexible investment attraction, only the minimum building areas of the Sabrang TP is proposed for the specific zones. Hence, there have not any set guidelines for the developments that require large-scale investment attraction, such as land use for the hotel, resort, studio apartment and leisure activities. These should depend on the investors' wish and creativity. Nevertheless, minimum guidelines for specific spaces such as residential, commercial and partially public spaces as these are main spots of urban amenity of the site. Any development should also follow the guidelines from the BEZA's Building Construction Act, 2017 for Economic Zone.

5.2 TOURISM FACILITIES

The proposed tourism park includes heritage museum, resort, picnic spots, landscapes and beach areas, wildlife of various species. Activities for tourists include angling, water skiing, river cruising, hiking, rowing, yachting and sea bathing. Tourists would be encouraged to visit the nearest tourist attractions spots like; Sahangu-Matamuhuri Wildlife Santuary, Himchari National Park, Teknaf Game Reserve, Saint Martin's Island and Ramu Buddhist Temple. There could be a possibility to arrange a cruise ship tour to Saint Martin Island via Sabrang & Naf tourism site from Chittagong or Cox's Bazar through the Inani Beach at Cox's Bazar.

5.3 ROAD NETWORK

The road network shall be as per Schedule-I from BEZA's Building Construction Act for Economic Zone (page-2335).

5.4 GROUND COVERAGE

Building footprint maximum 50% of the total area.

5.5 BUILDING ORIENTATION

Building orientation and openings should maximize the north and south exposure and natural cross flow ventilation and well considered landscaping to provide valuable shade throughout summer and the use of winter sun. Green corridor must be placed in the center of the shopping district in consideration of the circulation of tourist and floating population to ensure the connectivity within the site and create interesting building facades. Buildings would be placed facing the green corridor with an active edge for at least two thirds of the building's frontage to vitalize the tourist complex.

5.6 ACCESS TO PLOTS

The development of the site shall be designed to enable vehicles to exit the site in a forward direction. Development works shall be designed to ensure easy and safe access of vehicles in the proposed plots.

5.7 SERVICING AND LOADING

If plots are located near accommodation or residential area, loading and service areas shall be sited to the rear or side of the property and away from residences. Loading areas shall be separated from pedestrian access paths.

5.8 PARKING

Parking for residential, commercial and other facilities is to be developed within the plot. No on-street parking will be allowed within the Sabrang Tourism Park.

5.9 LANDSCAPING

Planning for any area within commercial, business and beach areas of Sabrang Tourism Park will present a distinctive landscape and induce vitalization of sitting areas, walkways, shops and restaurant in the vicinity.

5.10 SIGNAGE

Good signage in tourism parks can save lives. The designed signage must be easy to notice, be easy to understand, use colors that stand out from the background, include Bengali and English languages, include graphics and the traditional “no” symbol of a red circle with a line through it and avoid crowding too many messages into one spot.

5.11 LIGHTING

From parks and plazas to walkways and waterfronts, open spaces are essential to a tourism park and the right lighting can turn them into unique visual experiences. An innovative lighting design should be developed to create urban outdoor spaces that boost tourism and economic development, while saving energy and reducing the environmental impact.

5.12 ROADS, SIDEWALKS AND STREET FURNITURE

Planning for any area within commercial and business areas of Sabrang Tourism Park will present a distinctive design for walkways with multiple street furniture and adequate lighting.

5.13 VIEWS TO WATER

Any development of the Sabrang Tourism Park near sea or lake should try to optimize the views to water.

6 PHASING PLAN

6.1 INTRODUCTION

Three phases for the implementation of Detailed Master Plan for Sabrang Tourism Park are recommended by the Consultants. All phases will comprise 15-year period. The phasing period are given Medium Term and Long Term as shown in Table 6-1.

Table 6-1: Phasing of Master Plan

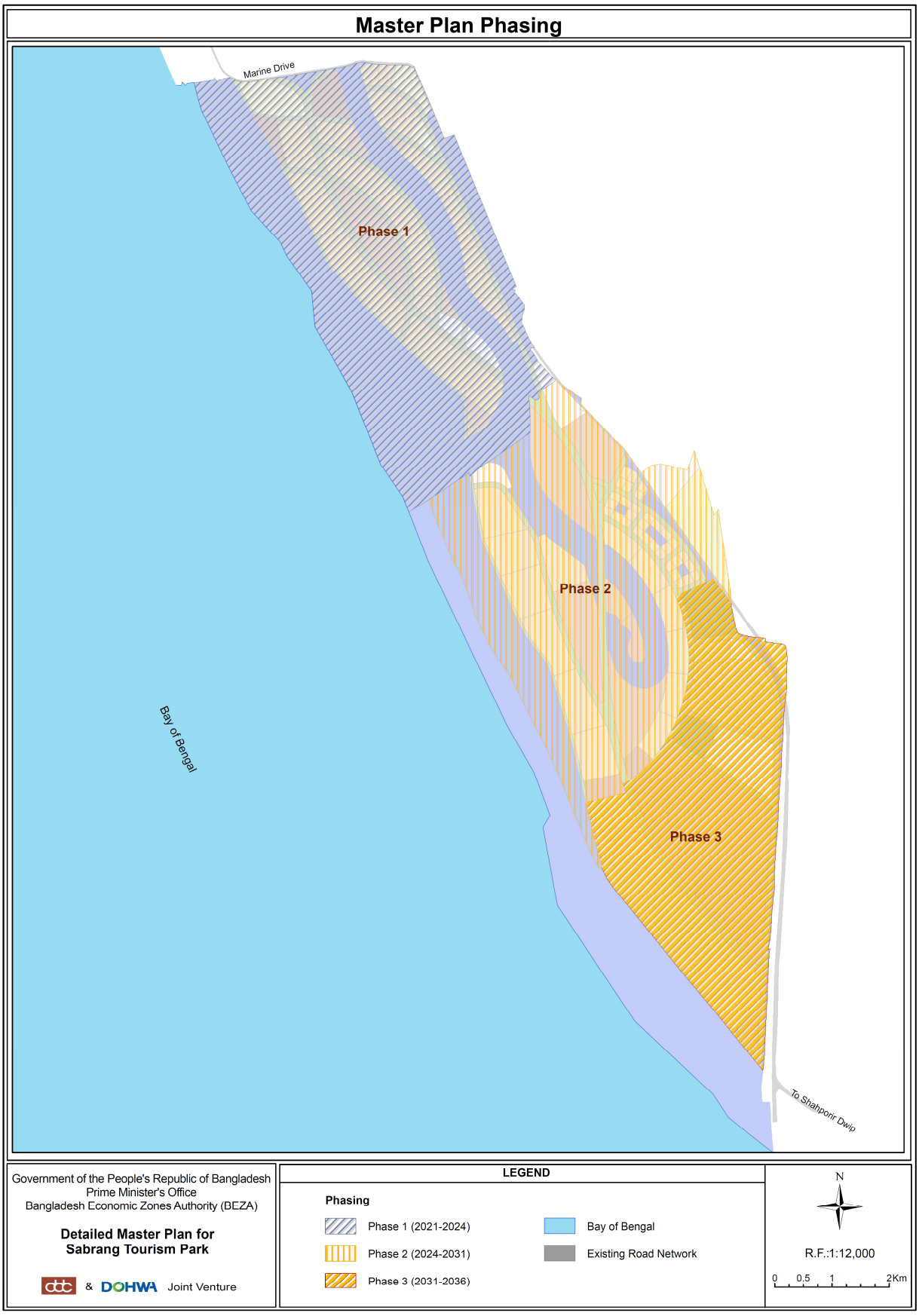
Phase	Period
1st	2021-2024 (3 years)
2nd	2024-2031 (7 years)
3rd	2031-2036 (5 years)

Source: Prepared by the Consultants' Team, 2020

The plan proposals have to be implemented by 2036 being the plan period. But there are some sectors which should be completed within 1st phase e.g., land development and lake etc.

6.2 MASTER PLAN PHASING

Total construction will be divided into two phases over 15 year's period. All infrastructure plan has to be developed separately according to their development plan to make the Sabrang Tourism Park be fully serviced at each stage. The service area and road will be developed in the initial stage. The Phasing Plan of Sabarng Tourism Park is shown in Map 6-1.



Map 6-1: Phasing Plan of Sabrang Tourism Park

6.2.1 PHASE 01 (2021-2024)

The list of facilities recommended to implement in 1st phase to start partially operation of Sabrang Tourism Park. Those are:

- Administrative Area
- 6 nos. Beach Side Resort and Hotel
- Bio-Gas Plant
- Boating and Shopping
- Bus Depot
- Disaster Management Centre
- Power Plant and Gas Station
- Electrical Sub-station-1
- Embankment
- Farming Area
- Food Zone
- Green Area
- Water Reservoir
- Solid Waste Centre
- Hospital
- Jetty Area
- Lake
- 25 nos. Lake Side Resort & Hotel (North)
- Park-1
- Rest Room & Wash Room
- Road
- STP 1
- STP 2
- Tourist Police Station and Fire Station
- Walkway
-

6.2.2 PHASE 02 (2024-2031)

The list of recommended facilities to implement in 2nd phase are:

- Amphitheatre
- Amusement Park
- 7 nos. Beach Side Resort and Hotel
- 32 nos. Economy Hotel
- Embankment
- Green Area
- Helipad Station
- Jhau Forest
- 6 nos. Lake Side Resort & Hotel (South)
- Liberation War and Heritage Museum
- Park-2
- Rain Water Harvesting Pond
- Road Island
- Security and Service Zone
- Shopping District
- Transportation Hub
- Walkway
- Watch Tower and Restaurant

6.2.3 PHASE 03 (2031-2036)

After implementation of 3rd Phase the Tourism Park will fully functional to provide tourism facilities for the tourist The list of facilities recommended to implement in 3rd phase are:

- 7 nos. Beach Side Resort and Hotel
- Electrical Sub-station 2
- Golf Course/Recreational Space
- Green Area
- Old Age Home
- Security Zone
- Service Studio Apartment
- South Watch Tower
- STP-3
- Welfare Centre

APPENDIX A MEETING MINUTES OF DRAFT FINAL REPORT

Government of the People's Republic of Bangladesh
Prime Minister's Office
Bangladesh Economic Zones Authority
www.beza.gov.bd

Meeting Minutes of Presentation/Workshop meeting on Detail Master Plan and Infrastructure Plan for Sabrang and Naf Tourism Parks

Chaired by: Mr. Md. Harunur Rashid, Executive Member (Admin & Finance), BEZA

Date & Time: 30 September, 2019, 10:30 AM

Venue: Conference Room of BEZA

2.0 List of Participants: **Annexure- A**.

3.0 Presentation on Sabrang Tourism Park

3.1 The Chair welcomed the participants to the presentation meeting and initiated discussions. He gave a brief speech on the importance of study and presentation. He, then, requested to the Team Leader of the Consultant to start the presentation.

3.2 Professor Md. Khairul Enam, Team Leader started the power point presentation of the Detail Master Plan and Infrastructure Plan of Sabrang and Naf Tourism Park Project. Mr. Enam welcomed the audience on behave of consultants' team and presented Detail Master Plan for Sabrang Tourism Park.

3.3 After the presentation, he then showed the 3D Animation of the Master Plan of Sabrang Tourism Park to the audience.

3.4 The Infrastructure Plan of Sabrang Tourism Park was presented by Mr. Mezbah-ul-Alam, Transport Expert of DDC-DOHWA JV consultants.

3.5 After the first presentation, Executive Member (Admin & Finance) of BEZA thanked the presenter for presentation. He then told to the meeting that a foreign investor wants to invest in 83 acre of land of Sabrang Tourism Park for development of tourism sector and construction of Administrative Building and a Clock Tower are on-going in Sabrang Tourism Park which were not incorporated in this plan. So, he requested the Team Leader to incorporate these issues in the updated Master Plan. Then he requested the participants to give comments on this presentation.

4.0 Decisions on Sabrang Tourism Park

Following decisions were taken on Presentation/Workshop meeting on Detail Master Plan and Infrastructure Plan for Sabrang Tourism Park:

4.1 All existing infrastructure including Administrative Building, Clock Tower, embankment along with proposal of 83 acre of land need to be incorporated in the updated Master Plan.

4.2 Road section for Sabrang Tourism Park needs to be revised to include cycling and walking path.

4.3 Utility demand analysis requires to be revisited considering the investment proposals received for plots in Sabrang.

4.4 The 3-D Animation should be updated considering updated Master Plan.

4.5 Space for casual program for performance of art/cultural activities, and bathing facilities may be created near the sea beach.

4.6 Proposal of gas power plant shall be replaced with potential energy mix with other fuel power plant.

4.7 Footpath shall be widened with sufficient greeneries.

4.8 Fire Station is required at the centre of the site for reducing the response time.

4.9 Drainage Plan, Solid Waste Management Plan, CETP, STP and their locations, embankment height all required to be reviewed as per the existing embankment height of BWDB and historical flood level analysis with dataset.

4.10 Preliminary source of water and indicative main distribution system should be incorporated with final report after consultation with IWM.

4.11 Environmental issues, social consideration, occupational health safety, emergency response/disaster management plans should be incorporate with final report following Green Economic Zone guideline.

4.12 Cost estimations of all on-site & off-site infrastructures and utility service facilities mentioning rate schedules should be incorporated with final report.

4.13 Jetty information in the transport sector of the land use proposal should be incorporated with final report.

4.14 All maps with proper scale, legend and direction should be inserted with final report.

4.15 Cost estimation of land filling should be reviewed following the existing RL of embankment of BWDB.

4.16 The Final Report should be included with Volume I: Survey Report, Volume II: Master Plan, Volume III: Infrastructure Plan and Volume IV: Development Management Plan as per discussion.

5.0 Presentation on Naf Tourism Park

5.1 The second presentation on Detail Master Plan and Infrastructure Plan of Naf Tourism Park was presented sequentially with ending the first session.

5.2 The Executive Member (Admin & Finance) of BEZA requested to the Team Leader of the Consultant to start the 2nd presentation. Then Team Leader started the power point presentation of the Detail Master Plan and Infrastructure Plan of Naf Tourism Park.

5.3 Team Leader again welcomed the audience on behalf of consultants' team. After the presentation, he then showed the 3D Animation of the Master Plan of Naf Tourism Park to the audience.

5.4 The Infrastructure Plan of Naf Tourism Park was presented by Mr. Mezbah-ul-Alam, Transport Expert of DDC-DOHWA JV consultants.

5.5 Then Executive Member (Admin & Finance) of BEZA requested the participants to give comments on this presentation.

6.0 Decisions on Naf Tourism Park

Following decisions were taken on Presentation/Workshop meeting on Detail Master Plan and Infrastructure Plan for Naf Tourism Park:

6.1 Functional area of Teknaf-Cox's Bazar National Highway side is considered as critical area and the land use plan of this section must be raised considering tidal effect.

6.2 The Cable Car Station has to be relocated from centre of main theme park to another suitable location and must be reflected in the final report accordingly.

6.3 Proposed water bodies of Naf Tourism Park have to be connected with the main water channel.

6.4 STP location has to be relocated towards more south-east to ensure the gravity driven collection of wastewater from all the land use features and sufficient space for STP must be proposed in updated Master Plan.

6.5 Health and educational facilities should be included in updated Master Plan.

6.6 Cost estimations of all on-site & off-site infrastructures and utility service facilities mentioning rate schedules should be incorporate with final report.

6.7 All maps with proper scale, legend and direction should be inserted with final report.

6.8 Cost estimation of land filling should be reviewed with following the existing RL of embankment.

6.9 Fire Station is required to relocate from periphery to centre of the site for reducing the response time.

6.10 Area of Solar panel which was proposed eastern side of Naf Tourism Park should be reviewed with proper judgement and should be incorporated accordingly.

6.11 The Final Report should be included with Volume I: Survey Report, Volume II: Master Plan, Volume III: Infrastructure Plan and Volume IV: Development Management Plan as per discussion.

7.0 Since there was no more issue for discussion, the Chair concluded the meeting conveying vote of thanks.

15.10.2019

(Md. Harunur Rashid)
Executive Member (Admin & Finance)

APPENDIX B COMPLIENCE CHECKLIST

Table A1.1: Compliance Checklist of Sabrang Tourism Park of Draft Final Report

SI No.	Comments	Remarks
1.	All existing infrastructure including Administrative Building, Clock Tower, embankment along with proposal of 83 acre of land need to be incorporated in the updated Master Plan.	Incorporated in Master Plan. Please see Volume –I, Figure 3-22. The 83 acres plots was added by the Consultants team, later with the discussion with Honourable Executive Chairman sir, the 83 acres plots are divided into 6 acres plots and golf course.
2.	Road section for Sabrang Tourism Park needs to be revised to include cycling and walking path.	Incorporated. The footpath is added with the road section and cycle lane are proposed with the canal. Please see Volume –II, Figure 2.1 and Figure 10.4.
3.	Utility demand analysis requires to be revisited considering the investment proposals received for plots in Sabrang.	Utility demand analysis are revised based on the updated Master Plan and number of populations.
4.	The 3-D Animation should be updated considering updated Master Plan.	Revised as per the updated Master Plan.
5.	Space for casual program for performance of art/cultural activities, and bathing facilities may be created near the sea beach.	Incorporated. Please see Volume –I, Figure 3.19 and Figure 3.22.
6.	Proposal of gas power plant shall be replaced with potential energy mix with other fuel power plant.	After discussion with the Honourable Executive Chairman sir on 16.03.2020, the gas supply system is removed from the Master Plan. The fuel of power plant is considered another. Please see Volume II, Chapter- 3.
7.	Footpath shall be widened with sufficient greeneries.	Incorporated. Please see Volume–II, Figure 2.1 and figure 10.4.
8.	Fire Station is required at the centre of the site for reducing the response time.	Incorporated in Master Plan. Please see Volume –I, Figure 3-22.
9.	Drainage Plan, Solid Waste Management Plan, CETP, STP and their locations, embankment height all required to be reviewed as per the existing embankment height of BWDB and historical flood level analysis with dataset.	Considered and incorporated into the Master Plan (Volume I) and Infrastructure Plan (Volume II).
10.	Preliminary source of water and indicative main distribution system should be incorporated with final report after consultation with IWM.	The Preliminary in-site distribution line and location of water reservoir are given in Master Plan (Volume II) and Infrastructure Plan (Volume II).
11.	Environmental issues, social consideration, occupational health safety, emergency response/disaster management plans should be incorporate with final report following Green Economic Zone guideline.	Considered and incorporated in the Infrastructure Plan (Volume II).
12.	Cost estimations of all on-site & off-site infrastructures and utility service facilities	Incorporated, please see Detail cost estimate (Volume IV).

SI No.	Comments	Remarks
	mentioning rate schedules should be incorporated with final report.	
13.	Jetty information in the transport sector of the land use proposal should be incorporated with final report.	Incorporated. Please see Volume –I, Figure 3.22.
14.	All maps with proper scale, legend and direction should be inserted with final report.	Incorporated in all volumes.
15.	Cost estimation of land filling should be reviewed following the existing RL of embankment of BWDB.	Revised and Incorporated.
16.	The Final Report should be included with Volume I: Survey Report, Volume II: Master Plan, Volume III: Infrastructure Plan and Volume IV: Development Management Plan as per discussion.	Incorporated.

APPENDIX C MEETING MINUTES OF PRIME MINISTER'S PRESENTATION

ডায়েরী নং ঃ 2008
তারিখ ০৯/০৩/২০২০

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
প্রধানমন্ত্রীর কার্যালয়
পুরাতন সংসদ ভবন, ঢাকা।

মুজিব শতবর্ষ MUJIB 100

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
বাংলাদেশ অর্থনৈতিক অঞ্চল কর্তৃপক্ষ
প্রধানমন্ত্রীর কার্যালয়, ঢাকা।
১। নির্বাহী সদস্য (পরিঃ উন্নঃ/প্রশাঃ ও অর্থ/বিনিঃ উন্নঃ)
২। সচিব/মহাব্যবস্থাপক (পরিঃ উন্নঃ/প্রশাসন/বিনিঃ উন্নঃ)
৩। PD, সাপোর্ট টু বেজা/ফেজ-১/জামালপুর/ভূমি অধিগ্রহণ/...
৪। ব্যবস্থাপক প্রশাঃ/বিনিঃ উন্নঃ/পরিঃ উন্নঃ/আইন/অর্থ ও ...এমআইএস ও গবেষণা/পরিকল্পনা/সংযুক্তি-বিনিঃ উন্নঃ/সংযুক্তি-পরিঃ উন্নঃ
তাং ০৯/০৩/২০২০
নির্বাহী চেয়ারম্যান

পত্র সংখ্যাঃ ০৩.০৬৮.০০৬.০৯.০০.০২৪.২০১৪(অংশ-৫)- ২১৮

তারিখঃ ২৪ ফাল্গুন ১৪২৬ বঃ
০৮ মার্চ ২০২০ খ্রিঃ

বিষয়ঃ 'নাফ ট্যুরিজম পার্ক', 'সাবরাং ট্যুরিজম পার্ক' এবং 'সোনাদিয়া ইকো-ট্যুরিজম পার্ক' এর মাস্টার প্লান পর্যালোচনা সভার কার্যবিবরণী।

'নাফ ট্যুরিজম পার্ক', 'সাবরাং ট্যুরিজম পার্ক' এবং 'সোনাদিয়া ইকো-ট্যুরিজম পার্ক' এর মাস্টার প্ল্যান পর্যালোচনার জন্য মাননীয় প্রধানমন্ত্রীর সভাপতিত্বে গত ১৯/০২/২০১৯ তারিখে অনুষ্ঠিত সভার কার্যবিবরণী সদয় অবগতি ও প্রয়োজনীয় কার্যার্থে নির্দেশক্রমে এসাথে প্রেরণ করা হলো।

সংযুক্তিঃ বর্ণনামতে।

০৮/০৩/২০২০
(মোঃ জিয়াউল হক)
পরিচালক-১
ফোনঃ ৫৫০২৯৪২১
E-mail: dir1@pmo.gov.bd

নির্বাহী চেয়ারম্যান
বেজা
মোনেম বিজনেস ডিস্ট্রিক্ট (লেভেল-১২)
১১১ বীর উত্তম সি.আর দত্ত রোড, ঢাকা।

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
প্রধানমন্ত্রীর কার্যালয়
তেজগাঁও, ঢাকা।

সাবরাং ট্যুরিজম পার্ক, নাফ ট্যুরিজম পার্ক ও সোনাদিয়া ইকো ট্যুরিজম পার্কের খসড়া মাস্টার প্ল্যান উপস্থাপন সংক্রান্ত সভার কার্যবিবরণী

সভাপতি	:	শেখ হাসিনা প্রধানমন্ত্রী গণপ্রজাতন্ত্রী বাংলাদেশ সরকার।
তারিখ	:	০৬ ফাল্গুন ১৪২৬, ১৯ ফেব্রুয়ারি, ২০২০
সময়	:	বেলা ১১:০০টা
স্থান	:	চামেলী, প্রধানমন্ত্রীর কার্যালয়।

মাননীয় প্রধানমন্ত্রী উপস্থিত সকলকে স্বাগত জানিয়ে সভার কার্যক্রম শুরু করেন। মাননীয় প্রধানমন্ত্রীর অনুমতিক্রমে মুখ্য সচিব, প্রধানমন্ত্রীর কার্যালয় সভার অলোচ্যসূচি ব্যাখ্যা করেন এবং সাবরাং ট্যুরিজম পার্ক, নাফ ট্যুরিজম পার্ক ও সোনাদিয়া ইকো-ট্যুরিজম পার্ক -এর খসড়া মাস্টার প্ল্যানের উপস্থাপনা শুরু করার জন্য বেজা'র নির্বাহী চেয়ারম্যান-কে অনুরোধ জানান।

২। বেজা'র নির্বাহী চেয়ারম্যান সভাকে অবহিত করেন যে, বেজা'র নিজস্ব অর্থায়নে সাবরাং ট্যুরিজম পার্ক ও নাফ ট্যুরিজম পার্কের মাস্টার প্ল্যান প্রণয়নের লক্ষ্যে Development Design Consultants Ltd ও DOHWA Consultants Ltd -কে এবং সোনাদিয়া ইকো-ট্যুরিজম পার্কের মাস্টার প্ল্যান প্রণয়নের জন্যে Mahindra Consulting Engineers এবং DevCon Consultants Ltd -কে পরামর্শক প্রতিষ্ঠান হিসাবে নিয়োগ দেয়া হয়েছে। এছাড়া, তিনি বেজা'র অধীনে পরিচালিত কার্যক্রমের অগ্রগতি বিষয়ে সংক্ষিপ্ত আলোকপাত করেন এবং সংশ্লিষ্ট পরামর্শক প্রতিষ্ঠানের টিমলিডার কর্তৃক খসড়া মাস্টার প্ল্যান উপস্থাপন করবেন মর্মে সভায় অবহিত করেন।

৩। অতঃপর Development Design Consultants Ltd ও DOHWA Consultants Ltd এর পক্ষে অধ্যাপক খাইরুল এনাম সাবরাং ট্যুরিজম পার্ক ও নাফ ট্যুরিজম পার্কের খসড়া মাস্টার প্ল্যান উপস্থাপন করেন এবং Mahindra Consulting Engineers এবং DevCon Consultants Limited এর পক্ষে জনাব বালাকৃষ্ণানান সুরেশ সোনাদিয়া ইকো-ট্যুরিজম পার্কের খসড়া মাস্টার প্ল্যান উপস্থাপন করেন।

৪। মাননীয় প্রধানমন্ত্রী অপরূপ প্রাকৃতিক সৌন্দর্যের লীলাভূমি আমাদের এ বাংলাদেশকে বিশ্ববাসীর কাছে ট্যুরিজমের গন্তব্য হিসেবে আকর্ষনীয় করে গড়ে তোলার লক্ষ্যে আধুনিক ও যুগোপযোগী পরিকল্পনা এবং তার সঠিক বাস্তবায়নের উপর বিশেষ গুরুত্ব আরোপ করেন। একই সাথে প্রাকৃতিক ভারসাম্য ও জীব বৈচিত্র রক্ষার প্রতিও সজাগ দৃষ্টি রাখার আহবান জানান। সভাপতি আশাবাদ ব্যক্ত করেন যে, ট্যুরিজম পার্কসহ অন্যান্য অর্থনৈতিক অঞ্চলসমূহ দেশের আর্থিক ও সামাজিক উন্নয়নে গুরুত্বপূর্ণ অবদান রাখবে এবং বিশ্ববাসীর কাছে দেশের ভাবমূর্তি উজ্জ্বল করবে।

৫। ট্যুরিজম পার্কের উন্নয়ন কার্যক্রমকে অধিকতর কার্যকর করার লক্ষ্যে মাননীয় প্রধানমন্ত্রী নিম্নবর্ণিত অনুশাসন প্রদান করেন:

৫.১ সাবরাং ট্যুরিজম পার্ক:

৫.১.১. সাবরাং ট্যুরিজম পার্কটি বিশেষভাবে বিদেশী ট্যুরিষ্টদের আকৃষ্ট করার প্রয়োজনীয় সকল সুযোগ সুবিধার সমন্বয়ে যুগোপযোগী করে গড়ে তুলতে হবে এবং এর অংশবিশেষ সম্পূর্ণরূপে বিদেশী পর্যটকদের জন্য সংরক্ষিত রাখতে হবে।

৫.১.২. সাবরাং ট্যুরিজম পার্কের সমুদ্র সৈকতে যাওয়ার জন্য Dedicated walk-way রাখতে হবে। প্রয়োজনে সুরক্ষা বাঁধ অতিক্রম করার জন্য Under-pass নির্মাণ করা যেতে পারে। হোটেলগুলো থেকে সমুদ্র সৈকতে যাওয়ার রাস্তা সরাসরি Under-pass এর সাথে সংযুক্ত করা যেতে পারে।

৫.১.৩. সমুদ্র সৈকতে বড় কোন স্থাপনা করা যাবে না এবং সৈকতে স্থাপনা করার ক্ষেত্রে নান্দনিকতা বজায় রাখতে হবে। তবে সৈকতে পর্যটকদের জন্য Swimming Pool এবং Lavatory-সহ অন্যান্য সহায়ক স্থাপনা নির্মাণ করা যেতে পারে।

৫.১.৪. সাবরাং ট্যুরিজম পার্কে সীমিত পরিসরে বাজেট হোটেল এর ব্যবস্থা রাখতে হবে। সকল বয়সের ট্যুরিষ্টদের প্রয়োজন বিবেচনা করে সুযোগ সুবিধা নিশ্চিত করতে হবে। শিশু, প্রতিবন্ধী এবং বয়স্কদের জন্য বিশেষ সুবিধার ব্যবস্থা করতে হবে।

৫.১.৫. সকল স্থাপনা যাতে দুর্যোগ প্রতিরোধী এবং বায়ু চলাচলের ব্যবস্থা সম্বলিত হয় তা নিশ্চিত করতে হবে। প্রয়োজনে ভবনের নীচতলা ফাঁকা রাখতে হবে যাতে প্লাবিত হলে স্থাপনা জলমগ্ন না হয়।

৫.১.৬. সাবরাং ট্যুরিজম পার্কে প্রবেশাধিকার সংরক্ষিত থাকবে।

৫.১.৭. পর্যটকদের সার্বিক নিরাপত্তা নিশ্চিত করতে সংশ্লিষ্ট সকলকে প্রয়োজনীয় ব্যবস্থা গ্রহণ করতে হবে।

৫.১.৮. বিআইডাব্লুটিএ কর্তৃক পরিকল্পনাধীন জেটি নির্মাণের কাজ দ্রুত শুরু করতে হবে।

৫.১.৯. ট্যুরিজম পার্কটি পর্যটকদের ব্যবহারের জন্য দ্রুত উন্মুক্ত করতে প্রয়োজনীয় পদক্ষেপ গ্রহণ করতে হবে। আগামী ০৩ বছরের মধ্যে আংশিকভাবে উন্মুক্ত করার ব্যবস্থা গ্রহণ করতে হবে।

৫.২. নাফ ট্যুরিজম পার্ক:

৫.২.১. নাফ ট্যুরিজম পার্কের প্রতিরক্ষা বাঁধ নির্মাণ ও ভূমি উন্নয়নের কাজ দ্রুত ও নির্বিঘ্নে করার লক্ষ্যে বাংলাদেশ নৌবাহিনীকে ব্যবহার করা যেতে পারে।

৫.২.২. ঝড় ও জলোচ্ছাস প্রতিরোধের জন্য প্রচুর ঝাউ এবং ম্যানগ্রোভ প্রজাতির বৃক্ষ রোপণ করতে হবে।

৫.২.৩. প্রাকৃতিক পরিবেশ নিশ্চিত রাখার সুবিধার্থে নাফ ট্যুরিজম পার্কে মূল ভূখন্ড থেকে কোন সংযোগ ব্রীজ স্থাপনের প্রয়োজন নেই এবং সেখানে কোন মোটরচালিত যান চলাচল করবেনা। রিক্সা/ভ্যান/গলফ কার্ট জাতীয় যান চলাচল করবে যাতে প্রাকৃতিক পরিবেশ অক্ষুন্ন থাকে।

৫.২.৪. আগামী ০৩ বছরের মধ্যে নাফ ট্যুরিজম পার্কের অধিকাংশ কাজ শেষ করে পর্যটকদের জন্য উন্মুক্ত করার ব্যবস্থা করতে হবে।

৫.২.৫ পর্যটকদের নিরাপত্তা নিশ্চিত করতে প্রয়োজনীয় পদক্ষেপ গ্রহণ করতে হবে।

৫.৩. সোনাদিয়া ইকো-ট্যুরিজম পার্ক:

৫.৩.১. সোনাদিয়া ইকো-ট্যুরিজম পার্কের মাস্টার প্ল্যান প্রণয়নে বিদ্যমান প্রাকৃতিক সৌন্দর্য ও জীব-বৈচিত্র অপরিবর্তিত রেখে পর্যটক আকর্ষনের বিভিন্ন উপাদান সংযুক্ত করতে হবে।

৫.৩.২. বেজা'র চলমান বৃক্ষরোপণ কার্যক্রম জোরদার করতে হবে। প্রয়োজনে ঝাউ এর বীজ ছিটানোর ব্যবস্থা করতে হবে। এছাড়া গাছ কাটা বন্ধে জেলা প্রশাসন, উপজেলা প্রশাসন ও নিরাপত্তা বাহিনী প্রয়োজনীয় ব্যবস্থা গ্রহণ করবে।

৫.৩.৩. লাল কাঁকড়া, কচ্ছপ ও অন্যান্য প্রাণী সংরক্ষণে প্রয়োজনীয় ব্যবস্থা গ্রহণ করতে হবে এবং পার্কের স্থাপনা যেন এই সকল প্রজাতির প্রাকৃতিক প্রজননের ক্ষেত্রসমূহ নষ্ট না করে সেদিকে সজাগ দৃষ্টি রাখতে হবে।

৫.৩.৪. সোনাদিয়া ইকো-ট্যুরিজম পার্কের যে সকল জায়গায় লাল কাঁকড়া বিচরণ করে এবং কচ্ছপ প্রজননের স্থান রয়েছে সে সকল স্থানে পর্যটকদের চলাচলের জন্য Elevated walk-way তৈরি করতে হবে।

৫.৩.৫. সমুদ্র সৈকত হতে ৫০০ মিটারের মধ্যে কোন স্থায়ী স্থাপনা তৈরি পরিহার করতে হবে।

৫.৩.৬. সামদ্রিক প্রাণি সম্পদ গবেষণার সুযোগ সম্বলিত Oceanarium নির্মাণ করতে হবে।

৫.৩.৭. আগামী ০২ বছরের মধ্যে সোনাদিয়া ইকো-ট্যুরিজম পার্ক আংশিকভাবে পর্যটকদের জন্য উন্মুক্ত করার প্রয়োজনীয় ব্যবস্থা গ্রহণ করতে হবে এবং ০৫ বছরের মধ্যে সকল নির্মাণ কাজ সমাপ্ত করতে হবে।

৬। প্রতিটি ক্ষেত্রে বর্জ্য ব্যবস্থাপনা নিশ্চিত করতে হবে।

৭। পরিশেষে মাননীয় প্রধানমন্ত্রী সবাইকে ধন্যবাদ জানিয়ে সভার সমাপ্তি ঘোষণা করেন।

স্বাক্ষরিত/-
০৪/০৩/২০২০

(শেখ হাসিনা)
প্রধানমন্ত্রী
গণপ্রজাতন্ত্রী বাংলাদেশ সরকার

APPENDIX D COMPLIENCE CHECKLIST

Table A 1.2: Compliance Checklist of Sabrang Tourism Park of Prime Minister's Presentation

ক্রম নং	সভার সিদ্ধান্ত	গৃহিত কার্যক্রম
১	সাবরাং ট্যুরিজম পার্কটি বিশেষভাবে বিদেশী ট্যুরিষ্টদের আকৃষ্ট করার প্রয়োজনীয় সকল সুযোগ সুবিধার সমন্বয়ে যুগোপযোগী করে গড়ে তুলতে হবে এবং এর অংশবিশেষ সম্পূর্ণরূপে বিদেশী পর্যটকদের জন্য সংরক্ষিত রাখতে হবে।	ট্যুরিজম পার্কে বিদেশী পর্যটকদের জন্য প্রয়োজনীয় সকল সুযোগ সুবিধার ব্যবস্থা রাখা হয়েছে। গলফ কোর্স, সমুদ্র সৈকত কেন্দ্রিক সুবিধাদি, ওয়াচ টাওয়ার, পার্ক, ঝাউবন কেন্দ্রিক সুবিধাদি ইত্যাদি অন্যতম।
২	সাবরাং ট্যুরিজম পার্কের সমুদ্র সৈকতে যাওয়ার জন্য Dedicated walk-way রাখতে হবে। প্রয়োজনে সুরক্ষা বাঁধ অতিক্রম করার জন্য Under-pass নির্মাণ করা যেতে পারে। হোটেলগুলি থেকে সমুদ্র সৈকতে যাওয়ার রাস্তা সরাসরি Under-pass এর সাথে সংযুক্ত করা যেতে পারে।	সাবরাং ট্যুরিজম পার্কে পর্যটকদের সমুদ্র সৈকতে যাওয়ার জন্য প্রস্তাবিত সুরক্ষা বাঁধে যানবাহন চলাচল নিষেধ করা হয়েছে যাতে পর্যটকের নিবিঘ্নে সমুদ্র উপভোগ করতে পারে।
৩	সমুদ্র সৈকতে বড় কোন স্থাপনা করা যাবে না এবং সৈকতে স্থাপনা করার ক্ষেত্রে নান্দনিকতা বজায় রাখতে হবে। তবে সৈকতে পর্যটকদের জন্য Swimming Pool এবং Lavatory সহ অন্যান্য সহায়ক স্থাপনা নির্মাণ করা যেতে পারে।	সমুদ্র সৈকতের নান্দনিকতা বজায় রাখার জন্য মাস্টার প্ল্যানে উচুঁ ভবন নির্মাণ কঠোর ভাবে নিষেধ করা হয়েছে। ট্যুরিজম পার্কে ভবন নির্মাণের সর্বোচ্চ উচ্চতা ৯ তলা প্রস্তাব করা হয়েছে। (ভলিউম -১, অধ্যায় - ৪, অনুচ্ছেদ - ৪.৩)
৪	সাবরাং ট্যুরিজম পার্কে সীমিত পরিসরে বাজেট হোটেলের এর ব্যবস্থা রাখতে হবে। সকল বয়সের ট্যুরিষ্টদের প্রয়োজন বিবেচনা করে সুযোগ সুবিধা নিশ্চিত করতে হবে। শিশু, প্রতিবন্দী এবং বয়স্কদেও জন্য বিশেষ সুবিধার ব্যবস্থা করতে হবে।	সাবরাং ট্যুরিজম পার্ক মাস্টার প্ল্যানে ৩২টি প্লট বাজেট হোটেলের জন্য রাখা হয়েছে যা মোট আবাসি এলাকার ৯.৪০% । (ভলিউম -১, অধ্যায় - ৪, অনুচ্ছেদ - ৪.১.১)
৫	সকল স্থাপনা যাতে দুর্যোগ প্রতিরোধী এবং বায়ু চলাচলের ব্যবস্থা সম্বলিত হয় তা নিশ্চিত করতে হবে। প্রয়োজনে ভবনের নীচতলা ফাঁকা রাখতে হবে যাতে প্লাবিত হলে স্থাপনা জলমগ্ন না হয়।	বিএনবিসি এর নির্দেশনা অনুসারে, ঝড় ও জ্বলোচ্ছাস থেকে রক্ষার জন্য প্রতিটি ভবনের নিচ তলা ফাঁকা রাখার প্রস্তাব করা হয়েছে। (ভলিউম - ৩, অধ্যায় - ২, অনুচ্ছেদ - ২.৫.৪)
৬	সাবরাং ট্যুরিজম পার্কে প্রবেশাধিকার সংরক্ষিত থাকবে।	সাবরাং ট্যুরিজম পার্কে প্রবেশাধিকার সংরক্ষিত করার প্রস্তাব করা হয়েছে। প্রবেশাধিকার সংরক্ষণ করার জন্য সাধারন যানবাহন ট্যুরিজম পার্কে প্রবেশে নিষেধাজ্ঞা রাখা হয়েছে এবং সেই পরিপ্রেক্ষিতে ট্যুরিজম পার্কের প্রবেশপথেই পার্কিয়ের ব্যবস্থা রাখা হয়েছে। (ভলিউম - ১, অধ্যায় - ৩, অনুচ্ছেদ - ৩.২.৬)
৭	পর্যটকদের সার্বিক নিরাপত্তা নিশ্চিত করতে সংশ্লিষ্ট সকলকে প্রয়োজনীয় ব্যবস্থা গ্রহণ করতে হবে।	পর্যটকদের সার্বিক নিরাপত্তা নিশ্চিত করতে Law Enforcement, Fire station, Disaster Management Centre প্রস্তাব করা হয়েছে। (ভলিউম - ১, অধ্যায় - ৩, অনুচ্ছেদ - ৩.২.৪)
৮	বিআইডাব্লিটিএ কর্তৃক পরিকল্পনাধীন জেটি নির্মাণের কাজ দ্রুত শুরু করতে হবে।	বেজা ইতোমধ্যে জেটি নির্মাণের পদক্ষেপ গ্রহণ করেছে।
৯	ট্যুরিজম পার্কটি পর্যটকদের ব্যবহারের জন্য দ্রুত উন্মুক্ত করতে প্রয়োজনীয় পদক্ষেপ গ্রহণ করতে হবে। আগামী ০৩ বছরের মধ্যে আংশিকভাবে উন্মুক্ত করার ব্যবস্থা গ্রহণ করতে হবে।	ট্যুরিজম পার্কটি বাস্তবায়ন পরিকল্পনার ক্ষেত্রে ৩টি পর্যায়ে করা হয়েছে এবং প্রথম য প্রস্তাবিত পর্যায়ের সময়সীমা ৩ বছর রাখা হয়েছে। (ভলিউম - ১, অধ্যায় - ৬, অনুচ্ছেদ - ৬.১)

SABRANG TOURISM PARK

VOLUME-II:
INFRASTRUCTURE PLAN

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1 BACKGROUND

1.1 INTRODUCTION

The Detailed Master Plan (DMP) which is the outcome of the last several extensive activities related to physical plan preparation of any area. The inscriptions of completion of the process undertaken by the Bangladesh Economic Zones Authority (BEZA) with their own fund to prepare Detailed Master Plan for Sabrang Tourism Park under the project 'Preparation of Detailed Master Plan for Sabrang and Naf Tourism Park' (proposal package no. PS05-BEZA-2017). DMP is a three-tier plan package of which 1st two tiers are Master Plan and Infrastructure Plan are prepared for 2020-2049 period and Development Management Plan also be prepared for same duration by the joint team of Consultants from home and abroad and counterpart experts employed by BEZA. This report is prepared to describe the proposed infrastructure plan based on the proposed Master Plan.

1.2 PURPOSE OF THE DETAILED MASTER PLAN

The Detailed Master Plan (DMP) provides guidance for development of Tourism Park of the Sabrang area. It is concerned with whole range of planning matters for the area declared by gazette of Sabrang. DMP also setting out in detail the changes the authority intends to take place in them and giving guidance on the form of new development. It shows the location of roads, infrastructure, community facilities and acceptable land use zones. Consequently, it can serve as an effective tool to control development.

The specific purposes of the DMP are:

- Set out the planning policies of the tourism park site;
- Intensify the 30 years planning features in tourism park;
- Provide a detailed analysis of the area and design of good quality;
- Serve as a reference document for investor attraction and investment;
- Serve as a document for land use and development control;
- Provide infrastructure plan to facilitate tourism park as a sustainable manner;
- Provide guidelines for public and private investment priorities;
- Offer clarity and accuracy regarding future development to investors;
- Make recommendations on land development techniques.

1.3 OBJECTIVE OF THE PROJECT

Some objectives of the Detailed Master Plan (DMP) are general and some are more specific in nature. These are separately mentioned below.

1.3.1 GENERAL OBJECTIVES

Two Special Economic Zones (SEZ) is to established in the Sabrang & Naf Tourism Park with large-scale tourism development containing both public and private investment. This project is to be developed over the long-term, so that it can into a tourism park containing different tourism related facilities.

The general objective of the project is mentioned below:

- To facilitate private investment;
- To promote tourism in Bangladesh and
- Align tourism facilities with regard to best practices, international compliance, quality standards, and building codes, good social and environmental practices.

1.3.2 SPECIFIC OBJECTIVES

The specific objectives of this project are mentioned below.

- To examine the Sabrang and Naf Tourism Park site;
- To documentation of its existing facilities of the area;
- To identify opportunities and constraints of the site for tourism park and
- To prepare a thirty-year detailed master plan and development management plan for Sabrang and Naf Tourism Park.

1.4 REPORT OVERVIEW

This report is submitted as final deliverables among the 4 deliverables under the contract for consultancy services between the Bangladesh Economic Zones Authority (BEZA) and the consultants with joint venture of DDCL, Bangladesh and DOHWA, Korea for the Preparation of Detailed Master Plan for NAF and SABRANG Tourism Park project.

The final report is divided into four volumes, those are:

- Volume I: Master Plan
- Volume II: Infrastructure Plan
- Volume III: Development Management Plan and
- Volume IV: Detail Cost Estimate

This part of the Final Report is **Volume II: Infrastructure Plan** is describing the Proposed Infrastructure Plan for Sabrang TP. The Infrastructure Development Plan for the Sabrang TP are conceived as a 'complete plan' like one plan is prepared for the In-site infrastructure and other plan is prepared for the off-site infrastructure. The planning consideration for preparation of Infrastructure Plan (On-site and Off-site) for Sabrang TP are discussed below.

1.5 PLANNING CONSIDERATION

1.5.1 ON-SITE INFRASTRUCTURE PLAN

1.5.1.1 TRANSPORT

- Heavy vehicle is not be permitted into the tourism park. Only light motorized vehicle will allow in Tourism Park.
- 4 lane and 2 lane road will be designed with pedestrian facility.
- Boating facilities and boating infrastructure will be established to ensure water based recreational facilities.

- Air transport (Helipad) will be established in the tourism park.

1.5.1.2 DRAINAGE

- Existing Natural Drainage system (River, Canal) will be considered as Primary Drainage Network of the tourism park;
- All-natural waterbodies will be preserved and new waterbody will be proposed according to drainage demand and capacity assessment;
- Drainage related infrastructure (embankment, bridge, culvert) will be proposed as environment friendly and ensure all navigational clearance of the waterbodies;
- Provision will be taken to protect erosion and siltation of the water way where tidal flow is active.

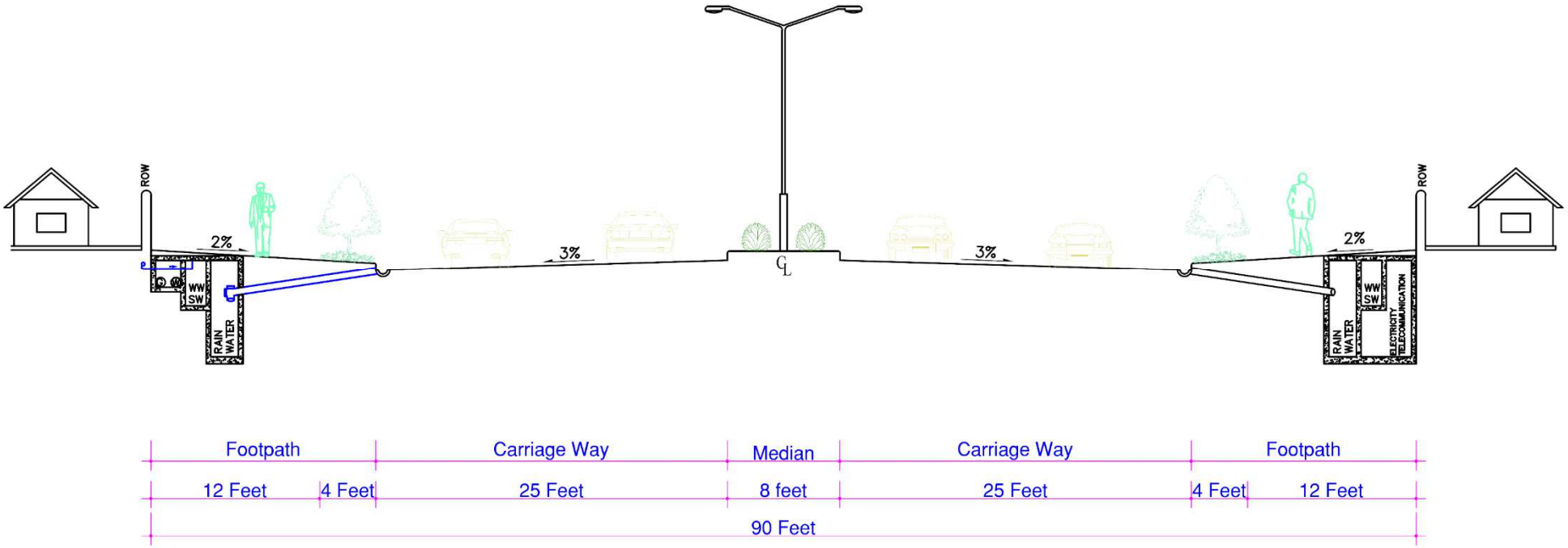
1.5.1.3 UTILITY SERVICES

Utility Service Network is important for smooth functioning of the Tourism Park. Overhead utility line creates haphazard and unsafe connection of lines. It also hampers visibility of the area. Underground utility network is proposed for Sabrang TP. Sections of the allocation of all utilities along with road is given in Figure 1-1, Figure 1-2and Figure 1-3.

1.5.2 OFF-SITE INFRASTRUCTURE PLAN

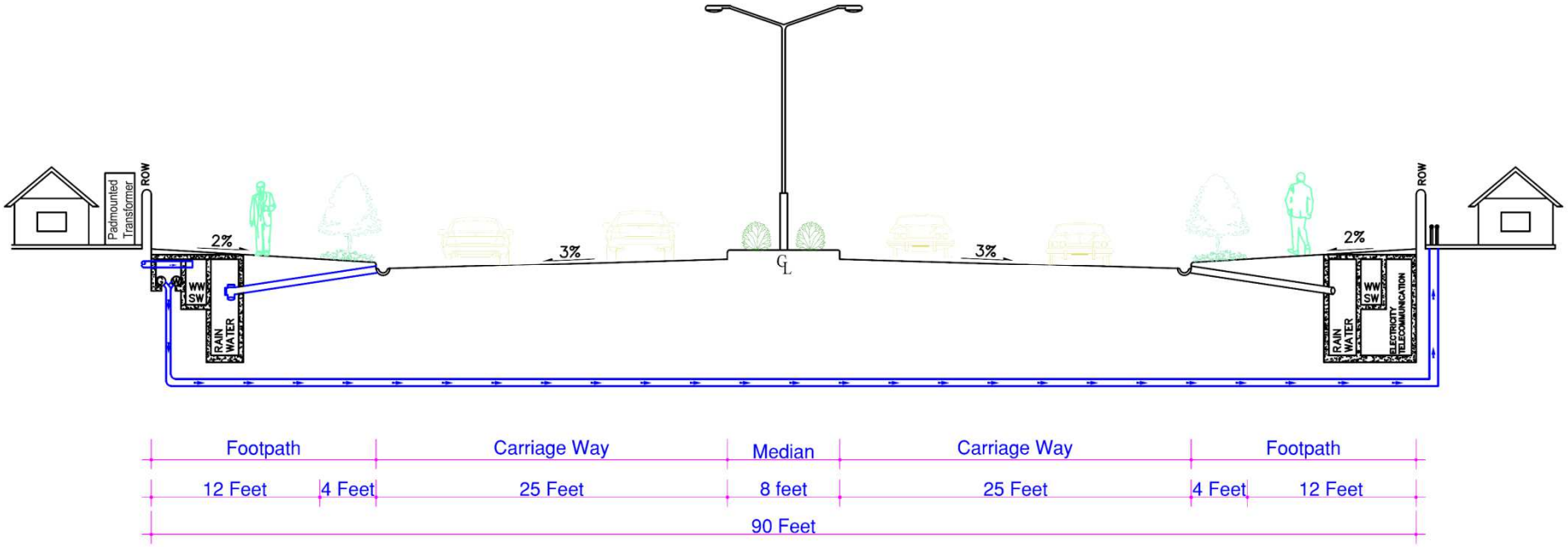
Off-site Infrastructure Plan will also be prepared for smooth communication and functional of the tourism park. Communication facilities are the major off-site infrastructure for the Sabrang TP. The strategies will consider to prepare off-site Infrastructure plan are given below.

- Provision will be given for all type's communication facilities (air, water, rail and road network) to ensure smooth communication with other areas of the country;
- Communication facilities will be proposed for different categories tourist.



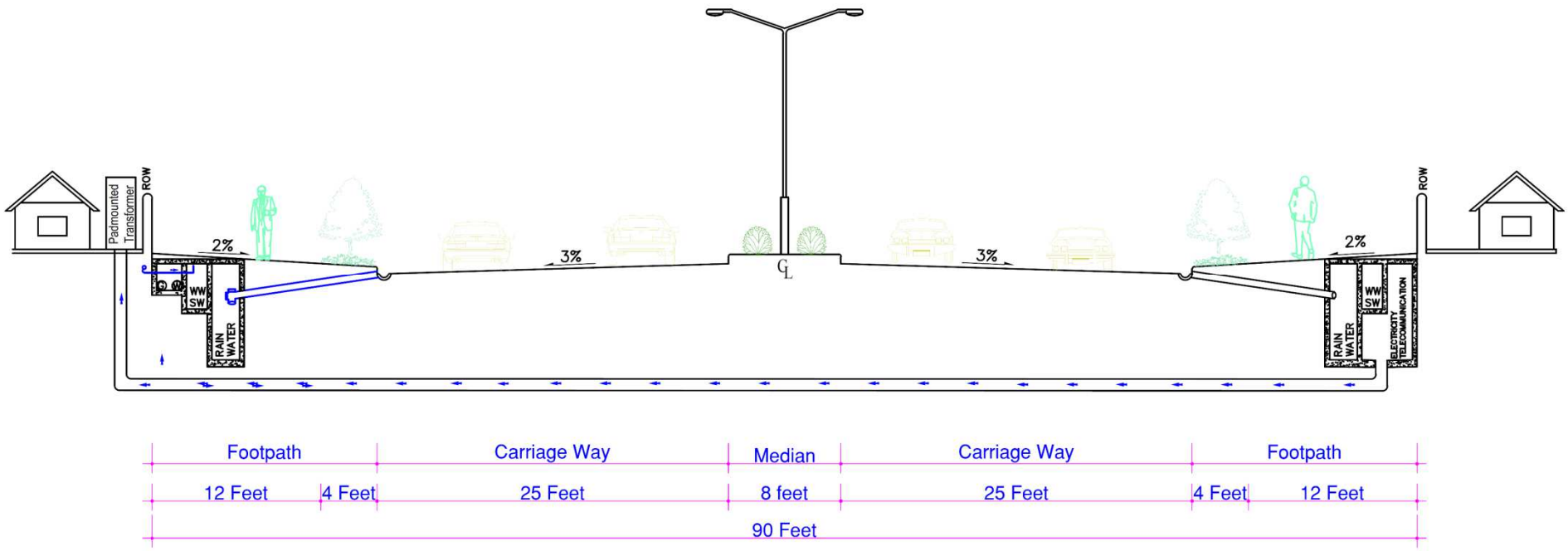
Road Width 90 Feet

Figure 1-1: Allocation of All Utilities beneath Arterial Road



Road Width 90 feet

Figure 1-2: Gas & Water Supply Pipe Connection to Opposite Side of Road



Road Width 90 Feet

Figure 1-3: Electrical & Telecommunication Cable Connection to Opposite Side of Road

2 TRANSPORTATION DEVELOPMENT PLAN

2.1 ON-SITE TRANSPORTATION PLAN

All on-site roads of Sabrang TP will be used to carry tourists, local people, daily commodities and construction materials. To minimize environmental impact, carbon exhaustion would be kept minimum. For a good traffic management system, outside vehicles would be restricted and tourist minibuses in a circular route will be operated inside for sightseeing and amusement.

2.1.1 MASTER PLAN OF ROAD NETWORK

The Road Network of Sabrang TP consists of a main arterial road and feeder roads. Width of the main arterial road is 25m and width of the feeder roads is 13.5m. The on-site road network master plan is provided in Map 2-1.

2.1.1.1 DESIGN CRITERIA

The road design criteria of Sabrang Special Economic Zone are adapted from Geometric Design Standard, Roads and Highways Department (RHD), People's Republic of Bangladesh – April, 2005. Where the standard was insufficient, guidelines were followed from AASHTO: A policy on Geometric Design of Highways and Streets (Edition – 2011).

2.1.1.2 DESIGN SPEED

As Sabrang TP is an enclosed tourist zone with only one entry and exit point, 25 km/hr. design speed is selected throughout the area to facilitate accommodation, amusement, entertainment and shopping. The design speed is needed to be maintained through legal notice, road signs, markings and enforcement of traffic regulations.

2.1.1.3 CROSS SECTION AND WIDTH OF ROAD

The standards of road cross section and width have been adopted from "Bangladesh Economic Zone (Construction of Building) Rules, 2017", (Rule-7, Schedule-1).

2.1.1.4 DESIGN VEHICLE

Road geometry and alignment have been designed considering BUS-12 (Intercity Bus). The vehicle length, width and height are 12.2m, 2.6m and 3.7m respectively.

2.1.1.5 TYPES OF ROAD

Two types of road will be developed throughout the project area. They are:

- Arterial Road
- Feeder Road

There is one arterial road proposed which starts from main entry gate of Sabrang TP and goes through the centre of the park ending at the last point. There are also many feeder roads which

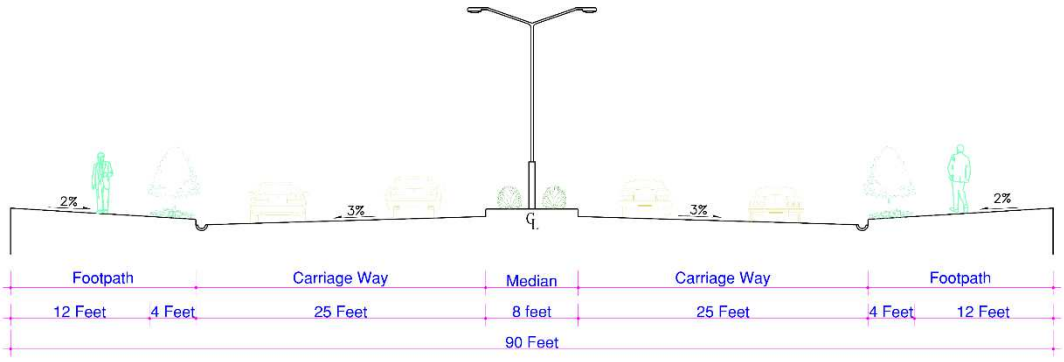
connects different areas of the park with the arterial road. Total 14 Km 572.47-meter on-site roads are proposed in Sabrang TP to ensure well connectivity of Tourism Park.

- **Arterial Road**

The components of the arterial road are:

i) Footpath: 12.00 ft x 2
ii) Green Turf: 4.00 ft x 2
iii) Carriage Way: 25 ft x 2
iv) Median: 8 ft
v) Total Width: 90 ft

Total length of arterial road= 4 km 125 m.



Cross section of arterial road is given in Figure 2-1.

Figure 2-1: Cross Section of Arterial Road

- **Feeder Road**

Road Width 90.00 feet

The components of the feeder road are:

i) Footpath: 12 ft x 2
ii) Green Turf: 4 ft x 2
iii) Carriage Way: 15 ft x 2
iv) Total Width: 62 feet

Total length of feeder road= 10 km 447.47 m

Cross section of feeder road is given in Figure 2-2.

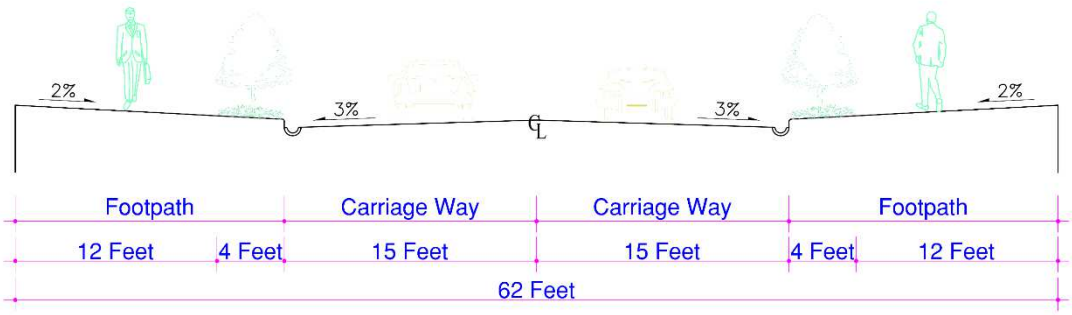
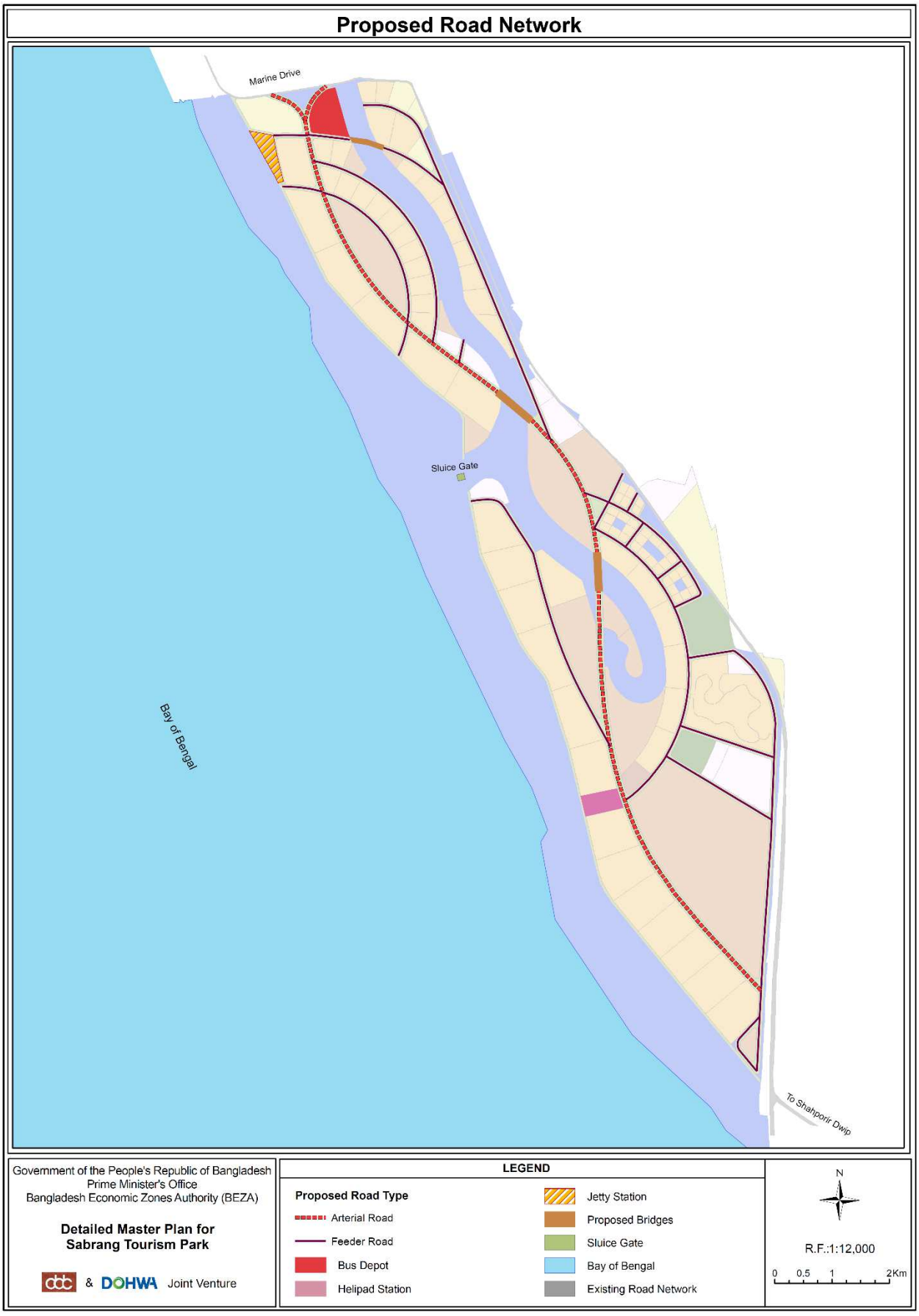


Figure 2-2: Cross Section of Feeder Road



Map 2-1: On-Site Road Network Plan of Sabrang Tourism Park.

2.1.2 PEDESTRIAN FACILITIES

An individual's decision to walk is as much a factor of security, safety and convenience as it is the perceived quality of the experience. Pedestrian facilities will be designed with the following factors:

Sufficient Width: Sidewalks should accommodate anticipated volumes based on adjacent land uses and they should at a minimum allow for two adults to walk abreast.

Protection from Traffic: High volume or high speed (>56 km/h or 35 mph) motor vehicle creates dangerous and uncomfortable conditions for pedestrian. Physical (and perceptual) separation can be achieved through a combination of methods: a grassy planting strip with street trees, a raised planter, bicycle lanes, on-street parallel parking.

Street trees: Street trees are an essential element in a high-quality pedestrian environment. Not only provide shade, also give a sense of enclose to the sidewalk environment, which enhance the pedestrian's sense of walking in a protected environment.

Pedestrian scale design: Large highway–scale signage reinforces the general notion that pedestrians are out of place. Signage should be designed to be seen by the pedestrian. Street lighting should likewise be scaled to the level of the pedestrian, instead of providing light poles that are more appropriate on high-speed freeways. Components such as street furniture, vistas and landmarks should be incorporated into designs to help construct walking routes intersecting.

Continuity: Pedestrian facilities are often discontinuous, particularly when private developer is not encouraged to link on-site pedestrian facilities to adjacent developments and nearby sidewalks or street corners. New developments should be designed to encourage pedestrian access from nearby street. Existing gaps in the system should be placed on a prioritized list for new sidewalk construction.

Clearance: Vertical clearance above sidewalks for landscaping, trees, signs and similar obstructions would be at least 2.4m (8ft). In commercial area and common facility area of proposed master plan, the vertical clearance for awnings would be 2.7m (9 ft). The vertical clearance for building overhangs that cover the majority of the sidewalk would be 3.6m (12ft).

Most of the footpaths within the road reserve lie between the edge of the roadway and the frontage of adjacent private property. There are four distinct zones within this area and it is important to distinguish between the total width and the width of the zone likely to be used by pedestrians (the thorough route).

When determining the width of the frontage or street furniture zone, a 'shy distance' of 0.15m should apply from any object next to the thorough-route. This area should then be excluded from the thorough-route width as it is unlikely to be used by pedestrian. For example, if a lamp post is near the thorough-route, the shy zone would be the area next to it. This area would then be included in the zone where the lamp post is located and the thorough-route width would be reduced.

In off-road environment, if same principles apply, however, one or more of the zones in the following table may be absent or duplicated on the opposite side of the thorough route.

Table 2-1: Zone-wise Purpose of Pedestrians

Area	Purpose
Kerb zone	- Defines the limit of the pedestrian environment; - Prevents roadway water run-off entering the footpath; - Deters vehicles from using the footpath; - A major tactile cue for vision impaired pedestrians.
Street furniture zone	- Used for placing features such as signal pole, lighting column, hatch cover, sandwich board, sea and parking meter; - Can be used for soft landscaping/vegetation; - Creates a psychological buffer between motorized vehicles and pedestrians; - Reduces passing vehicles splashing pedestrians; - Provides space for driveway gradients.
Thorough route (or clear width)	The area where pedestrians normally choose to travel (this should be kept free from obstructions at all times).

➢ **Passing Place**

Where thorough route width is constrained to less than 1.5-meter-wide, passing places should be provided – but only where it is not possible to widen the footpath over a longer distance and never as a low-cost alternative to a full-width footpath. The advantages of passing places are:

- two wheelchairs can pass each other,
- walking pedestrian can pass stationary pedestrians, such as those waiting to use a crossing or waiting for public transport.

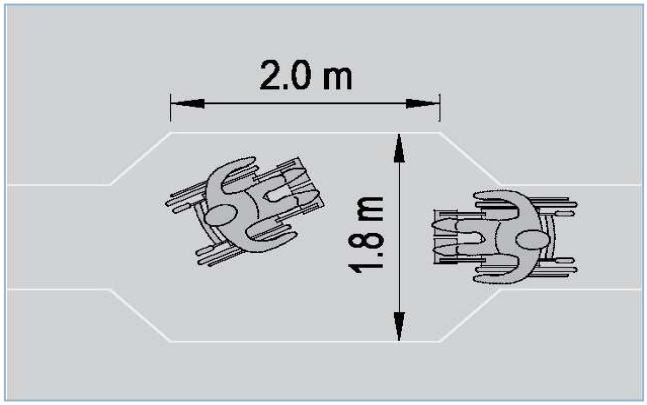


Figure 2-3: Dimensions of Wheelchair Passing Place

➢ **`Gradient**

The gradient of a thorough route is the slope parallel to the direction of travel. Movement becomes more difficult as gradient increases. A gradient of 2% is applied to the pedestrian walkways in Sabrang TP.

2.1.3 TRAFFIC SYSTEM MANAGEMENT

Traffic Management System and Operation refer to multimodal transportation strategies intended to maximize the efficiency, safety and utility of the transportation infrastructure. Traffic management system considers the full range of options for maximizing the performance of existing transportation infrastructure without expanding the infrastructure itself (e.g., adding general purpose lanes, constructing a new interchange, etc.).

TSM seeks to achieve the following options:

- Maximize the effectiveness of the use of existing infrastructure and facilities;
- Ensure reliable traffic flow and safe operation of transport;
- Address environmental goals; and
- Ensure fair allocation of infrastructure space (road space, rail slots, etc.) among competing users.

2.1.3.1 TRAFFIC FLOW MANAGEMENT

For road transport, tactical traffic management involves monitoring the actual traffic situation in real-time (including volumes, speeds, incidents, etc.) and then controlling or influencing the flow using that information in order to reduce congestion and ensure safety for passenger. There are many ways of ensuring safe and reliable traffic flow and promoting safety.

As Sabrang TP is an enclosed tourist zone with only one entry and exit point, for a good traffic management system, outside vehicles should be restricted and a circular route of tourist minibuses will be maintained inside for sightseeing and amusement. Sufficient parking space will be provided for any type of personal vehicles. Separate tourist buses will be kept in the bus depot inside the park for travelling to other tourism sites in and around Cox's Bazar.

2.1.3.2 AUTOMATED OR MANUAL TRAFFIC SIGNALING

Traffic signals are perhaps the earliest form of "intelligent" traffic management, aimed primarily at safety but also at managing priorities at junctions. If automated traffic signalling is not possible then the traffic police are needed to be well trained and informed about the rules and regulations of traffic management strategies.

2.1.3.3 ROAD MARKINGS AND SIGNS

Clear and efficient signing is an essential part of the road system and a road with poor signing or with badly maintained signs is not functioning well. Road users depend on signing for information and guidance and road authorities depend on signing for traffic control and regulation and for road safety. Any type of traffic signs required will be incorporated in the Sabrang TP as per Bangladesh Road Sign Manual, Roads and Highways Department.

2.1.3.4 TRAFFIC SAFETY MANAGEMENT

Major goal of this transport plan is to provide safe and reliable transport network. To accomplish the desired goal, some major strategies concerning safety of the tourist can be carried out.

Roundabout: Roundabout is a type of intersection design that can improve overall traffic safety. Provide better speed control and reduce delays. A roundabout will be constructed in the southernmost corner of Sabrang TP where the circular route tourist buses will flow in a clockwise circle around a centre island and maintain its circular route.

T-Scale Intersection Management: For proper management of the T-Scale intersections formed at the intersection points of the arterial road and feeder roads, road markings, signs and traffic signalling will be utilized.

Speed Breaker: Speed breakers will be utilized before major intersections and pedestrian crossings to reduce vehicle over speeding. The speed breakers will be marked with proper road markings and signs.

Traffic Calming: Traffic calming uses physical design and other measures to improve safety for motorist, pedestrian and cyclist. It aims to encourage safer, more responsible driving and potentially reduce traffic flow.

2.2 OFF-SITE TRANSPORTATION PLAN

2.2.1 ROAD NETWORK

The major roads for off-site tourist transportation include Cox's Bazar-Chittagong Highway (N1), Marine Drive Road, Teknaf Beach Point – Sabrang Bazar Road and Shapla Chattar – Marine Drive Road. The marine drive road works as the major approach road to Sabrang Tourism Park. There are also various earthen roads connecting Sabrang Tourism Park area to the regional road connecting Teknaf and Shahporir Dwip (Figure 2-4).

2.2.1.1 ROADWAY IMPROVEMENT OPTIONS

A planned road-way need to be developed for accommodating future traffic volume which will be generated by natural existing traffic growth as well as from proposed tourism sites. Road widening and proposed new road are most common method for road improvements used in Bangladesh.

- **Options for Road Category**

  - **Primary Road**

Primary road is proposed to establish smooth communication with important locality. The maximum width for a primary road for off-site road network of Sabrang TP is 40 meters. This may vary, especially on existing roads, due to localized circumstances. The primary road component recommended for this project is given below for urban and non-urban area.

Primary Road Section (Urban Area)

- Median = 1 meter
- Vehicle Lane = 3.65x4 =14.6 meter
- Cycle Lane/NMV = 4x2 = 8 meter
- Paved Shoulder = 1.5x2 = 3 meter

- Footpath = 2x2 = 4 meter

Primary Road Section (Non-Urban Area)

- Median = 2 meter
- Vehicle Lane = 3.65x4 =14.6 meter
- Cycle Lane/NMV = 4x2 = 8 meter
- Paved Shoulder = 1.5x2 = 3 meter
- Unpaved Shoulder = 1x2 = 2 meter

- **Secondary Road**

The Functions of the secondary road is to create links between the Union and primary roads and also create links between various important nodes of activity within the Union. Secondary roads are also intended to be high-capacity routes, although their design speed will be significantly less than primary roads. Maximum recommended width for secondary road is 25 meters, although this may vary especially on existing roads due to localized circumstances. The secondary road component recommended for this project is given below for non-urban area. Secondary road for urban area will added 2x2=4meter footpath with this non-urban road component.

Secondary Road Section: Total Width 17.3 meter

- Vehicle Lane = 3.65x2 = 7.30 meter
- Paved Shoulder = 1.5x2 = 3 meter
- Cycle Lane/NMV = 3x2 = 6 meter
- NMV Separator = 0.5x2 = 1 meter

- **Tertiary Road**

Functions of the tertiary road are to collect and distribute traffic to and from access roads from predominantly residential areas to other parts of the hierarch; provide direct access to roadside land uses. The recommended road width for tertiary road is 18 meters.

Tertiary Road Section: Total Width 12.3 meter

- Vehicle Lane = 3.65x2 = 7.30 meter
- Paved Shoulder = 1.5x2 = 3 meter
- Unpaved Shoulder = 1x2 = 2 meter

➢ **Road Widening Standard**

Most common method in Bangladesh for accumulating the future need of the transport is road widening. There are several standards followed by the different implementation agency like RHD, LGED etc. Standard for road widening and standard for new road construction for the proposed off-site road of Sabrang TP will be adopted from standard of implementation agency of those roads.

Figure 2-4: Off-site Road Network

➢ **Proposed Road for Widening and Surface Improvement**

Road network of the Teknaf Upazila is not constructed following a concrete plan. Consequently, most of the roads are less than 20 feet width which may seem feasible today but will create problems for the local people and tourists in the long run. For eradicating the problem, the consultant develops a well-equipped plan and a standard for the roads. The standard will be followed and the road width will not be less than 25 feet.

For an efficient road network development, implementation of some of the recommendations made by the Roads and Highways Department in 2008 would be essential. In order to serve the Upazila as well as the local traffic around the project area, an analysis is given in the proposals. Further analysis under the transportation plan reveals that most of the links suggested by this study entail to be developed in a phased manner. The route is intended to be high capacity and fast flowing. With such road-design, the roads will be more functional. Major Roads and its corresponding Inventory has been shown in Table 2-2.

Table 2-2: Proposed Road for Widening

Road Name	Road Category	Existing Width (ft)	Proposed Width (ft)
Marine Drive Road	Primary	42	130
N1	Primary	39	130
Shapla Chattar to Beach Point Road	Primary	25	130
Teknaf to Shahporir Dwip	Secondary	30	80
Union Complex to Marine Drive Road	Tertiary	17	60

To remove transportation problems, following steps to be taken:

➢ **Smoothing of Road Alignment**

There are some sharp turns in the Marine Drive Road which may cause accident. So, the alignment of the Marine Drive Road is needed to be smoothed and sharp turns are needed to avoid.

➢ **Surface Improvement**

The National Highway (N1) is riddled with potholes and uneven road surfaces. So, road surface needs to be improved.

➢ **Installation of Road Sign, Signal, Marking and Guard Post**

Any type of road sign, signal, marking is not existing in Teknaf Upazila. Guard posts before and after bridges are also not present. These traffic management system utilities are to be incorporated according to the standards of highway manual.

For providing an effective road network, primary emphasize has given to link the missing-points. These will accommodate internal traffic and enhance easy movement of vehicles around the project area. Some road widening proposals has been made after assessing the land measurement, design standard and implementation process. The proposed roads for widening are shown in Figure 2-5.

Figure 2-5: Proposed Road for Widening

2.2.1.2 PROPOSED FOOTPATH

Teknaf town is the only nearest urban area from the Sabrang TP. It will work as the primary place for tourists to go shopping or to utilize any type of urban facilities. So, sufficient pedestrian facilities are needed to be provided in Teknaf town to accommodate for the increase in tourist population owing to the project.

2.2.1.3 DEVELOPMENT OF BICYCLE LANE

A bicycle lane is a part of the roadway design for preferential use by bicyclist and motorcycle typically with a width of 1.2m to 1.5m (4ft to 5ft). Bicycle lane serves need of all types of cyclists in core and fringe areas, providing them with their own travel lane on the street surface. They are designed with signage, edge striping and bicycle icons to call attention to their preferential use by bicyclist. On two-way street, bicycle or motorcycle lane is needed to install on both sides. Two-way bike-lanes on one side of the two-way street create hazardous conditions for bicyclist and are not recommended. In cases where 1.5 m (5ft) cannot be achieved for bike-lane, an unmarked lane of lesser width can be installed as an interim measure.

Different types of design are used for developing a bicycle lane. Some precedence factors are needed to address before marking a bicycle lane. They are:

- Separate Bi-cycle or Motor-cycle lane demarcation
- Parking Facilities
- Access to the Transit
- Continuity

Bicycle lane will be provided in both lanes of the Marine Drive Road and the National Highway (N1) to facilitate bicycle riding along the beach from Cox's Bazar to Teknaf and Sabrang.

Figure 2-6: Demarcated Bi-Cycle lane

2.2.1.4 DEVELOPMENT OF RICKSHAW LANE/NMV LANE

One of the particular characteristics of the project area roads is large number of non-motorized vehicles and pedestrians. This has many implications for road design. Failure to provide proper facilities for NMVs will significantly reduce the capacity of the road and cause of accidents.

Shoulders are to be provided on all primary and secondary roads for use by NMVs. On heavily-trafficked sections, such as through the core area it will be necessary to provide separate NMV lanes. Normally 3m is needed as a minimum and this can accommodate a maximum of 513 PCU/hr. For the flows-width relationships following Table 2-3 will provide clear decision.

Table 2-3: NMV Lane Capacities.

NMV lane width (m)	Flow per lane (PCU/hr)
3.0	513
3.6	645
4.2	732
4.8	794
5.4	901
6.0	1015

Source: Tables 6.40, 6.47, RMSS Vol. V11A

Note: Capacities are for Level of Service 'D'

Care is needed with the design and layout of NMV lanes in order to make them as convenient and easy use as possible. They must be well constructed with a smooth durable surface and should be marked with the rickshaw symbol.

Separate Rickshaw/NMV lane is proposed in the road from Teknaf Beach Point to Sabrang Bazar to facilitate movement of tourists from Sabrang Tourism Park to Sabrang Bazar and Teknaf town.

2.2.1.5 RICKSHAW STOPPAGE AND PASSENGER SHED

To facilitate the passenger using the rickshaw/NMV to go to Sabrang Bazar/Teknaf Town a rickshaw stoppage/passenger shed is proposed in Teknaf Beach Point. All components of off-site transportation are shown in Figure 2-7.

Figure 2-7: Off-site Transportation Components

2.2.1.6 BUS STOPPAGE AND BUS BAY

➢ **Bus Stoppage**

The inappropriate positioning of bus stop often results in commuters standing in the street while waiting for the bus. To avoid such a situation, bus stop should be placed adjacent to the bus's linear line of travel so that the bus does not need to pull over to the left. The position of the bus stop should always leave clear space for walking behind the shelter.

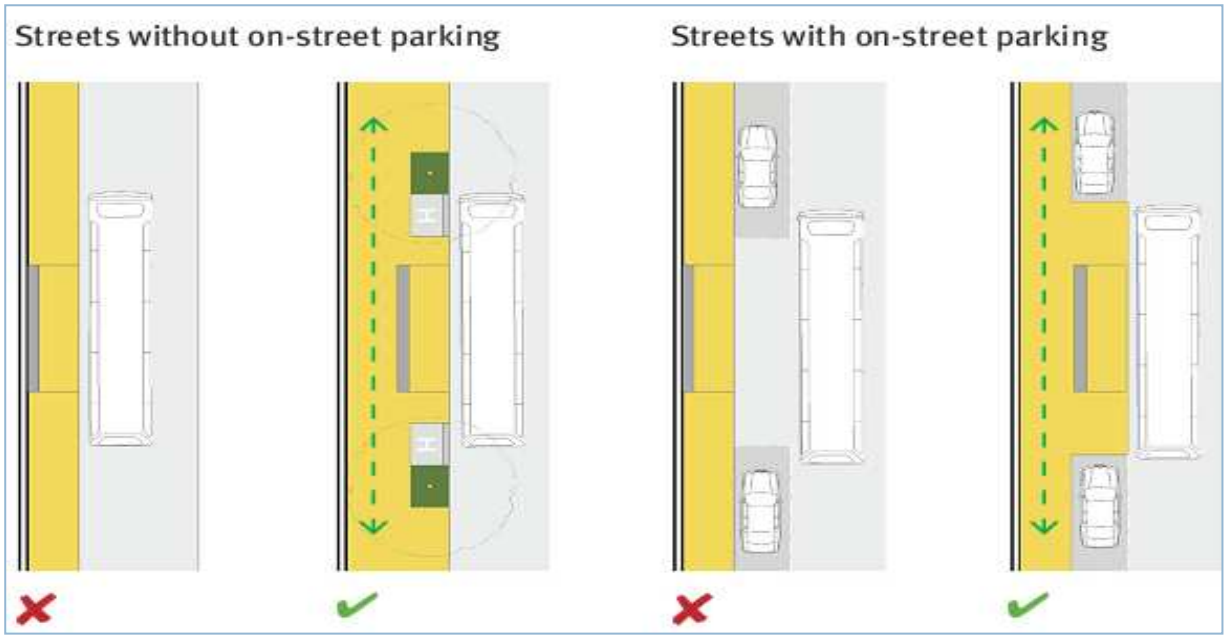


Figure 2-8: Design of Bus stoppage

Source: ITDL, 2013

➢ **Bus Bay**

A bus turnout, bus pull-out, bus bay, bus lay-by (UK),[1] or off-line bus stop is a designated spot on the side of a road where buses or trams may pull out of the flow of traffic to pick up and drop off passenger. It is often indented into the sidewalk or other pedestrian area. Bus stoppage and bus bay would be incorporated to facilitate tourist loading and unloading in Sabrang TP.

Figure 2-9: Diagram of a Bus Bay and Actual Bus Bays in UK

Source: Bus Stop Design Guide, 2005

2.3 PHASING PLAN

2.3.1 CONSIDERATIONS

The Phasing plan for Road Network basically would be followed six phases for the Development of Detailed Master Plan for Sabrang Tourism Park. Such as phasing plan will be implemented in consideration with the installed utilities in the road network. The main considerations for the phased development plan of the Road Network are as follows:

- All infrastructure plan to make the Sabrang TP be fully serviced at each stage.
- Lake, main arterial road has to be developed in the initial stage.

2.3.2 ESTIMATE THE LENGTH OF ROAD NETWORK FOR PHASING

The estimation of length of the road for each phasing development plan is determined in Table 2-4 and phasing location will consider as master plan phasing in Map 2-2.

Table 2-4: Phasing Plan of On-site Road Network

Phase No.	Road Type	Length in meter	% of Completion
Phase 1	Arterial	4125	28.31
	Feeder	3965.35	27.21
Phase 2	Feeder	3571.42	24.51
Phase 3	Feeder	2910.7	19.97
Total		**14572.47**	**100.00**

2.4 COST ESTIMATE

The cost estimation of Proposed Road Network is given Table 2-5.

Table 2-5: Cost Estimation of Road Network

Item No.	Phase No.	Road Type	Unit	Quantity	Unit Rate (BDT)	Amount in BDT	Unit Rate Reference
1.01	Phase 1	Arterial	Sqm	112006.5	2081.00	233085527	Pwd-2018
1.01		Feeder	Sqm	75341.65	2081.00	156785974	Pwd-2018
1.01	Phase 2	Feeder	Sqm	67856.98	2081.00	141210375	Pwd-2018
1.01	Phase 3	Feeder	Sqm	55303.3	2081.00	115086167	Pwd-2018
Total				**310508.4**		**646168043**	

Map 2-2: Road Network Phasing of Sabrang Tourism Park

3 POWER GENERATION AND DISTRIBUTION PLAN

3.1 EXISTING SCENARIO

Teknaf Upazila is served by Rural Electrification Board (REB) through Cox's Bazar Palli Bidyut Samity (PBS). REB has two 33/11 KV distribution substations (Teknaf-1 & 2) which are connected to 132/33 KV grid substation located at Cox's Bazar via a 33 KV line. There is a 28 MW solar power plant in Hnila Union and generated electricity is transmitted to the substation of PBS (Table 3-1, Table 3-2).

Table 3-1: Existing Facilities

Facilities	Capacity	Distance from Sabrang EZ
Solar Power Plant	28 MW	20 KM
33/11 KV Substation	Teknaf-1=15/19MVA	9.3 KM
	Teknaf-2=10/14MVA	21.2 KM

Source: Rural Electrification Board, 2019.

Table 3-2: Ongoing Projects

Facilities	Capacity	Distance from Sabrang EZ
33/11 KV Substation	Teknaf-1 Upgradation (15MVA to 25MVA)	9.3KM
	Teknaf-3=10MVA New Substation	6.8KM

Source: Rural Electrification Board, 2019.

The nearest 33/11KV substation from Sabrang TP is Teknaf -1 which is located at a distance of 9.3Km. Capacity of Teknaf-1 is currently being upgraded from 15MVA to 25MVA. Teknaf-3 substation is currently being developed which is located at a distance of 6.8 KM from Sabrang EZ.

Rural Electrification Board has a plan of installing three new substations (Teknaf-4,5,6) of 10/14 MVA capacity each. Among these three Teknaf-4 will be at close proximity to Sabrang TP.

The nearest 132/33KV grid substation is located at Cox's Bazar. Power Grid Company of Bangladesh (PGCB) has a plan of installing another similar grid substation at Teknaf by 2025.Location of existing and proposed Substation of PBS are shown in Figure 3-1.

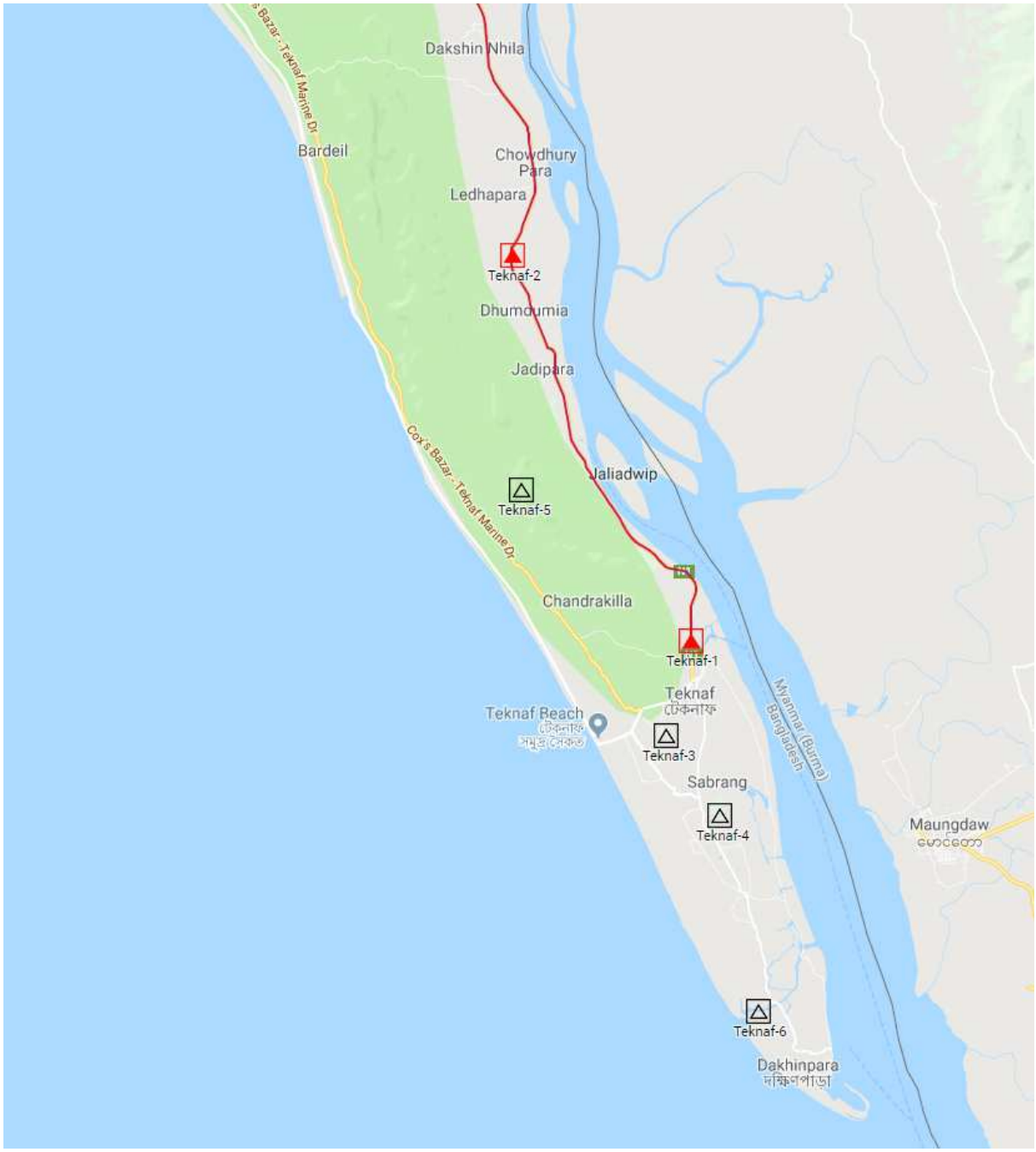


Figure 3-1: Existing and Proposed Substations and Existing Lines of PBS

Source: Rural Electrification Board, 2019.

3.2 PROJECTION OF DEMAND

3.2.1 METHODOLOGY

The consultants have gathered data of electrical power demand of several renowned five and four star rated hotels operating in Bangladesh. These hotels are - Dhaka Regency Hotel & Resort Ltd., Royal Tulip Sea Pearl Beach Resort and Spa Ltd., The Peninsula Chittagong Ltd. Cox Regency Hotel Ltd. is a proposed four star rated hotel at Cox's Bazar whose feasibility study report has also been studied. The Electrical load density of these hotels is given in Table 3-3.

Table 3-3: Electrical load density of Existing Hotels

Hotels	Load Density (Watts/sft)
1. Dhaka Regency Hotel	6.44 watts/sft
2. Royal Tulip Sea Pearl Hotel & Beach Resort Ltd.	5.93 watts/sft
3. The Peninsula Chittagong Ltd.	27.4 watt/sft
4. Cox Regency (Proposed)	13.6 watt/sft
Average Load density	13.34 watt/sft

Derivations of these load densities are shown in the Appendix C.

The first three load densities include diversity factor. Whereas load density of the proposed Cox Regency Hotel is derived from the connected load.

According to Bangladesh National Building Code, the recommended minimum load density for hotel buildings is 2.23 watts/sft (non a/c) and 6.97 watts/sft (a/c). [Reference in Appendix D]

The prime basis for projecting future demand is the average load density of the abovementioned hotels which is 13 Watt/sft for air-conditioned space. For non-air-conditioned space, 5 Watt/sft load is considered. The total power demand at the completion of the project is expected to be 16 MW.

Future requirement of Electricity for the area has been calculated by using the following method:

$E_r = A \times D$

Where,

E_r = Demand of Electricity

A= Total Floor area (sft)

D= Load Density (watt/sft)

Note:

1. Building footprint ranges from 10% to 60% depending on the function.
2. Load Density: 13 watt/sft for air-conditioned space
   5 watt/sft for non-air-conditioned space
3. Diversity factor: 60%

Total power demand of Sabrang TP is expected to be 78 MW. A detailed analysis of Demand forecast is attached in Appendix A and Appendix B.

3.3 POWER TRANSMISSION AND GENERATION PLAN

As a major sub-sector of the tourism industry, the hotel sector accounts for a significant amount of the overall resource consumption. Hotel facilities rank among the top five in terms of energy consumption in the commercial/service building sector (minor only to food services and sales, health care and certain types of offices). The existing infrastructure and capacity of Rural Electrification Board is not sufficient to meet such energy demand. However, the future plan of Bangladesh Rural Electrification Board and Power Grid Company of Bangladesh is very promising. PGCB has a plan of

installing a 100/150 MVA 132/33 KV grid substation at Teknaf. Sabrang and Naf Tourism Park has also been considered in the future plan of Bangladesh Rural Electrification Board.

Table 3-4: Future Plan

Facilities	Capacity	Location
33/11 KV Substation	3x33/11 KV 10/14MVA Substation	Shilkhali, Sabrang EZ, Naf Tourism Park (Zaliardwip)
132/33 KV Grid Substation	100/150 MVA	

Source: Bangladesh Rural Electrification Board, 2019

8.45 acres plot (Plot-23) has been allocated at the load centre of Sabrang TP for installation of a Captive Power Plant.

The Developers and the unit investors are required to install solar system in their premises and at least one percent of total requirement shall be consumed from online solar system.

3.4 POWER DISTRIBUTION PLAN

The Sabrang TP is divided into three Distribution Zones; North, Central and South zone (Figure 3-2). North and Central Zone will be supplied from Substation – 1 and Substation-2 respectively whereas the Substation located at the power plant will supply the South Zone. Flood lights and Street lights of each zone will be supplied from their respective zone substation.

The distribution network has been designed in such a way that ensures reliability and efficiency. Redundant parallel supplies from all substations have been provided to important facilities such as cable car station, hotels, central plaza, old age home etc. Such redundancy signifies that the system will continue to function satisfactorily in spite of the failure of one of two substations. Moreover, four 2000 KVA diesel generators will function as standby in case of failure in the main. The distribution network for different zone shown in Figure 3-3, Figure 3-4, Figure 3-5and Figure 3-6. The total electrical distribution network shown in Figure 3-7.

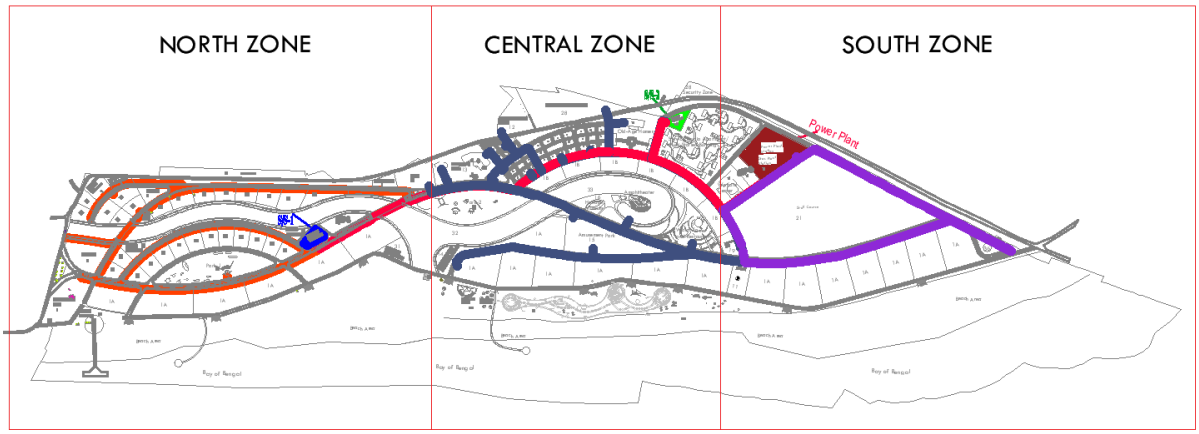


Figure 3-2:Distribution Zones of Sabrang Tourism Park

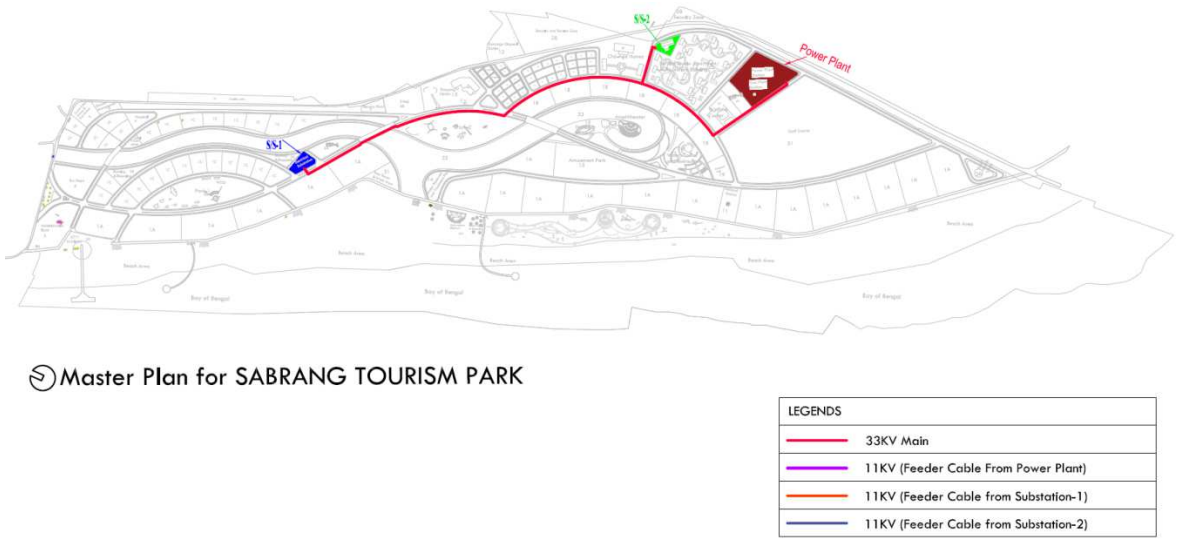


Figure 3-3:33KV Main Line of Sabrang Tourism Park

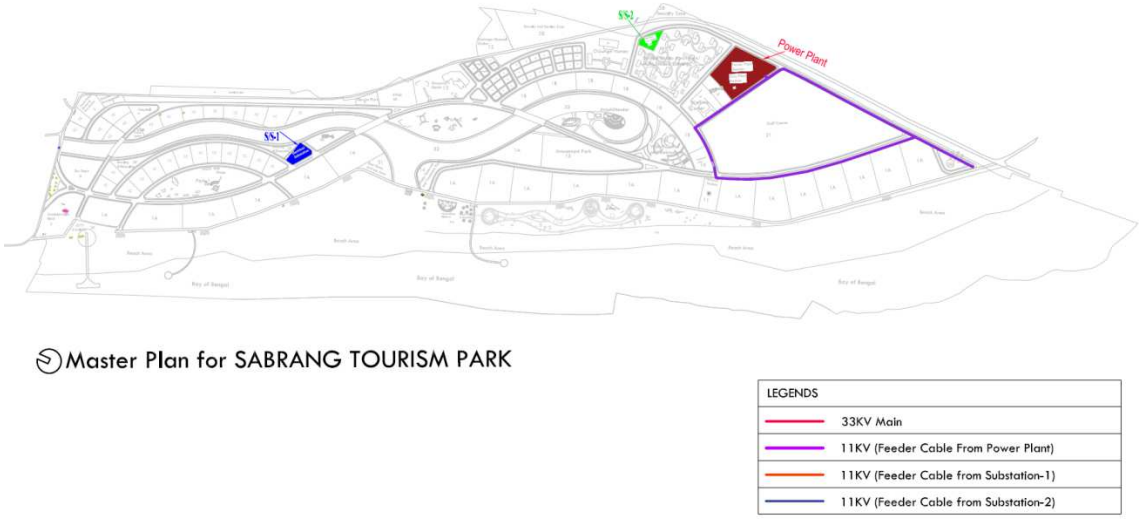


Figure 3-4: 11KV Feeder Route of South Zone

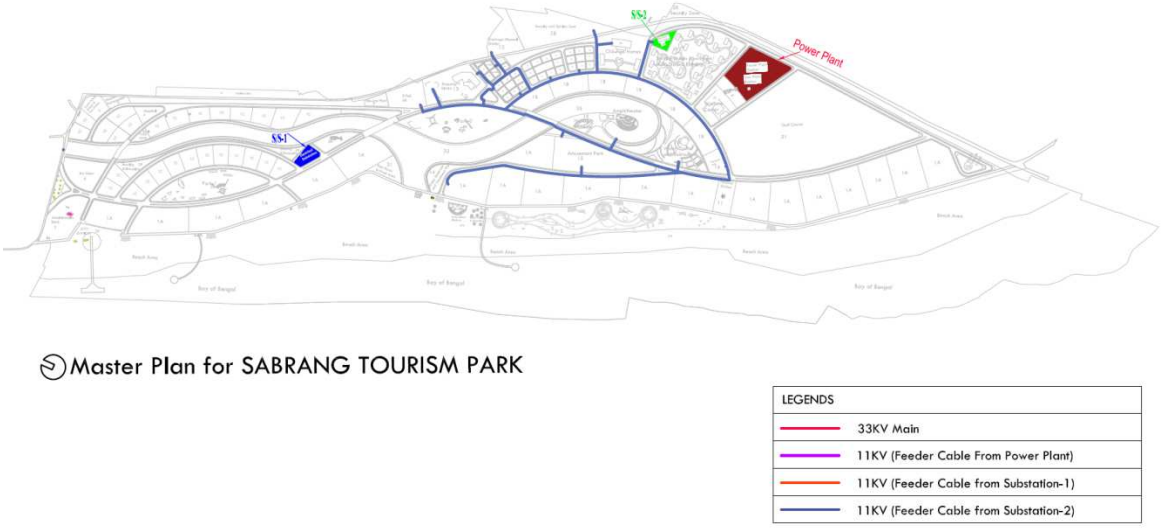


Figure 3-5: 11KV Feeder Route of Central Zone

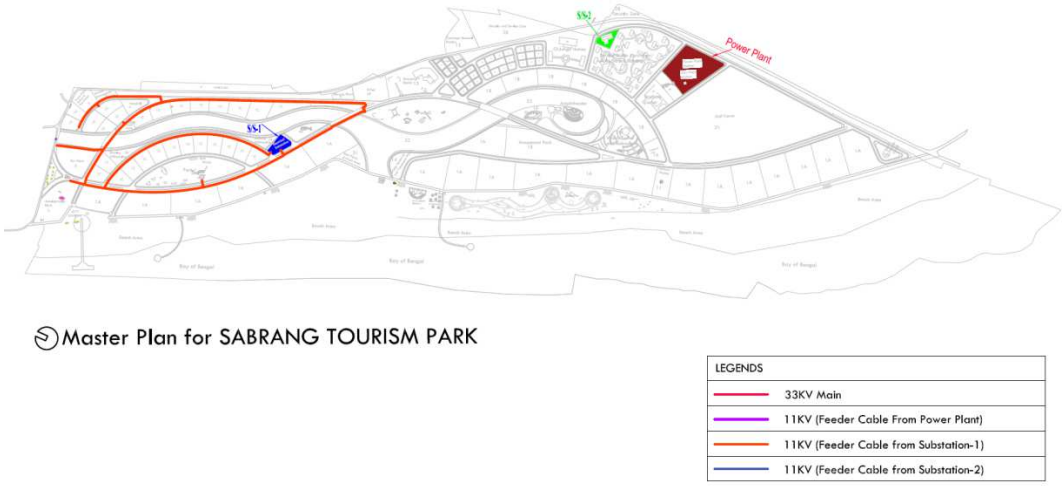


Figure 3-6: 11KV Feeder Route of North Zone

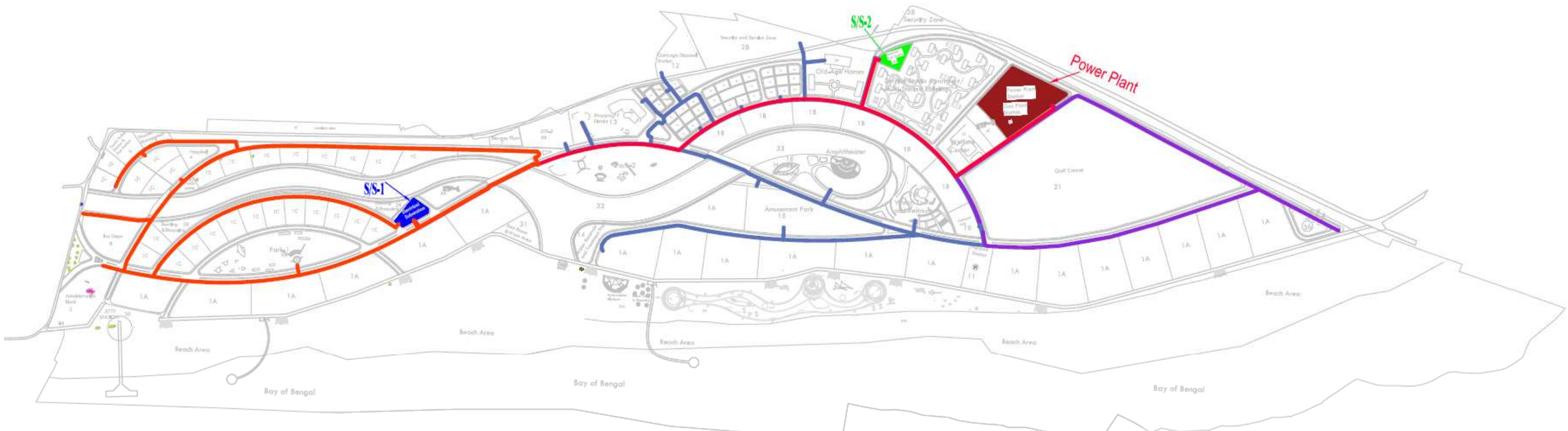


Figure 3-7: Electricity Distribution Network of Sabrang Tourism Park

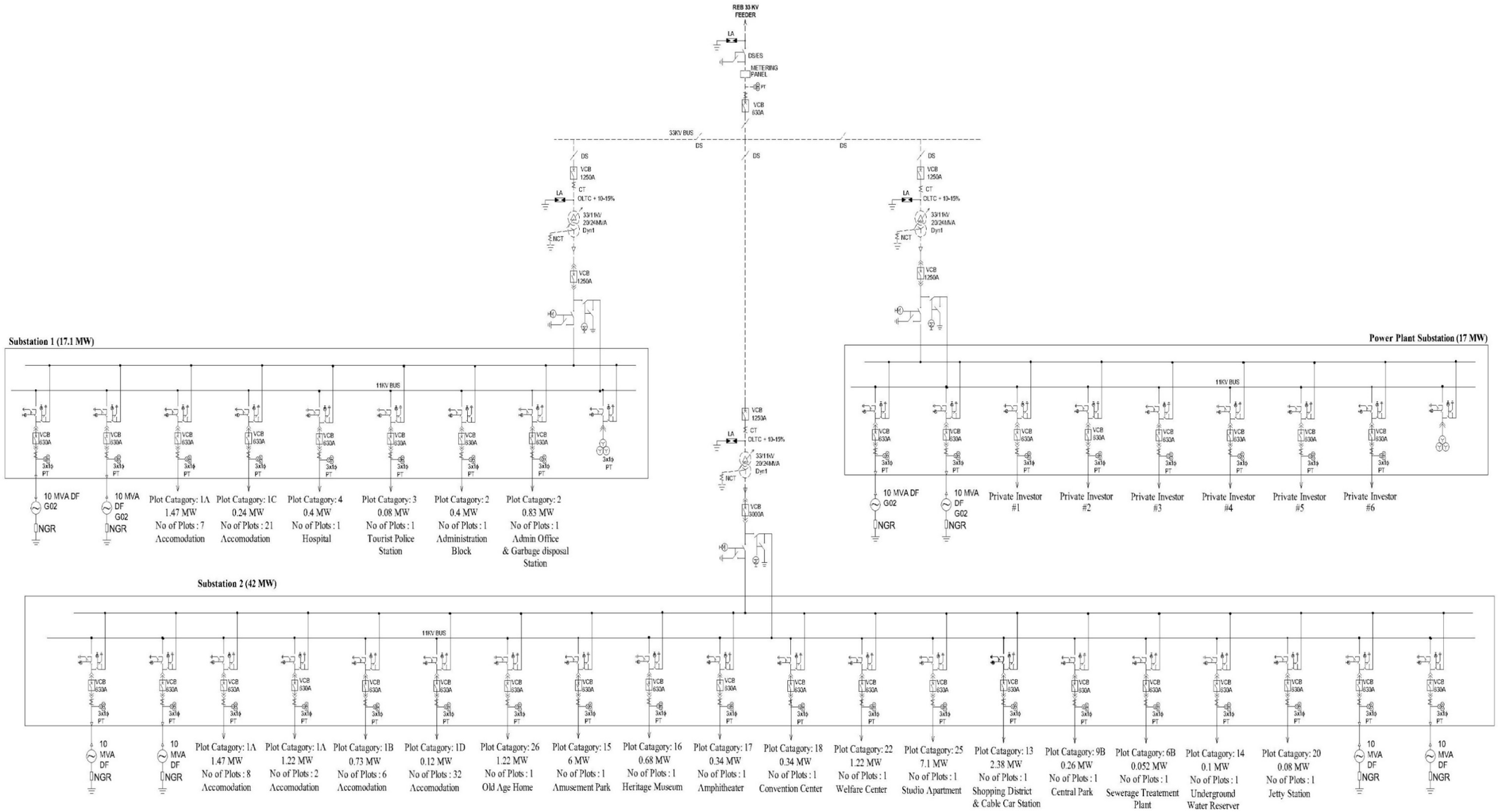


Figure 3-8: Single Line Diagram of Distribution System

3.5 PHASING FOR POWER GENERATION AND DISTRIBUTION PLAN

3.5.1 PHASING OF POWER GENERATION PLAN

Referring to the latest utility demand, the total power requirement for the Sabrang TP is considered to be 78 MW.

In order to accommodate the power demand initially 10MW will be taken from BREB for Infrastructure development purposes. For that purpose, it is required that BREB extends the existing 33kV line up to Sabrang TP. Since the REB power supply is not consistent and reliable due to frequent problems in the network, a 10MW Diesel Generator set need to be installed in Phase-1. The proposed 132/33KV grid substation of PGCB will be vital for fulfilling demand of this TP.

The Table 3-5 summarizes the approximate capacity building requirement of Diesel Power Plant phase by phase.

Table 3-5: Phase by phase capacity building requirements of Captive Power Plant

Source	Infrastructure		Master Plan			Total Capacity
	Phase-1	Phase-2	Phase-1	Phase-2	Phase-3	
REB	10MW	10MW	20MW	20MW	20MW	80MW
Diesel Generator	10MW	10MW	20MW	20MW	20MW	80MW
Total Capacity	**10MW**	**20MW**	**40MW**	**60MW**	**80MW**	**80MW**

3.5.2 PHASING OF DISTRIBUTION PLAN

Captive power plant, Substations and distribution network should be developed phase by phase as per demand requirement of each phase. The development of power plant, substation-1 and the 33 KV main network must start as early as possible to facilitate the infrastructure development works of Phase-1. The feeder network will be developed phase by phase as per the requirements of Investors.

The Table 3-6 summarizes the stages of powers distribution plan.

Table 3-6: Development stages of Power Distribution Network

Type	Phases	Development of Distribution Network
Infrastructure Development	Phase-1	Installation of 33/11 KV & 11/0.4KV substation at Substation-1. Installation of Diesel Generators.
	Phase-2	Installation of 33/11 KV & 11/0.4KV substation at Powerplant. Installation of Diesel Generators.
Master Plan Implementation	Phase-1	Installation of 33/11 KV & 11/0.4KV substation at Powerplant. Installation of Diesel Generators. Development of distribution network in North Zone.
	Phase-2	Addition of another 33/11 KV substation at powerplant. Development of 11KV & 0.4KV distribution network in Central Zone.
	Phase-3	Development of 11KV & 0.4KV distribution network in South Zone.

3.6 PHASE WISE COST ESTIMATION

Sl.	Items	Infrastructure Development		Master Plan Implementation			Total
		Phase-I	Phase-II	Phase-I	Phase-II	Phase-III	
1	Four 33/11 KV GIS Substation with 2X10/26 MVA Transformer	90000000.00	44875000.00	134875000.00	134875000.00	134875000.00	539500000.00
2	2000 KVA Substation			2,60,56250.00			2,60,56250.00
3	2 X 1250 KVA Substation	1,01,03,850.00		1,01,03,850.00			2,02,07,700.00
4	11 KV and 0.4 KV Underground Distribution Network	130000000.00	103070900.00	300000000.00	300000000.00	300000000.00	113,30,70,900.00
5	Street Light	65530208.00	58701762.00				124,231,970.00
6	8 X 10 MVA Generator	110,00,00000.00	48,85,00000.00	80,00,00000.00	80,00,00000.00	80,00,00000.00	398,85,00000.00
7	33 KV overhead double circuit line from utility substation to onsite substation	1,30,00,000.00					1,30,00,000.00
8	33 kV double circuit electrical cable interconnection between two 33/11 kV substation	40000000.00		23000000.00			6,30,00,000.00
9	1 MWp Solar Energy			66362500.00		66362500.00	132725000.00
Total		**1448634058.00**	**695147662.00**	**1324237500.00**	**1234875000.00**	**1301237500.00**	**6040291820.00**

4 WATER SUPPLY PLAN

4.1 INTRODUCTION

This chapter presents the basis of design for potable water services for the project. This chapter includes assessing the water requirement & design of water supply system into the site of Sabrang Tourism Park.

Bangladesh Economic Zones Authority (BEZA) assigns Institute of Water Modelling (IWM) to prepare a water supply Master Plan to fulfill water demand for Naf and Sabrang Tourism Park. The detail of this project is given in Volume one. That's why, the consultants' team for Detailed Master Plan preparation works only on-site Water Supply Network.

4.2 SOURCE OF WATER

Source of water will be identified by the end of the Project "Detail Study on Total Water Demand and Water Availability for Sabrang and Naf Tourism Park.

4.3 WATER QUALITY

The chemical analysis of the water will also be identified by the end of the Project "Detail Study on Total Water Demand and Water Availability for Sabrang and Naf Tourism Park".

4.4 WATER DEMAND

The on-site Water demand for the Proposed Master Plan of Sabrang Tourism Park is given below:

Phase 1: Population-22,648 persons& water demand = 6,715 m3/day

Phase 2: Population-13,964 persons & water demand = 4,091 m3/day

Phase 3: Population-16,094 persons& water demand = 4,330 m3/day

Total water demand for one day (52,706 persons) =15,135 m3/day.

i.e., 15,135,000 liters/day

Total water demand for two days =30,270 m3/2 days.

i.e., 30,270,000 liters/2 days

4.5 WATER DISTRIBUTIONNETWORK SYSTEM

4.5.1 SCOPE

Water comes from Deep tube-well/surface treated water/nearby others sources will be stored at first into Central Underground Water Reservoir (CUGWR), then water will be diverted through pipe line network by phase wise area & into each plot by pumping.

4.5.2 DISTRIBUTION OF WATER SYSTEM

Distribution of water system vary in size which is to deliver water from the source(s) i.e., Central Underground Water Reservoir (CUGWR) to individual phase wise area and each plot.

4.5.3 METHOD OF WATER DISTRIBUTION

Three methods are given below:

i) **Through Gravity Flow:** This is the ideal set-up when the location of the water source is at a considerably higher elevation than the area to be served.

ii) **Through Pumping with Storage:** Water is either (a) pumped to a distribution pipe network, then to UGWR of each building, with excess water going to a storage tank, or (b) pumped to a storage tank first, then water is distributed by gravity from the tank to the UGWR of buildings.

iii) **Through Direct Pumping to the Distribution Line**: a) In this system, water is pumped directly from the deep tube well to the distribution system and to the UGWR of each building; b) In this system, at first water is pumped directly from the deep tube well to Central Underground Water Reservoir (CUGWR) for one or two days water capacity reserve and also this water is pumped by Hydro pneumatic pump system to the distribution system & to be serve into the CUGWR of each building.

Elevated water reservoir/OHWR will not be used in the project. So, method no. 3(three) will be considered and used Hydro pneumatic Pump.

4.5.3.1 CENTRAL UNDERGROUND WATER RESERVOIR (CUGWR)

The capacity of the Central Underground Water Reservoir (CUGWR) shall be made adequate to store 2 days of water demand. Two days storage has been suggested to ensure availability of uninterrupted water supply during any maintenance or any repairing works.

This CUGWR will be divide into several numbers of chamber for each phase or Separate CUGWR will be provide at the same location for each phase. Capacity of each CUGWR will be considered as per phase wise water demand.

4.5.3.2 WATER SUPPLY PUMPS (HYDRO PNEUMATIC)

The capacity of water supply pumps shall be sufficient enough to meet hourly peak demand based on daily demand calculation as per phase wise water demand and number of pumps depends on each phase. The head of the pumps will be selected adequate enough to overcome the vertical head plus the head lead loss due to friction of total equivalent pipe length.

Pump Discharge : Equal to peak hourly demand.

Pump head : (Vertical lead + head loss due friction) + 15% Safety factor.

Two/three nos. of water pumps (Hydro pneumatic) will be installed into pump room i.e., over CUGWR for pumping water from Central Underground Water Reservoir to main distribution line.

4.5.3.3 PIPE LINE HYDRAULICS

➢ **Pressure**

The pressure exerted by a column of water is called pressure head, and can be calculated using the formula below:

h=P/ϒ,

Where: h= depth of water above datum,

P=Pressure,

ϒ=specific weight of water.

Pressure unit: psi-English system & n/m2 (Pascal)-SI system

➢ **Head Losses**

Shear stress is developed between the water and the pipe wall when water is flowing. The shear stress is the result of friction, and is dependent on the flow rate, the roughness of the pipe, and the length and diameter of the pipe. The commonly used formulas for computation of head loss due to friction (also called friction loss) are the:

- Hazen-William's formula
- Darcy Weisbach formula
- Manning's formula

➢ **Hydraulic Grade Line (HGL)**

Water in a pressurized pipe possesses three forms of energy which are:

i) Kinetic energy – energy due to the water's movement;
ii) Potential energy – energy due to elevation;
iii) Pressure energy – energy due to internal pressure.

The kinetic energy is called the velocity head, the potential energy is called elevation head, and the internal pressure energy is called pressure head. The SI unit for head is meter (m). An imaginary line corresponding to the sum of the elevation heads and pressure heads versus distance is the hydraulic grade line (HGL) of the pipeline. The HGL corresponds to the height that water will rise vertically in a tube attached to the pipe that is open to the atmosphere. The determination of the HGL is essential in the design of transmission lines.

➢ **Distribution System**

For purposes of designing the pipelines, the distribution systems are considered also in terms of the topology or layout that is used. There are two types:

i) Branched/Dead end/tree System
ii) Grid pattern/reticulation/Interlaced system
iii) Circular System or Ring System
iv) Radial System

v) Looped System

4.6 PIPE NETWORK ANALYSIS

Pipe network analysis involves the detailed and careful scrutiny of the fluid flow through a hydraulic network containing several interconnected branches and loops. In the design of a distribution system, a pipe network analysis must be done to determine the flow rates and pressure drops in the individual sections of the network, thus giving basis for selecting pipe diameters.

One important tool that a network designer may use is the equivalent pipe method. It is the substitution of a complex system of pipes by a single pipe that will give an equivalent head loss at a given flow. Most commonly methods used are:

i) Network Analysis by Dead End Method

ii) Network Analysis by Conventional Method (Hardy Cross)

iii) Equivalent Pipe Method

4.6.1 PROTECTION OF WATER QUALITY IN DISTRIBUTION SYSTEM

Contamination of water supplies should be avoided at all times. In most small water supply systems, however, economic reasons prevent 24-hour daily water service. This creates a risk of polluted water infiltration into the pipelines through leaks in pipe joints and service taps. To counter the health risk, 0.3 mg/L residual chlorine should be maintained throughout the distribution system.

Other measures to preserve the quality of water are the following:

i) Install water mains using adequate separation from potential sources of contamination such as sewers, storm water pipes, septic tanks, etc.

ii) Avoid cross-connections and prevent backflow.

iii) Provide at least the minimum allowable pressure and adequate flow at all delivery points in the distribution system.

iv) Avoid situations that may give rise to negative pressures.

v) Control the pressure up to the maximum allowable while avoiding pipe breakage.

vi) Minimize low-flow dead-ends to avoid stagnant water. Effective circulation of water in the pipelines should be maintained to prevent the deposition of sediments and minimize the growth of bacteria.

vii) Install non-return valves on source facilities to prevent backflow that might cause contamination.

viii) Promptly repair leaks in pipes to keep dirty water from coming in when pressure in the pipe is reduced.

ix) Cover reservoirs to prevent contamination. Ensure that all hatches and structures of the reservoir are secured and vermin-proof.

4.6.2 PIPELINE MATERIALS SELECTION

4.6.2.1 FACTORS IN SELECTING PIPELINE MATERIALS

a) Flow Characteristics,

b) Pipe Strength,

c) Durability,

d) Type of soil,

e) Cost of pipes.

4.6.2.2 PIPE MATERIALS

a) Galvanized Iron (GI) Pipes: GI pipes are available in sizes of 12.5, 20, 25, 32, 40, 50, 62-65, 75-80 and 100 mm. They are joined by means of threaded couplings.

b) Plastic Pipes: Unplasticized Polyvinyl Chloride (uPVC) are plastic pipes. They are available in different pressure ratings and sizes of 20, 25, 32, 40, 50, 63, 75, 90, 110, 125, 140, 160, 180, 200, 225, 250, 280, 315, 355, 400, 450mm. uPVC pipes can be joined either through solvent cement welding or through the use of special sockets with rubber rings.

c) HDPE Pipe: High density Polyethylene (HDPE) are plastic pipes. They are available in different pressure ratings and sizes of 16, 20, 25, 32, 40, 50, 63, 75, 90, 110, 125, 140, 160, 180, 200, 225, 250, 280, 315, 355, 400, 450, 500, 560, 630, 710, 800, 900 and 1000 mm. An adequate and properly made pipe joint will lead to faster and non-hazardous systems operations. Butt fusion, electro-fusion, which are permanent joints and detachable joints such as flanged joints.

4.6.3 APPURTENANCES FOR DISTRIBUTION MAINS VALVES

One of the most important types of appurtenances is the valve. A valve is a device that can be opened and closed to different extents (called throttling) to vary its resistance to flow, thereby controlling the movement of water through a pipeline. Valves can be classified into five general categories as follows:

a) Isolation Valves.
b) Air Release Valves and Vacuum Breaking Valves.
c) Pressure Reducing Valves.
d) Float valve.
e) Directional Valves.

Fittings are installed in the pipelines for the following purposes:

a) To connect the Same Type and Size of Pipe

Union: Unions are provided in the pipeline for ease of repair. Unions are usually installed at 60-meter intervals on straight pipelines. Coupling: Used in jointing two pipes of the same diameter. It is cheaper than unions. For HDPE same dia. of pipe are joined by Butt fusion/electro-fusion/flanged system.

b) To Connect Two Pipes of Different Sizes

Reducers are used when there is a reduction of pipe size and include bushings and elbows for galvanized iron pipes. Also available are reducing elbows, tees and crosses.

c) To Change the Direction of Flow

Elbow: To change flow direction. Tee: To divide the flow into two. Cross: To divide the flow into three.

d) To Stop the Flow

These are the caps, plugs and blind flanges.

4.6.4 DESIGN CRITERIA

4.6.4.1 WATER CONSUMPTION RATE

The average water consumption for the building will be determined on the basis of number of occupants and units of appurtenances which requires water. According to Bangladesh National Building code (BNBC), water consumption rate is as follows. i) Hotel: 300 litre (80 gals)/day/person & ii) office and others:45 litres (12 gals)/day/person.

4.6.4.2 WATER, SOIL & WASTE SYSTEM

The following fixture unit values shall be considered to designate the relative load weight of different kinds of fixtures for estimating total load carried by a soil or waste pipe and shall be used for sizing the internal soil, waste and vent stack and horizontal branches for building.

Fixture Type	Fixture Unit Value
1. Floor Drain	1
2. Kitchen Sink, Domestic	2
3. Wash basin (Ordinary)	1
4. Urinal, wall Lip	4
5. Urinal, Stall	4
6. Water Closet, Tank-operated	4

Main water & waste water line will be design as per Hazen William or Manning's equation.

4.6.4.3 SIZING OF WATER SUPPLY PIPING

The sizes of water supply for vertical and horizontal line, fixture numbers shall be determined on the members of connected fixture for building and distribution line will be design as per Hazen William/ Manning's equation.

4.6.4.4 STANDARD OF WATER SUPPLY PIPING & FITTINGS

All pipe and fittings shall conform & follow as per BNBC code.

4.6.4.5 TESTING OF WATER SUPPLY PIPING

After installation of the entire water supply system, it shall be tested & approved by the authority/Engineer before its use. Mains shall be tested to a pressure 500kpa/72 psi or double the maximum working pressure, wherever is greater for at least 5 min.

4.6.4.6 THRUST BLOCKS

Plugs, caps, tees, bends and fire hydrants shall be provided with concrete thrust blocks. Backing shall be placed between solid ground and the hydrant or fitting to be anchored. The area of bearing shall be as shown on the Drawing. The backing shall be so placed that fitting joints shall be accessible for repair. The concrete shall be 2500 psi plain cement concrete.

4.6.4.7 PIPE BEDDING

Fine sand as pipe bedding material shall be used. The sand shall be free from clay, site, salts, organic impurities and debris.

4.6.4.8 FLUSHING

The Contractor shall provide facilities for flushing the line. Water for flushing the line shall be arranged by the Contractor. Flushing of line shall be done section by section. For each valve section of pipeline, the Contractor shall make a temporary hose connection between the water pipeline and the pipeline under test. Water shall be pumped into the section flushed. Other arrangements for storing and pumping of water shall be subject to the approval of Engineer-in- Charge. Due precautions shall be taken by the Contractor for the disposal of water. The pipeline shall be flushed by keeping all the branching pipes open. Flushing shall be continued until clean water starts flowing through the other end. Section by section, the entire pipeline shall be flushed at a minimum flushing velocity of (0.76m/sec)2.5 ft. /sec.

4.6.4.9 LEAKAGE TEST

Flushing of the pipeline shall be followed by a leakage test. The Contractor shall provide facilities for performing the leakage test. Water and pumping facilities shall be provided by the Contractor. Before the testing of pipeline, the Contractor shall ensure that concrete backing blocks have been provided where necessary.

The test shall be performed only after all concrete work in contact with pipe to be tested has set for a minimum of 24 hours. All joints shall be left exposed. Leakage test shall be performed by keeping the end of the pipeline closed by proper plugs blocked to resist 150 per cent of the working pressure. While filling the line all valves and openings shall be kept open and water shall be filled in slowly. When the pipeline is completely filled with water and all air expelled, water shall be pumped into the pipeline to a minimum pressure of 150 percent of actual working pressure and the test pressure shall be maintained for at least 1 hour. Each and every joint shall be inspected for leaks and for all visible leakage and displacement leakage test shall be performed by the Contractor, for the newly laid pipeline. A measured quantity of water shall be pumped into the pipeline. No piping installation will be accepted until the leakage is equal or less than the number of imperial litres per hour as determined by the formula:

L = ND(P) ^0.5/32,046

Where, L = Leakage in Imperial litres/hr, N = Number of joints, D = Nominal diameter of pipe in mm, P = Average test pressure (kpa) during test.

In the event of the pipeline failing the leakage test, the Contractor shall locate and repair the defective pipe, fitting or joint at his expenses. For dewatering the line for repairs the Contractor shall follow the instructions given by the Engineer-in-Charge for disposal of water. After repairs of the line, the Contractor shall retest the line. The line will not be accepted until it passes the leakage test.

4.7 PHASING FOR WATER SUPPLY PLAN

The Phasing plan for Water Supply Network basically would be followed three phases for the Development of Detailed Master Plan for Sabrang Tourism Park. Such as phasing plan will be implemented in consideration with the installed utilities in the road network. The main considerations for the phased development plan of the water supply plan are as follows:

- Water reservoir/Treatment plan will be established in 1st phase.
- Water supply line along with proposed arterial road will also be constructed in 1st phase.
- Water supply line along with feeder road will be implemented as per the proposed road phasing.

The estimation of length of the water supply, diameter & Hydro pneumatic pump for each phasing development plan is determined in Table 4-1, Table 4-2, Table 4-3 and Table 4-4 respectively and phasing location will consider as master plan phasing in Figure 4-2, Figure 4-3, Figure 4-4 and Figure 4-5

Table 4-1: Estimated total Water Supply Pipe length for Water Distribution Networks

Phase No.	Item	Length (m)	Outer Dia. Of HDPE pipe (mm)
1	Water Supply Line	5,386	160~560 (main)
2	Water Supply Line	5,245	32~90(Branch) & 110~560 (main)
3	Water Supply Line	4,265	25~90 (Branch) & 125~400 (Main)

Table 4-2: Diameter & length of HDPE pipe of Water Supply Networks in Phase 1

Sl. No.	Line ID	Length in Meter	Outer Dia. HDPE in mm
1	i'1-h'1	191.00	225
2	h'1-g'1	172.00	225
3	g'1-f'1	193.00	250
4	f'1-e'1	198.00	355
5	e'1-d'1	190.00	400
6	d'1-c'1	206.00	450
7	c'1-b1	449.00	450
1	h1-i1	191.00	160
2	g1-h1	235.00	225
3	f1-g1	199.00	250
4	e1-f1	214.00	280
5	d1-e1	192.00	315
6	c1-d1	247.00	500

Sl. No.	Line ID	Length in Meter	Outer Dia. HDPE in mm
7	b1-c1	358.00	500
-	b1-a1	1,314.00	560
-	h1-h"1	192.00	315
1	m1-n1	151.00	200
2	l1-m1	132.00	250
3	k1-l1	121.00	315
4	j1-k1	126.00	355
5	d1-j1	116.00	355

Table 4-3: Diameter & length of HDPE pipe of Water Supply Networks in Phase 2

Sl. No.	Line ID	Length in Meter	Outer Dia. HDPE in mm
1	f2-e2	346.00	180
2	e2-d2	387.00	225
3	d2-c2	542.00	225
4	c2-b2	135.00	225
1	k2-j2	140.00	110
2	j2-i2	195.00	160
3	i2-h2	144.00	225
4	h2-c2	109.00	250
5	c2-b2	230.00	400
-	b2-a'2	375.00	500
-	a'2-a2	50.00	560
1	g2-f'2	151.00	160
2	f'2-e'2	119.00	250
3	e'2-d'2	170.00	315
4	d'2-c2	129.00	355
1	h2-l2	100.00	90
2	h2-m2	251.00	50
3	f'2-f"2	50.00	90
4	e'2-e"2	50.00	125
5	d'2-d"2	50.00	125
6	h'2-h"2	71.00	125
1	t2-s2	72.00	32
2	s2-r2	182.00	160

Sl. No.	Line ID	Length in Meter	Outer Dia. HDPE in mm
3	r2-q2	238.00	200
4	q2-p2	236.00	250
5	p2-o2	170.00	280
6	o2-n2	146.00	315
7	n2-a2	232.00	355

Table 4-4: Diameter & length of HDPE pipe of Water Supply Networks in Phase 3

Sl. No.	Line ID	Length in Meter	Outer Dia. HDPE in mm
1	i'3-i3	143.00	25
2	h3-i3	69.00	140
3	g3-h3	137.00	200
4	f3-g3	130.00	250
5	e3-f3	125.00	280
6	d3-e3	132.00	315
7	c3-d3	116.00	355
8	b3-c3	153.00	355
9	a3-b3	1,345.00	500
1	m3-l3	196.00	125
2	k3-l3	250.00	400
3	j3-k3	135.00	400
4	b3-j3	239.00	400
1	l'3-l3	300.00	280
2	k'3-k3	350.00	280
3	j'3-j3	445.00	90

Table 4-5: Numbers of Hydro Pneumatic pump for Water Supply Distribution Line

Phase	Item	Nos
1	Hydro pneumatic pump	12 nos (2x6=2 sets)
2	Hydro pneumatic pump	7 nos (4 nos-1set+3nos-1set=2sets)
3	Hydro pneumatic pump	7 nos (4 nos-1set+3nos-1set=2sets)

Capacity of each Hydro pneumatic pump & specifications : Discharge/Each=90 m3/hr, Pressure=142-213 psi, Standard=EN ISO 9906 GRADE 3B/DIN/NEMA/IEC/BS/VDE/JIS & ISO 9001,Protector=IP55,Insulation class=F,CE certified/UL listed countries, 3-phase, 380-420 V, 50 Hz, Hydraulic system, Impeller, Shaft=SS AISI 304,Casing & Base plate=Cast Iron JL1043,Vessel=100 litre, Text display, Pump status = Automatic, Manual & Disable, Speed Controlled, Continuously optimized pump run on timer, Adjustable system pressure loss correction factor, Frequency converter, actual system values, Shaft protection bushes=Tungsten carbide.

The area of Central Underground water reservoir (CUGWR) =2 acre

The location of CUGWR, Hydro pneumatic pump& water pumping plan for each phasing development plan are shown in Figure 4-1.

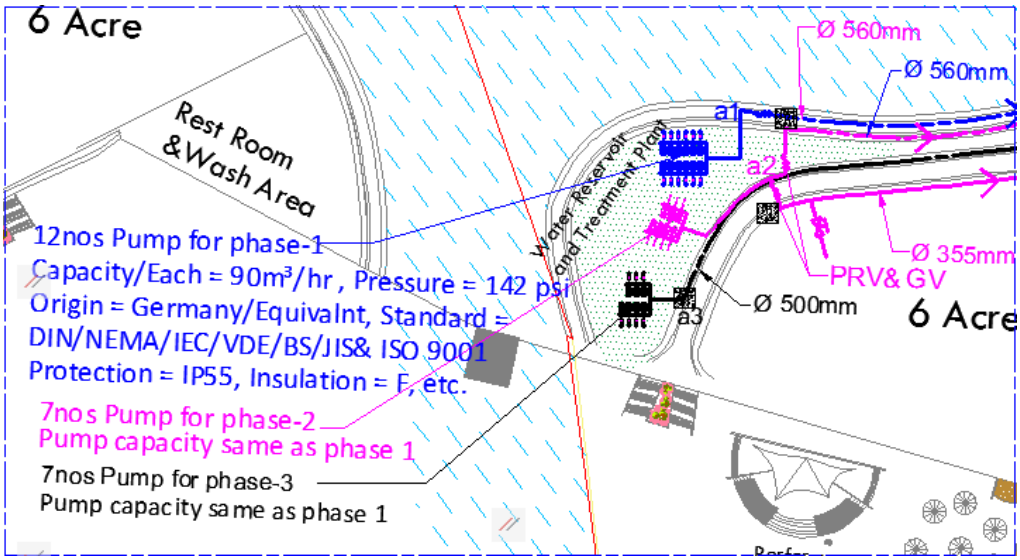


Figure 4-1: Water Pumping Plan for Sabrang Tourism Park

4.8 COST ESTIMATE

4.8.1 COST OF WATER SUPPLY PIPE

Cost of water supply pipe Line as per phase wise-

Phase No.	Unit Cost/Meter in BDT	Length in Meter	Total Cost in BDT
Phase 1	25,740	5,386	138,635,587.31
Phase 2	11,806	5,245	61,921,884.69
Phase 3	20,941	4,265	89,314,975.25
Total		**14,896**	**289,872,447.25**

4.8.2 COST OF HYDRO PNEUMATIC PUMP SYSTEM

Cost of Hydro pneumatic pump system as per phase wise-

Phase No.	Total Cost in BDT
Phase 1	20,406,658
Phase 2	12,605,358
Phase 3	12,605,358
Total	**45,617,374**

4.8.3 COST SUMMARY

Phase No.	Water supply pipe Line	Hydro pneumatic pump system	Total
Phase 1	138,635,587.31	20,406,658	159,042,245
Phase 2	61,921,884.69	12,605,358	74,527,243
Phase 3	89,314,975.25	12,605,358	101,920,333
Total	**289,872,447.25**	**45,617,374**	**335,489,821**

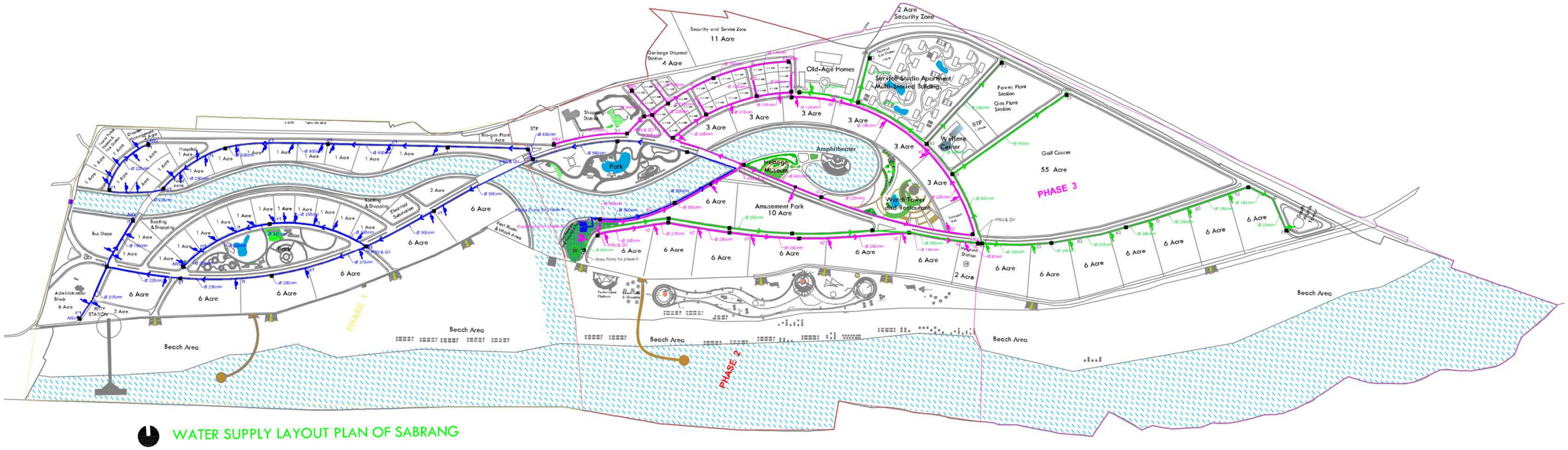


Figure 4-2: Water Supply Line of Sabrang Tourism Park

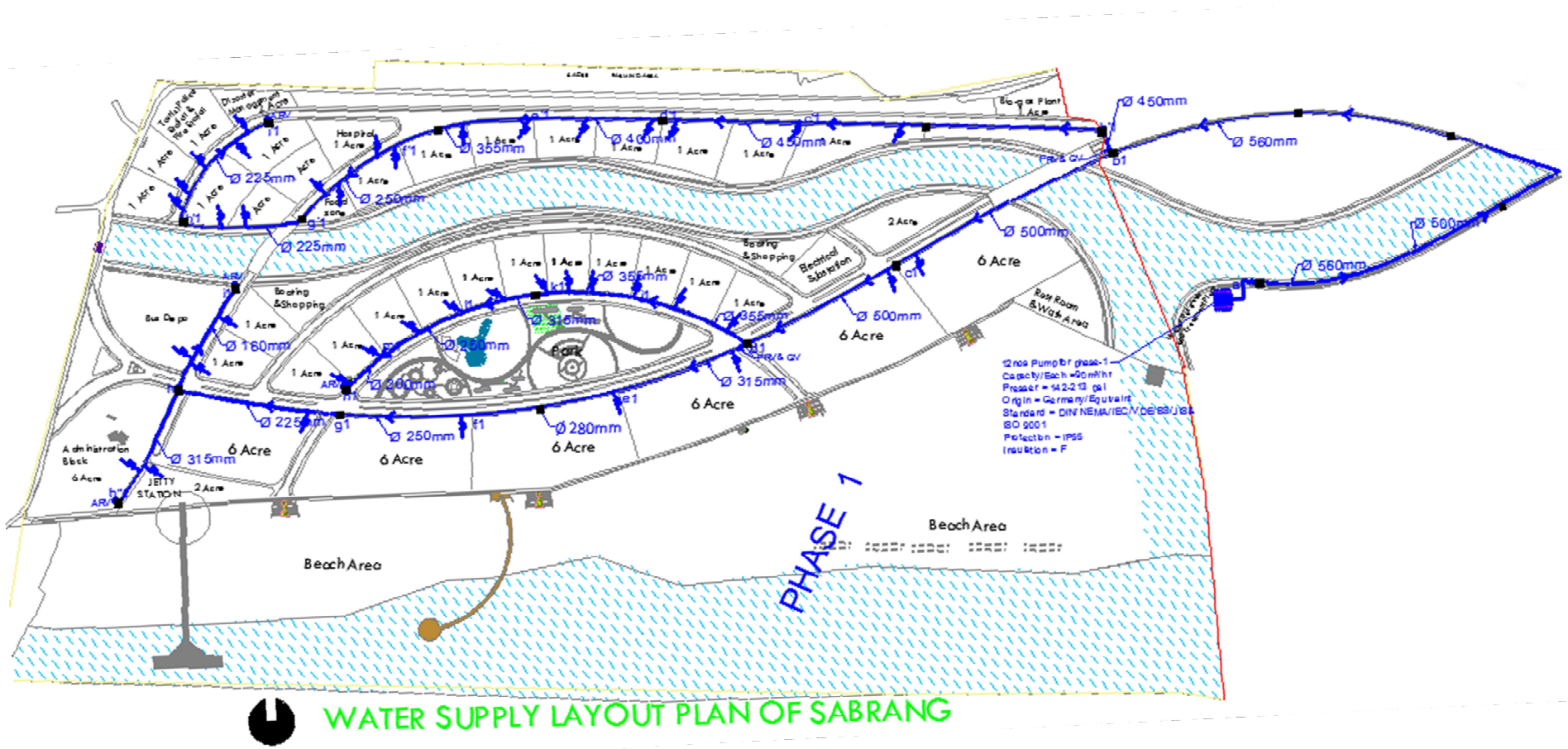


Figure 4-3: Water Supply Line of Phase-1

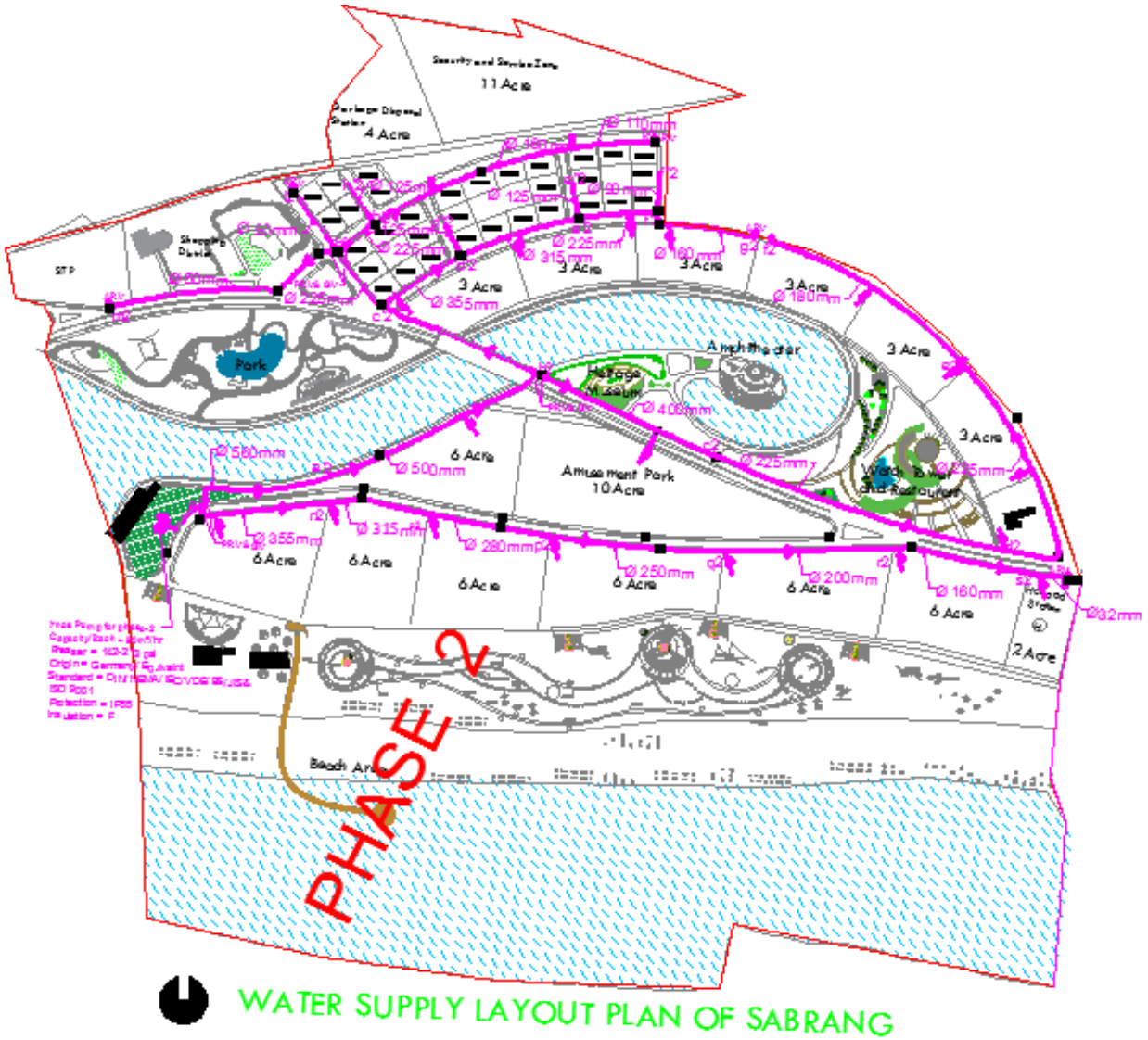


Figure 4-4: Water Supply Line of Phase-2

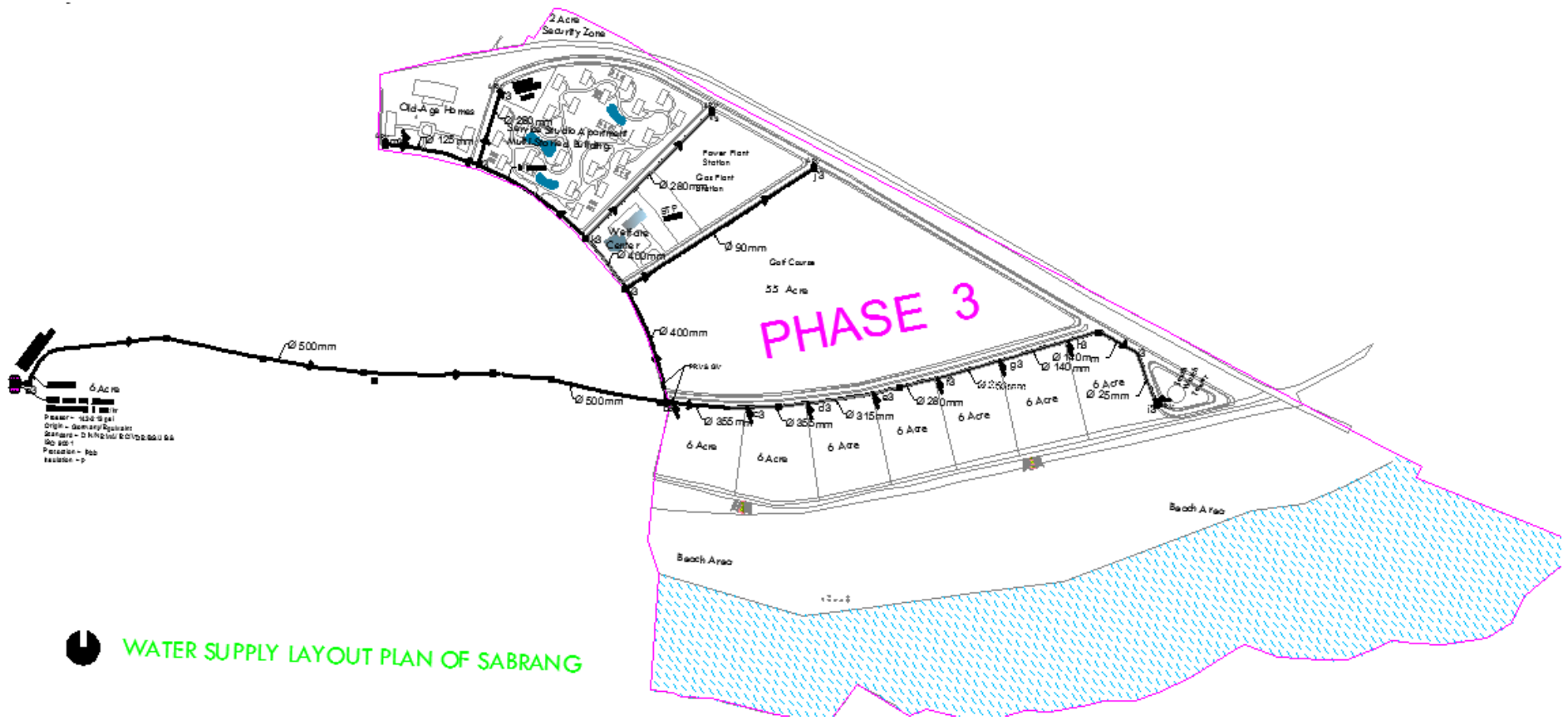


Figure 4-5: Water Supply Line of Phase-3

5 DRAINAGE AND ENVIRONMENTAL PLAN

5.1 DRAINAGE PLAN

Spontaneous spatial activities and habitation cause encroachment on water retention areas and natural drainage path with little or no care for natural drainage system. Inadequate drainage networks, natural siltation, absence of outlets, disposal of solid waste into the drains and drainage path and lack of proper maintenance of the existing drainage system are the major causes of blockage in drainage and water logging in an area. Therefore, drainage issue and its proper planning will be one of the key parts of the Master Plan preparation.

5.1.1 EXISTING DRAINAGE SYSTEM

5.1.1.1 TOPOGRAPHY AND SLOPE

A contour map of the study area has been prepared from the spot level values collected from the field survey. The highest and lowest spot levels value was found to 6.98 m and -2.1m respectively in Sabrang Tourism Park. According to the contour map, the island is low laying area with average height of 1.41m.

As observed during site visit, the proposed EZ has a level difference of 5 to 6m (approx.) with a gentle slope towards North East to South west direction. According to the contour variation, the depth of land filling across the project area shall vary. The natural slope of ground will be advantageous for gravity network of water supply, sewer and storm water drains.

5.1.1.2 DRAINAGE CHANNELS

Teknaf Upazila area is not served by any roadside drainage system. Drainage in the Teknaf town is covered by natural as well as manmade systems. Wastewater from rural homesteads is drained in to adjacent ditches or family pits. Bay of Bengal plays a vital role for the natural drainage system for the proposed tourism sites and its influence area. There is no exiting manmade drainage network in the project area of influence.

5.1.1.3 WATER BODIES

One natural canal (khal) passes through the central part of the project area in north south direction. Moreover, there are some water bodies, which are connected to Bay of Bengal through small canals, found within the project area. These water bodies are mainly used for fish cultivation and sometimes they are used for salt cultivation. Depth is quite low of those water bodies. Around 365.32 (35% of total area) acres, making it 2ndposition in land use ranking, of total land have been identified as waterbodies.

5.1.2 EXISTING DRAINAGE PROBLEMS AND PROSPECTS

The proposed site is mainly drained by the Bay of Bengal encompassing from western-southern sides. Water flows in and out of the proposed site through number of small canals meeting at the Bay of Bengal. There is no drainage issue reported in and around the proposed site.

5.1.2.1 PROSPECTS

To make the drainage network in the project site capable of handling future drainage requirements, a Drainage Plan has been an integral part of the Master Plan. As considered in draft master plan, the alignments of the existing natural canals would not be disturbed. Moreover, their capacity will be increased by widening of their cross-sectional profiles. To achieve an effective drainage system, following guiding principal may be considered:

- There should be provisions for drains on both sides of road networks
- The existing canals and planned water bodies, should be of proper section to make them sufficient to accommodate the rainwater during wet season.

5.1.3 PROJECTION OF DRAINAGE REQUIREMENT

5.1.3.1 CALCULATION OF RUN-OFF

For calculation of drainage runoff Rational Method has been adopted. According to this method for calculation of peak flows at any given point of a drainage system can be calculated by using the following formula:

Q = CIA/360

Where,

Q = peak flow in m3/sec

C = run-off coefficient

I = design rainfall intensity in mm/hr

A = Catchment area in hectares

5.1.3.2 RUN-OFF COEFFICIENT

The run-off coefficient C is defined as the ratio of the rate of run–off to the rate of rainfall during the same time period and is dimensionless. Because, some rainfall is retained in depression or ponds and the run–off is prevented from reaching the drain due to obstructions, or infiltrates into the soil, the runoff coefficient is less than one. It is a larger value for areas with low infiltration and high runoff (pavement, steep gradient), and lower for permeable, well vegetated areas (forest, flat land). Table 5-1 shows the run-off coefficients, which are commonly used when using the rational method for an individual situation.

The value applied is based upon an average for the situation under consideration, and is recommended to be set in the range of 0.30 to 0.48 for fully developed urban areas containing a normal mix of residential and commercial properties. This table shows the common runoff coefficient used for different type of areas. For this program, value of Run-off coefficient has been set to 0.33. (Table 5-1).

Table 5-1: Common Runoff coefficients for Different Land Use

Type of Drainage Area		Run – off Coefficient: C
Business	Downtown areas	0.70 – 0.95

Type of Drainage Area		Run – off Coefficient: C
	Neighbourhood area	0.50 – 0.70
Residential	Single – family areas	0.30 – 0.50
	Multi – units, detached	0.40 – 0.60
	Multi – units, attached	0.60 – 0.75
	Suburban	0.25 – 0.40
	Apartment dwelling areas	0.50 – 0.70
Industrial	Light areas	0.50 – 0.80
	Heavy areas	0.60 – 0.90
	Parks, cemeteries, playgrounds	0.10 – 0.35
	Rail road yard areas	0.20 – 0.40
	Unimproved areas	0.10 – 0.30
	Streets; Driveways and roofs	0.10 – 0.95
Lawns	Sandy soil, flat, 2%	0.05 – 0.10
	Sandy soil, avg, 2 – 7%	0.10 – 0.15
	Sandy soil, steep, 7%	0.15 – 0.20
	Heavy soil, flat, 2%	0.13 – 0.17
	Heavy soil, avg, 2 – 7%	0.18 – 0.22
	Heavy soil, steep, 7%	0.25 – 0.35

Source: Handbook of Hydrology, by - David R. Maidment

5.1.3.3 RAINFALL INTENSITY

The design rainfall intensity in mm/hr is defined as the average rate of precipitation of a given time period during a storm event. This is a variable value, and is dependent on the particular rainfall characteristics of the area, on the return period selected for the rainfall events, and on the time required for the run-off to flow from the most remote part of the catchment area to the point under consideration (defined as the time of concentration, Tc in minutes).

The average monthly rainfall data at Teknaf station for the last 10 years (Table 5-2) shows that rainy season begins in May and lasts till October with monthly average rainfall intensity 292 mm and 275 mm respectively. The average minimum and maximum monthly rainfall recorded during this period were 2 mm in February and 1269 mm in July. The rainfall follows a pattern with the highest rainfall in the summer from May to October and minimum rainfall in the winter from November to April. The annual average rainfall in Teknaf is estimated to be 369.5 mm. The Table 5-3 represents Maximum Annual Rainfall Intensity for the Shown Duration.

Table 5-2: Maximum Annual Rainfall Intensity for Teknaf Station

Year	Annual Daily Maximum Rainfall (mm)	Ranking	Probability (%)	Return Period, T (Years)
2009	155	10	94	1.1
2010	481	1	6	16.4
2011	207	8	74	1.3
2012	305	4	35	2.8
2013	214	7	65	1.5
2014	241	5	45	2.2
2015	331	3	26	3.9
2016	223	6	55	1.8

Year	Annual Daily Maximum Rainfall (mm)	Ranking	Probability (%)	Return Period, T (Years)
2017	181	9	84	1.2
2018	460	2	16	6.3

Source: Bangladesh Meteorological Department and Prepared by the Consultants' Team, 2019

Table 5-3: Maximum Annual Rainfall Volume

Year	Annual Daily Maximum Rainfall (mm)	30 min (0.5 hr)	1 hr	2 hr	6 hr	12 hr
2009	155	42.6	53.7	67.7	97.6	123.0
2010	481	132.4	166.8	210.1	303.0	381.8
2011	207	57.0	71.8	90.4	130.4	164.3
2012	305	83.9	105.7	133.2	192.1	242.1
2013	214	58.9	74.2	93.5	134.8	169.9
2014	241	66.3	83.6	105.3	151.8	191.3
2015	331	91.1	114.8	144.6	208.5	262.7
2016	223	61.4	77.3	97.4	140.5	177.0
2017	181	49.8	62.7	79.1	114.0	143.7
2018	460	126.6	159.5	200.9	289.8	365.1
Mean	279.8	77	97	122.2	176.3	222.1
Standard Deviation	107.7	29.6	37.3	47	67.8	85.5

Source: Bangladesh Meteorological Department and Prepared by the Consultants' Team, 2019

Table 5-4: 30 min Rainfall Frequency Analysis

Year/Month	30 min rainfall (mm)	Ranking	Probability (%)	Return Period, T(Years)	Intensity (mm/hr)
2010	132.4	1	6	16.4	264.70
2018	126.6	2	16	6.3	253.15
2015	91.1	3	26	3.9	182.16
2012	83.9	4	35	2.8	167.85
2014	66.3	5	45	2.2	132.63
2016	61.4	6	55	1.8	122.72
2013	58.9	7	65	1.5	117.77
2011	57.0	8	74	1.3	113.92
2017	49.8	9	84	1.2	99.61
2009	42.6	10	94	1.1	85.30

Table 5-5: Frequency Factors Calculation

Return Period, T	Frequency Factors					
	2	5	10	25	50	100
KT	-0.16427	0.7194574	1.304563	2.043846	2.592288	3.136681

Table 5-6: Design Rainfall Intensity Calculation

Duration (hr)	Return Period (years)					
	2	5	10	25	50	100
0.5	72.13755	98.29593904	115.6151	137.4978	153.7317	169.8457
1	90.87265	123.835761	145.6602	173.2355	193.6923	213.9982
2	114.4792	156.0144978	183.5145	218.2608	244.0375	269.624
6	165.1624	225.0792117	264.7494	314.8728	352.0571	388.9669
12	208.0547	283.6136077	333.6402	396.8488	443.7406	490.2862

Duration (hr)	Return Period (years)					
	2	5	10	25	50	100
24	262.1079	357.285562	420.3015	499.9222	558.9894	617.6205

Table 5-6 seen that Design Rainfall Intensity= 115.62 mm/hr, Return period= 10 years, duration=30 min.

5.1.4 DRAINAGE PLAN OF SABRANG TOURISM PARK

The consultant's team has used the above information for preparing the drainage plan (Table 5-6). The Proposed Lake of Master Plan will be used as Natural Drainage system for Sabrang TP and it's also used as outfall for the Sabrang TP. Road side drainage system is proposed to drain out rain water from the side. Table 5-7 shows the proposed road side drainage type, diameter and length of the drain and the drainage network shown in Map 5-1.

Table 5-7: Proposed Drainage Plan

Pipe Diameter	Length in Meter
375 mm	271.7
450 mm	3715.41
525 mm	909.4
600 mm	3273
750 mm	3367.7
900 mm	1956.01
1050 mm	1639.82
1200 mm	1348.93
1350 mm	200.5
1650 mm	181.3
Total	**16863.77**

5.2 PHASING FOR DRAINAGE PLAN

The Phasing for Drainage Plan would be followed six phases for the Development of Detailed Master Plan for Sabrang TP. Such as phasing plan will be implemented in consideration with the installed utilities in the road network. The main considerations for the phased development plan of the Drainage Plan are as follows:

- Proposed Water bodies will be excavated or re-excavated in 1st phase.
- Drainage line along with proposed arterial road will also be constructed in 1st phase.
- Drainage line along with feeder road will be implemented as per the proposed road phasing.

The estimation of length of the drainage network for each phasing development plan is determined in Table 5-8 and phasing location will consider as master plan phasing in Map 5-2.

Table 5-8: Phasing Plan of Drainage Network

Phase No.	Length in meter	% of Completion
Phase 1	11147.54	66.10
Phase 2	3262.33	19.35
Phase 3	2453.90	14.55
Total	**16863.77**	**100.00**

5.3 COST ESTIMATE

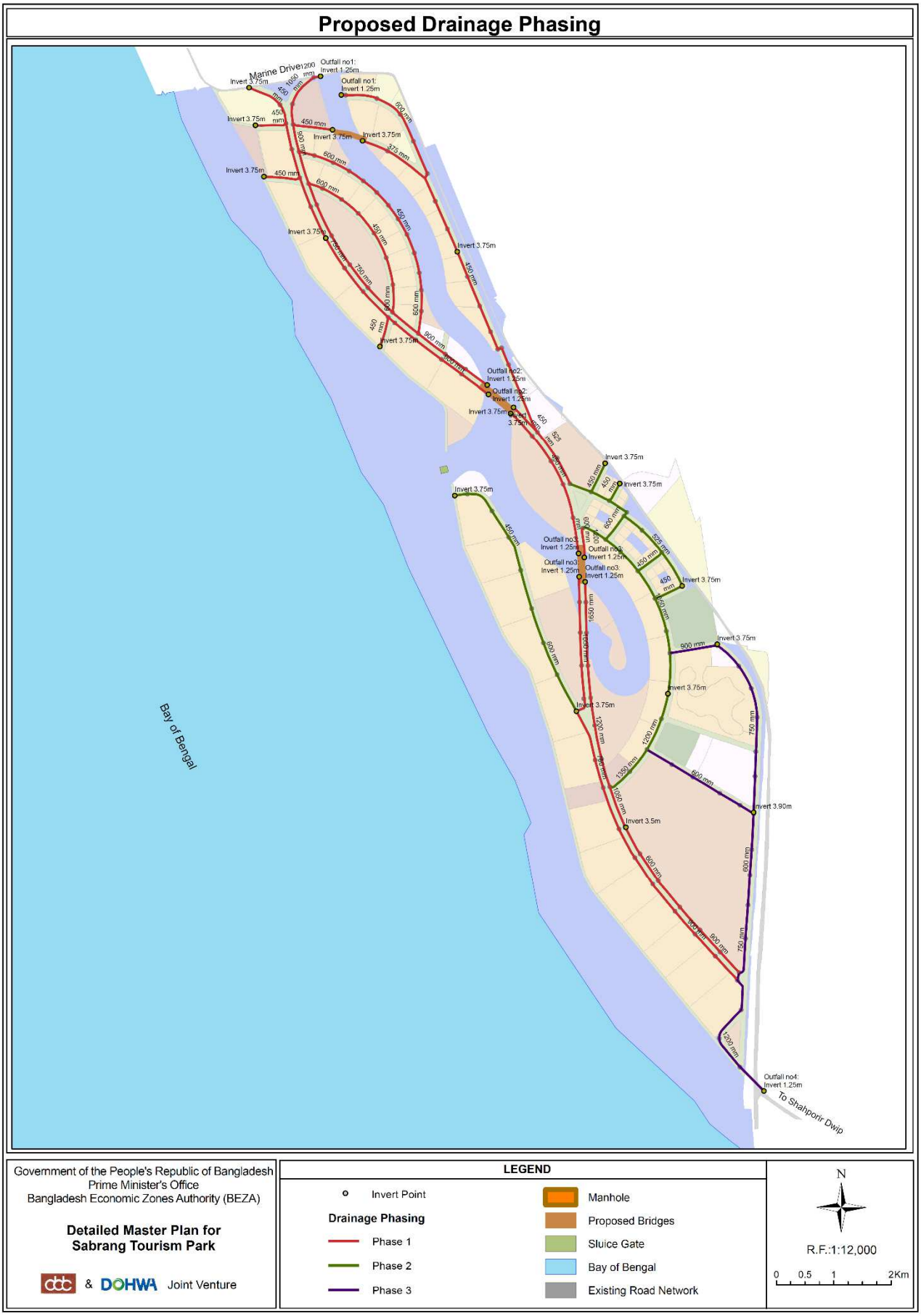
The estimated cost to implement the Drainage Plan are given Table 5-9.

Table 5-9: Cost Estimate of Drainage Plan

Phase No.	Pipe Diameter	Unit	Quantity	Unit Rate	Cost in BDT	Unit Cost Reference
Phase 1	1050 mm	Rm	799	14,000.00	11186000	LGED 2020
	1200 mm	Rm	708.13	17,045.00	12,070,075.85	LGED 2020
	1650 mm	Rm	181.3	30,000.00	5439000	LGED 2020
	375 mm	Rm	271.7	2,630.00	714571	LGED 2020
	450 mm	Rm	2738	3,882.00	10628916	LGED 2020
	525 mm	Rm	568.6	4,467.00	2539936.2	LGED 2020
	600 mm	Rm	1695.4	5,950.01	10087646.95	LGED 2020
	750 mm	Rm	2435.1	8,080.00	19675608	LGED 2020
	900 mm	Rm	1750.31	10,301.49	18030800.96	LGED 2020
Sub-Total			**11147.54**		**90372554.97**	
Phase 2	1050 mm	Rm	840.82	14,000.00	11771480	LGED 2020
	1200 mm	Rm	126.3	17,045.00	2152783.5	LGED 2020
	1350 mm	Rm	200.5	23,000.00	4611500	LGED 2020
	450 mm	Rm	977.41	3,882.00	3794305.62	LGED 2020
	525 mm	Rm	340.8	4,467.00	1522353.6	LGED 2020
	600 mm	Rm	776.5	5,950.01	4620182.765	LGED 2020
Sub-Total			**3262.33**		**28472605.49**	
Phase 3	1200 mm	Rm	514.5	17,045.00	8769652.5	LGED 2020
	600 mm	Rm	801.1	5,950.01	4766553.011	LGED 2020
	750 mm	Rm	932.6	8,080.00	7535408	LGED 2020
	900 mm	Rm	205.7	10,301.49	2119016.493	LGED 2020
Sub-Total			**2453.9**		**23190630**	
Total			**16863.77**		**142035790.5**	

Proposed Drainage Plan

Map 5-1: Drainage Plan of Sabrang Tourism Park



Map 5-2: Phasing of Drainage Plan

5.4 ENVIRONMENTAL PLAN

5.4.1 KEY ENVIRONMENTAL ISSUES AND MITIGATION MEASURES ADOPTED IN MASTER PLAN

Table 5-10 presents the key environmental issues identified with their potential mitigation measures considered in Master Plan.

Table 5-10: Environmental Mitigation for Sabrang Tourism Park

Sl. No	Environmental Issues	Nature of Impact	Mitigation Measures adopted in Master Planning
1	Ambient Air Quality	Degradation	Provision of green roofing system on roofs and vertical walls that receive full sunlight for at least 6 hours in a day.
2	Ambient Noise Level	Increase in Noise levels	Development of thick green belt and organized greens within each residential plot, and peripheral green belt all along the EZ boundary. Belts of trees and bushes situated between the noise source and the receiver can reduce the noise level perceived by the receiver.
3	Water Quality	Degradation of surface water quality and stress on groundwater resources	On-site wastewater treatment plant (WTP) facilities have been considered. An off-site surface water treatment plant with advanced treatment methods is suggested in vicinity of the tourism park area for both Sabrang and Naf.
4	Waste generation	Greenhouse gas emission, pollution from leachate	Zero waste approach has been considered. Biogas Plants fed with biodegradable waste generated on-site and sludge from WTP. Solid waste to be sorted at two stages (on-site and secondary sorting facility) and sent for recycling.
5	Biodiversity value	Loss of trees and vegetation, degradation of aquatic ecology.	Development of thick green belt and organized greens within each residential plot, and peripheral green belt all along the tourism park boundary. Treatment of wastewater before discharge.
6	Drainage	Waterlogging	Widening of existing natural canal, separate storm water sewerage system.

6 SEWERAGE TREATMENT PLAN

This chapter presents the basis of design for Soil & waste water convey system (Main line) and Sewerage Treatment Plant (STP).

6.1 SOIL & WASTE WATER CONVEY SYSTEM (MAIN LINE)

It has been observed that no sewer drainage piping network is available near or around the proposed site. In that case there is no other choice but to discharge the soil water from the toilets to a septic tank (to be constructed within the site) for converting the soil water in to effluent water which will be ultimately discharge into a seepage pit (Soak well) for absorption by earth. But it is not suitable at proposed site. Sewerage Treatment Plant (STP) will be provided for the Sabrang TP.

The plumbing fixtures shall be selected that it will be cost effective, suitable for simple operation and easy maintenance. To meet the above criteria, flush tank type water closets and urinal banks from locally available source shall be installed so that this will make it convenient to get replacement parts and to maintain the fixtures.

Separate soil and waste water piping shall be installed for the sewage disposal system from each toilet, kitchens, etc. soil from each sanitary fitting in the toilets shall be discharged by gravity through pipe network to terminal manholes/inspections pits for onward disposal into the main sewer line at STP.

Waste from kitchen shall be connected to the waste water system via grease trap. Necessary traps and vents shall be provided to maintain water seal in traps in order to prevent fouling of inside environment.

Separate waste, soil and rain (horizontal & Vertical) down pipe and combined pipe line (Soil & waste) will be consider for building. Finally, all combined pipe line from phase wise building will be connect to main waste & soil line and divert to STP plant.

6.1.1 PIPING MATERIALS

Unplasticized Polyvinyl Chloride (uPVC) are plastic pipes. They are available in different pressure ratings and sizes of 20, 25, 32, 40, 50, 63, 75, 90, 110, 125, 140, 160, 180, 200, 225, 250, 280, 315, 355, 400 and 450mm. uPVC pipes can be joined either through solvent cement welding or through the use of special sockets with rubber rings.

HDPE pipe: High density Polyethylene (HDPE) are plastic pipes. They are available in different pressure ratings and sizes of 16, 20, 25, 32, 40, 50, 50, 63, 75, 90, 110, 125, 140, 160, 180, 200, 225, 250, 280, 315, 355, 400, 450, 500, 560, 630, 710, 800, 900 and 1000mm. An adequate and properly made pipe joint will lead to faster and non-hazardous systems operations. Butt fusion, electro-fusion, which are permanent joints and detachable joints such as flanged joints.

6.1.2 TESTING

All soil and waste water drainage pipes will be tested after completion of works as per BNBC/others code.

6.1.2.1 DESIGN CRITERIA

A sewer is subjected to a wide range of flow conditions. One the other hand, it must minimize the deposition of solids under low flow conditions. Small sized sewers are prone to blockage by grease and silt. To reduce the chance of blockage and to facilitate cleansing, the minimum size for sewers should be 100 mm diameter. Minimum velocity 0.6m/sec and maximum velocity will be 2.5m/sec.

6.1.2.2 DESIGN STANDARDS AND REGULATIONS

In order to ensure proper standard and safety, the following authorized codes and regulations shall be followed and adapted as guide for design development.

BNBC	:	Bangladesh National Building Code.
UPC	:	Uniform Plumbing Code (1994)
NPC	:	National Plumbing Code (ASA A 40.8-1933)
WASA	:	Water and Sewerage Authority (Local)
B. S	:	British Standards (to be applied for locally produced products)

6.1.2.3 SIZING OF SOIL & WASTE PIPING

The sizes of soil and waste water pipe line shall be determined on the demand of 85% of total demand water. Hydraulic analysis for the design of the sewerage system shall be carried out using Manning's/Hazen William formula. The manning/Hazen William roughness coefficient shall be considered as per materials used.

6.1.2.4 SLOPE

Slope will be maintained properly by controlling of self-cleaning velocity and as per BNBC code.

6.1.2.5 INSPECTION PIT

Sufficient number of inspection pit will be provided (as per BNBC code) and also size. Auto lifting submersible sewage pump may be provided if depth from finish level to STP is higher.

6.1.2.6 PIPE BEDDING

Fine sand as pipe bedding material shall be used. The sand shall be free from clay, site, salts, organic impurities and debris.

6.1.2.7 STANDARD OF WASTE & SOIL PIPING & FITTINGS

All pipe and fittings shall conform & follow as per BNBC code.

6.2 SEWAGE TREATMENT PLANT

Total Capacity: 12,865 m3/day

Three STP are considered for the Sabrang TP. Those are:

The capacity of each STP is given below-

STP-1: Capacity:23,648 users i.e., 5,708 m3/day and approx. area required:3,710 sqm (0.92 acre).

STP-2: Capacity:14,964 users i.e., 3,478 m3/day and approx. area required: 2,260 sqm (0.56 acre).

STP-3: Capacity:17,388 users i.e. 3,680 m3/day and approx. area required: 2,393 sqm (0.59 acre).

Sewage treatment is the process of removing contaminants from wastewater and household sewage, both effluents and domestic. It includes physical, chemical, and biological processes to remove physical, chemical and biological contaminants. Its objective is to produce an environmentally safe fluid waste stream and a solid waste suitable for disposal or reuse. The objective of sewage treatment is to produce a disposable effluent without causing harm to the surrounding environment, and prevent pollution.

6.2.1 IMPORTANCE

It is very important to provide some degree of treatment to wastewater before it can be used for agricultural or landscape irrigation or for aquaculture. The principal objective of sewage treatment is generally to allow human effluents to be disposed of without danger to human health or unacceptable damage to the natural environment. According to a research, a large number of people die from water borne diseases in most of the developing countries. Therefore, it is very important to get the proper treatment of the water for a healthy living.

6.2.2 REMARKS

Treated water will be reserve into an underground tank for using of gardening & car washing purpose and excess treated water will be discharge into lake/bay. Dried sludge/sludge cake will be use in land fill purpose by transport/Truck into or outside the project (Figure 6-1).

Figure 6-1: Schematic Diagram of Sewerage Water Treatment Plant

6.3 PHASING FOR SEWERAGE TREATMENT PLAN

The Phasing plan for Sewerage Treatment Plan would be followed six phases for the Development of Detailed Master Plan for Sabrang TP. Phasing plan will be implemented in consideration with the installed utilities in the road network. The main considerations for the phased development plan of the sewerage network are as follows:

- One sewerage treatment plant will be established in 1st phase.
- Sewerage line along with proposed arterial road will also be constructed in 1st phase.
- Sewerage line along with feeder road will be implemented as per the proposed road phasing.

The estimation of length of the sewerage line for each phasing development plan is determined in Table 6-1, Table 6-2, Table 6-3, Table 6-4 and phasing location will consider as master plan phasing in Figure 6-2, Figure 6-3, Figure 6-4 and Figure 6-5.

Table 6-1: Phasing Plan of Sewerage Network

Phase	Item	Area (Acre)/Length (m)	Capacity, Dia. meter &Slope
1	STP-1	1.96	5,708 m3/day
	Sewerage Line	4,720	Dia.: 140 mm ~ 500 mm, Slope = 1:100 ~ 1: 800
2	STP-2	4	3,478 m3/day.
	Sewerage Line	6,134	Dia.: 140 mm ~ 560mm, Slope = 1:100 ~ 1: 950.
3	STP-3	1.75	3,680 m3/day.
	Sewerage Line	3,041	Dia.: 160 mm ~ 630 mm, Slope= 1:200 ~ 1:1200.

Table 6-2: Phase wise diameter and slope of Soil Pipe Network in Phase 1

Sl No.	Line ID	Slope	Outer Dia. HDPE, mm
1	7-8	1:400	280
2	8-9	1:400	280
3	9-10	1:600	400
4	10-11	1:600	400
5	11-12	1:800	500
6	12-6'	1:800	500
1	1-2	1:200	180
2	2-3	1:400	280
3	3-4	1:600	400
4	4-5	1:600	400
5	13-6	1:700	450
6	5-6	1:700	450
1	12-12'	1:100	140
2	13-13'	1:100	140
3	13-5	1:400	280

Sl No.	Line ID	Slope	Outer Dia. HDPE, mm
1	17-18	1:400	280
2	18-19	1:600	400
3	19-20	1:700	450
1	14-18	1:600	400

Table 6-3: Phase wise diameter and slope of Soil Pipe Network in Phase 2

Sl No.	Line ID	Slope	Outer Dia. HDPE, mm
1	a-b	1: 400	280
2	b-c	1: 400	315
3	c-d	1: 600	400
4	d-e	1: 600	400
5	e-f	1: 800	500
6	f-g	1: 800	500
7	g-h	1: 950	560
8	h-i	1: 950	560
9	i-j	1: 950	560
1	q-r	1: 200	160
2	r-s	1: 400	280
3	s-t	1: 600	400
4	t-o	1: 700	450
5	o-p	1: 700	450
1	k-l	1: 200	160
2	l-m	1: 400	280
3	m-n	1: 600	400
4	n-o	1: 700	450
1	l-l'	1: 100	140
1	u-v	1: 400	280
2	v-t	1: 600	400
1	e'-e	1: 300	225
2	b'-d	1: 400	280

Table 6-4: Phase wise diameter and slope of Soil Pipe Network in Phase 3

Sl No.	Line ID	Slope	Outer Dia. HDPE, mm
1	21'-21	1: 400	280
2	21-22	1: 400	280
3	22-23	1: 600	400
4	23-24	1: 600	400
5	24-25	1: 800	500
6	25-26	1: 1200	630
1	30-29	1: 200	160
2	29-28	1: 800	560
3	28-25	1: 800	560

Sl No.	Line ID	Slope	Outer Dia. HDPE, mm
1	27-26	1: 100	160
2	26-26'	1: 1200	630
1	28-28'	1: 600	400
2	29-29'	1: 800	400

6.4 COST ESTIMATE:

6.4.1 COST OF PIPE NETWORK

Costing of pipe networking according to phase wise are given below:

Phase No.	Unit Cost /Meter BDT	Length in meter	Total Cost
1	21,497	4,720	101,465,772.74
2	26,518	6,134	162,663,270.65
3	32,855	3,041	99,910,950.86
Total		**13,895**	**364,039,994.25**

6.4.2 COST OF STP

Costing of STP according to phase wise are given below:

Phase No.	Item	Plant, Equipment, Testing & commissioning in BDT	Civil Work in BDT	Total Cost in BDT
1	STP-1	145,496,185	525,889,826	671,386,011
2	STP-2	88,641,580	320,391,256	409,032,837
3	STP-3	93,823,862	339,122,393	432,946,255
Total		**327,961,628**	**1,185,403,475**	**1,513,365,103**

6.4.3 COST SUMMARY

Total costing of soil & waste water pipe network & STP according to phase wise are given below –

Phase No.	Pipe Network in BDT	STP in BDT	Total Cost in BDT
1	101,465,772.74	671,386,011	772,851,784
2	162,663,270.65	409,032,837	571,696,108
3	99,910,950.86	432,946,255	532,857,206
Total	**364,039,994.25**	**1,513,365,103**	**1,877,405,097**

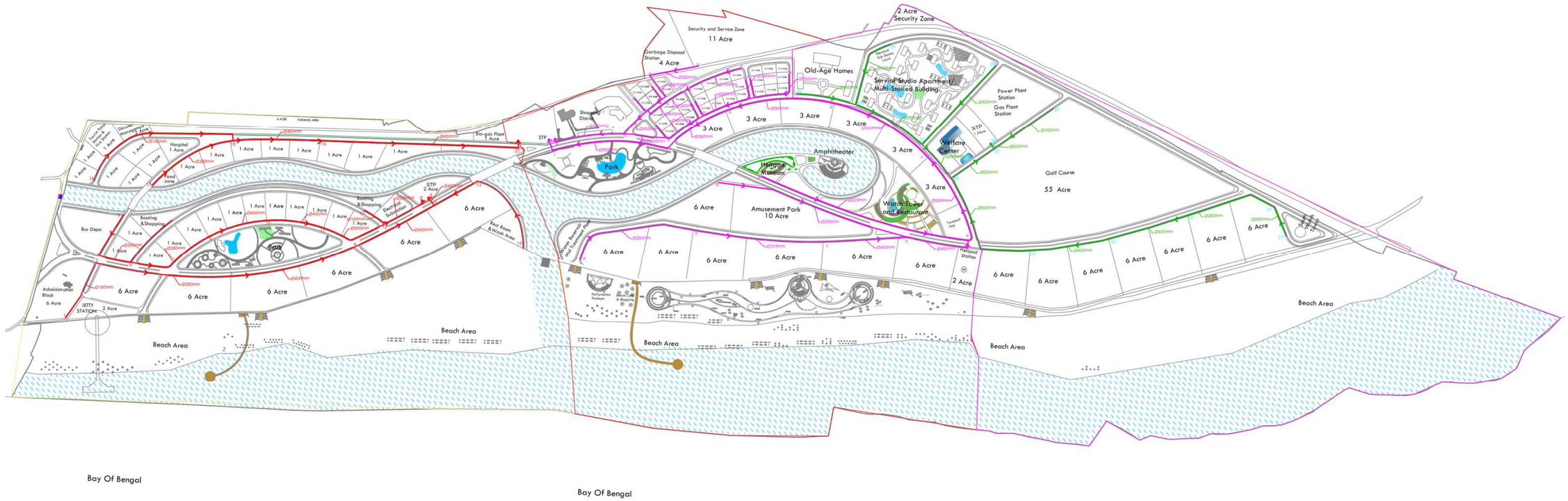


Figure 6-2: Sewerage Line of Sabrang Tourism Park

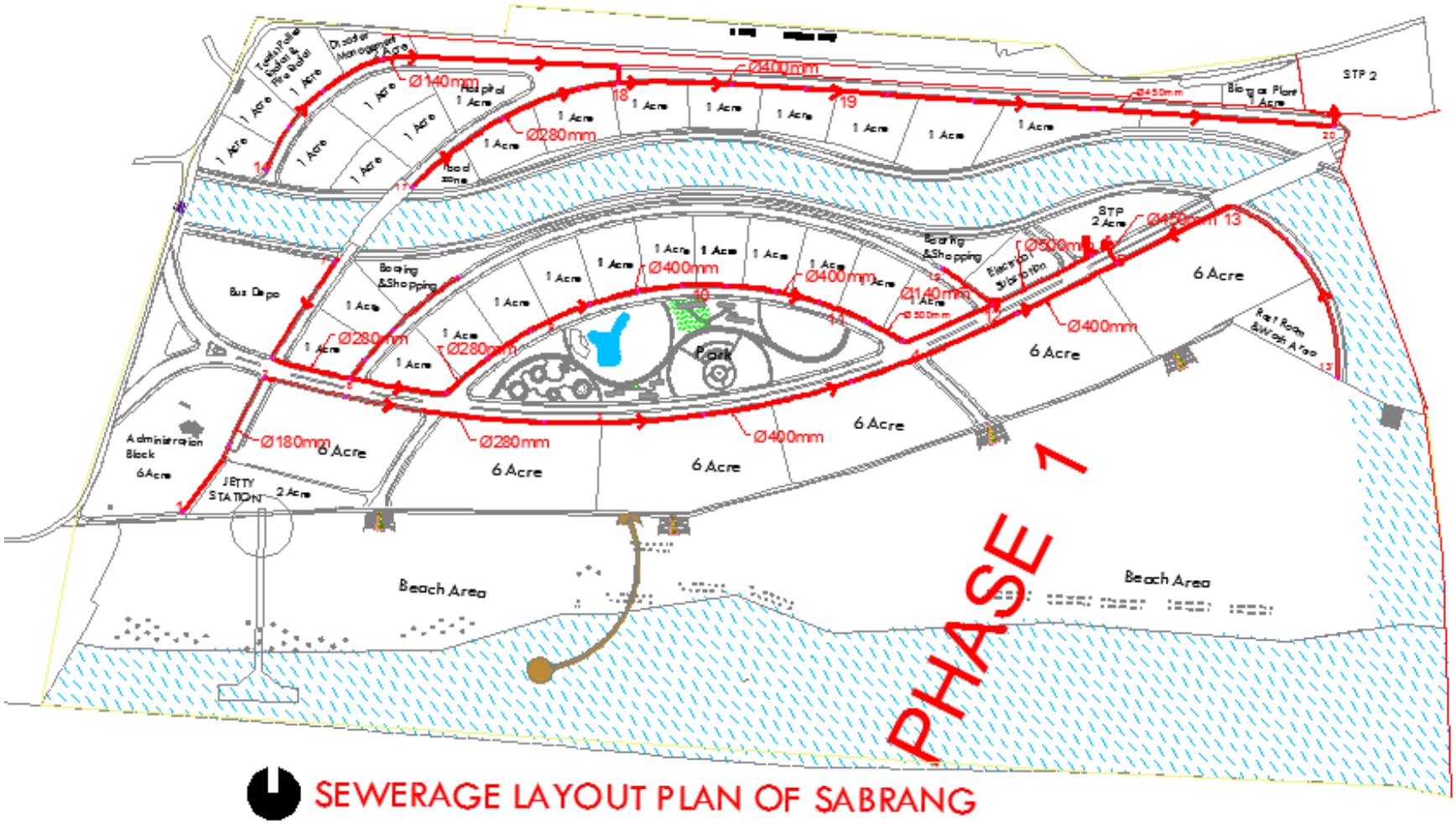


Figure 6-3: Sewerage Line of Phase 1

Figure 6-4: Sewerage Line of Phase 2

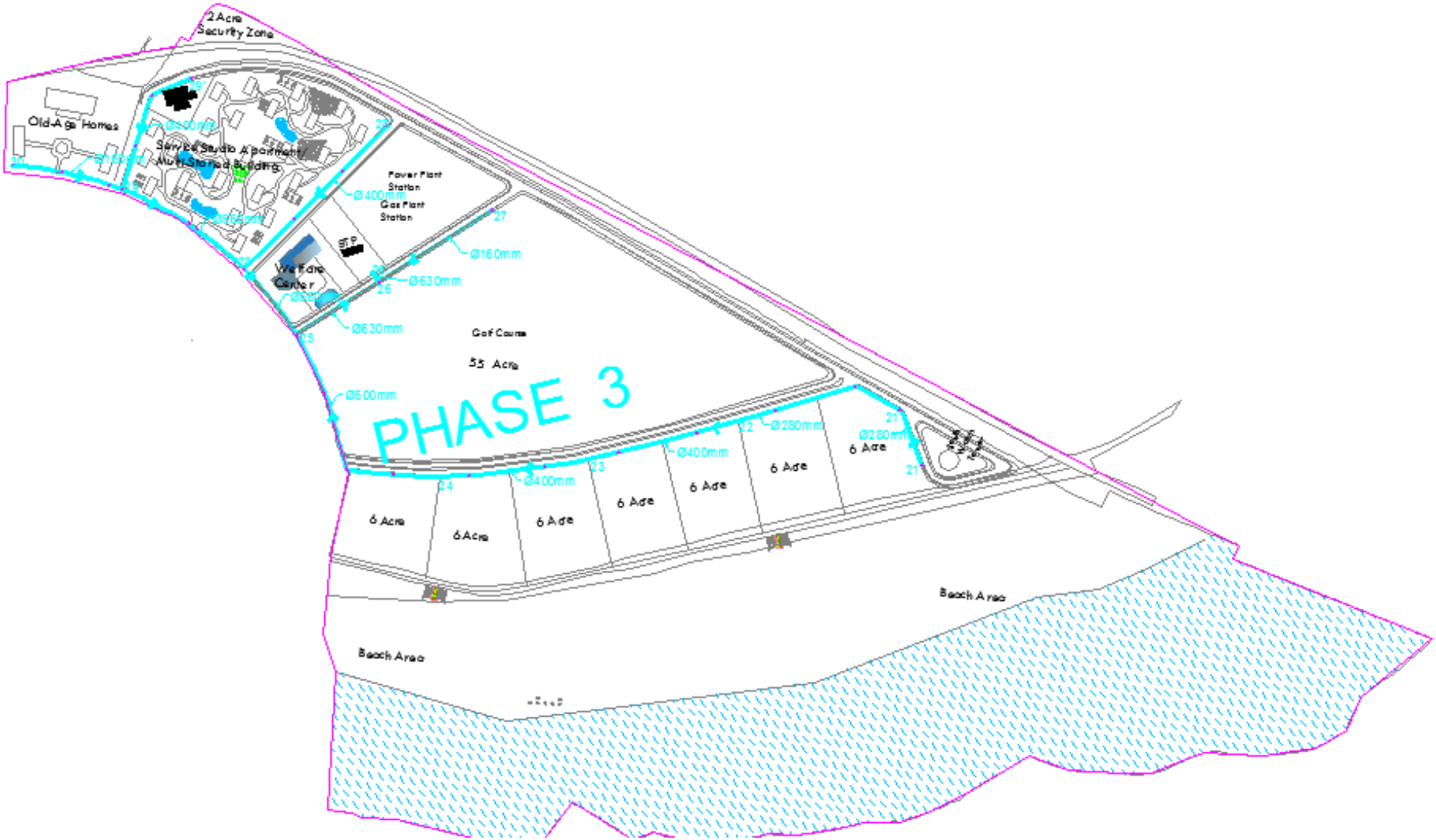


Figure 6-5: Sewerage Line of Phase 3

7 WASTE MANAGEMENT PLAN

7.1 EXISTING SCENARIO

Solid waste collection system is available in some part of the Teknaf area. Household waste mostly kitchen wastes constitute the bulk of the solid waste in the area. Most of the solid wastes are used as feed for the domestic pets, parts are dried and used as fuel and the residue is disposed of in family pit or nearby low land/ditch.

As discussed in Survey Report, it is found that 34.38 percent household dispose of solid waste in dustbins. Rest excepting 4.69 percent non respondents grouped as 'Do not dump' manage the dumping in their own way. Most of the households of this group dispose of solid waste either in family pit (28.91 percent). Community Collection is reported by 0.78 percent and 11.72 percent dumps in water bodies like river/canal/ditch. Solid waste disposal site availability in percentage (%) is provided in Table 7-1.

Table 7-1: Status of Solid Waste Dumping

Village	Solid waste disposal site availability						Percentage (%)
	Dustbin	Behind Dustbin	Canal-River	Out of House	Community Collection	Soil Hole	
Koangchori Para	0.00	0.00	0.00	0.00	0.78	13.28	14.06
Kata Bonia	0.00	0.00	0.00	0.00	0.00	15.63	15.63
Kochu Bonia	14.84	3.91	3.91	0.78	0.00	0.00	23.44
Khurer Mukh	2.34	0.78	0.78	10.94	0.00	0.00	14.84
Purba Uttar Para	5.47	0.00	5.47	0.00	0.00	0.00	10.94
Dakshinpara	0.78	0.00	0.78	7.81	0.00	0.00	9.38
Paschim Uttar Para	10.94	0.00	0.78	0.00	0.00	0.00	11.72
Total	34.38	4.69	11.72	19.53	0.78	28.91	100.00

Source: Socio-Economic Survey, 2019

7.2 PROJECTION OF DEMAND

7.2.1 PROJECTION BASIS

The prime basis of future requirement is the size of the population of the Sabrang Tourism Park which has to be served by utility provisions. At present, existing service level is not available in the tourism park. However, the standard set in Rangpur Master Plan under District Towns Infrastructure Development Project (DTIDP) of LGED are shown in following which will be modified according to the recommendations of various agencies delivering their designated services and presented in draft master plan package (Table 7-2).

Table 7-2: Planning Standards Followed by DTIDP for Solid Waste

Utilities 10-15 percent of the total built up area	
Solid waste disposal site	5 acre /50,000 Population
Waste Transfer Station	0.01 acre/ward

Source: Rangpur Master Plan, DTIDP, 2015.

In general, CBO initiative has proved effective in household waste collection and may be strengthened. This is better than the indiscriminate waste disposal. In this system beneficiaries themselves pays for the service which reduces the burden of the authority. Suitable dumping site should be selected for sanitary land fill with provision of waste recycling.

7.2.2 ESTIMATE OF SOLID WASTE PROCESSING AREA FOR SABRANG TOURISM PARK

7.2.2.1 CONSIDERATIONS

- Per Capita waste generation rate = 0.5 kg/day/person
- 3 months' time for composting and shifting to sales area
- One dumping area, one composting area, one compost clearing area and two storage area of compost for sale are considered for uninterrupted chain of the process (i.e., 5 times the area of 3 months dumping site).
- Additional area for truck terminal, labor shed, office, separation area (where perishable and non-perishable items are separated and most of the non-perishable items are recycled back) and office with additional/buffer space etc. to be required.
- Per m3 volume of waste = 288 kg.
- Estimated population of Sabrang Tourism Park at peak time is around 56000 at the end of the plan period.

7.2.2.2 AREA CALCULATION FOR SOLID WASTE CENTRE

- 3 months waste of core area population at the end of the plan period (at the end of plan period)

  = 0.5 kg/capita/day x (3x30 days) x 41000 persons

  = 2520000 kg

  = 8750m^3

- In the depth of composting site = 3 m

  Then, area of one composting site for 3 months waste

  = 6,407/3

  = 2916.67 m^2 (say)

= 0.72acres (say)

- Area needed for dumping, composting, fully composed (being shifted to sales site) and sales area = 5x0.5 acre = 3.6 acres
- Area required including additional spaces = 3.6+1 = 4.6 acres

7.2.2.3 AREA CALCULATION FOR BIO-GAS PLANT

Assumptions

- Food waste density (low compaction) = 700 Kg/m3 (https://www.intechopen.com/books/anaerobic-digestion/biogas-for-clean-energy)
- Food waste generation rate = 0.77*700= 539 gm/person/day (Waste Data Base, www.wasteconcern.org)
- Hydraulic Retention Time (HRT)= 40 days (mesophilic)
- Formula: D=2H

Area Calculation

- Total Population: 40455
- Volume of generated food waste, W=0.539*Pop/343 (m3/day): 31.15
- Wet volume of the substrate, Ww= 1.5*W: 46.72
- Volume of the Digester=HRT*Ww (m3): 1870
- One plant digester size (m3). For two equal sized plants: 935
- Height of the Digester (m): 6.67
- Diameter (m): 13.35
- Ground Area coverage for each digester (m^2): 140
- Area for Inlet and outlet chambers (30% of Digester): 42
- Total Area for one plant m^2: 182
- For two plants (ft^2): 4000

Keeping some area for sludge handling and drying, and area for creating buffer zone around the site for bio-gas plants, it is recommended to allot area **1 acre** for these facilities.

7.3 RECOMMENDATIONS

As per the projected data, 4.6-acre land will be required for the processing of solid waste at the end of project completion. Therefore, this amount of land should be reserved at a suitable location it should be start work from the phase 1 (Figure 7-1 and Map 7-1).

- Additional 1-acre land is required per annum for generating renewable energy from this projected (yearly) solid waste in Bio Gas plant.
- According to Environmental Impact Assessment (EIA) awarded by Department of Environment (DoE), no solid waste can be burnt in the project area. An environment friendly solid waste management system should be in place during the whole period of the project in the field. Therefore, it is recommended to establish "4R" concept at accommodation facilitates.

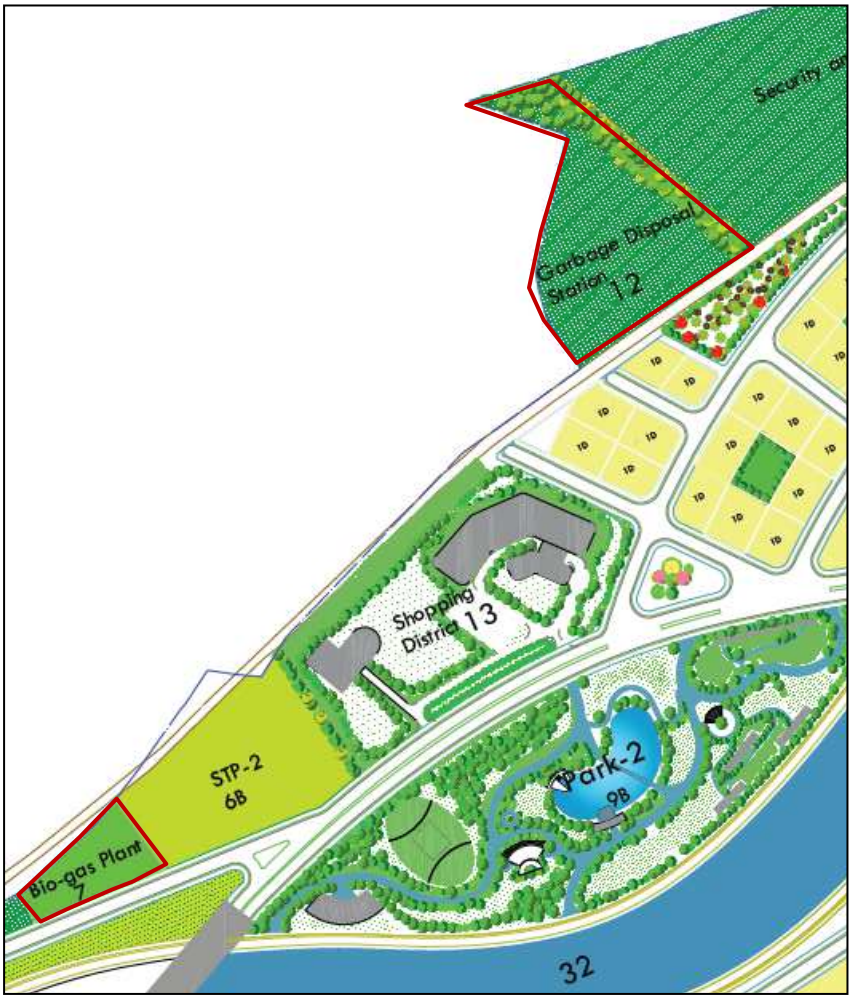
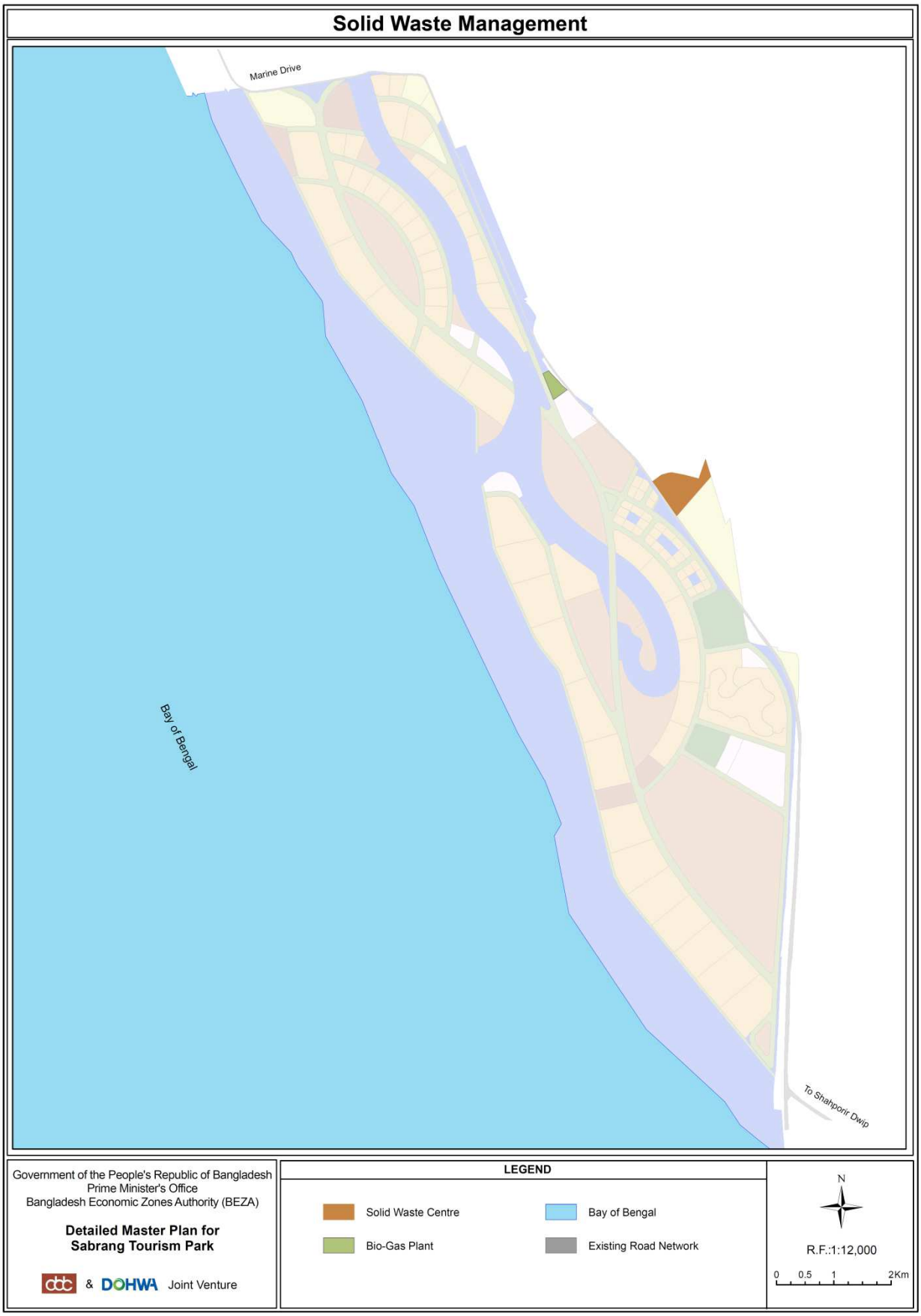


Figure 7-1: Blow up image of the Disposal Station of Sabrang Tourism Park



Map 7-1: Solid Waste Centre and Bio-gas Plant of Sabrang Tourism Park

8 FIRE FIGHTING PLAN

8.1 CONSIDERATIONS

Considering the devastating consequences and life of the occupants of the building it is very important to have an effective and reliable fire detection and firefighting system for the Sabrang Tourism Park. The emergency public address system shall be connected to the fire Alarm system for providing automatic pre-set electronically generated evacuation voice announcement system. The system will incorporate the following items:

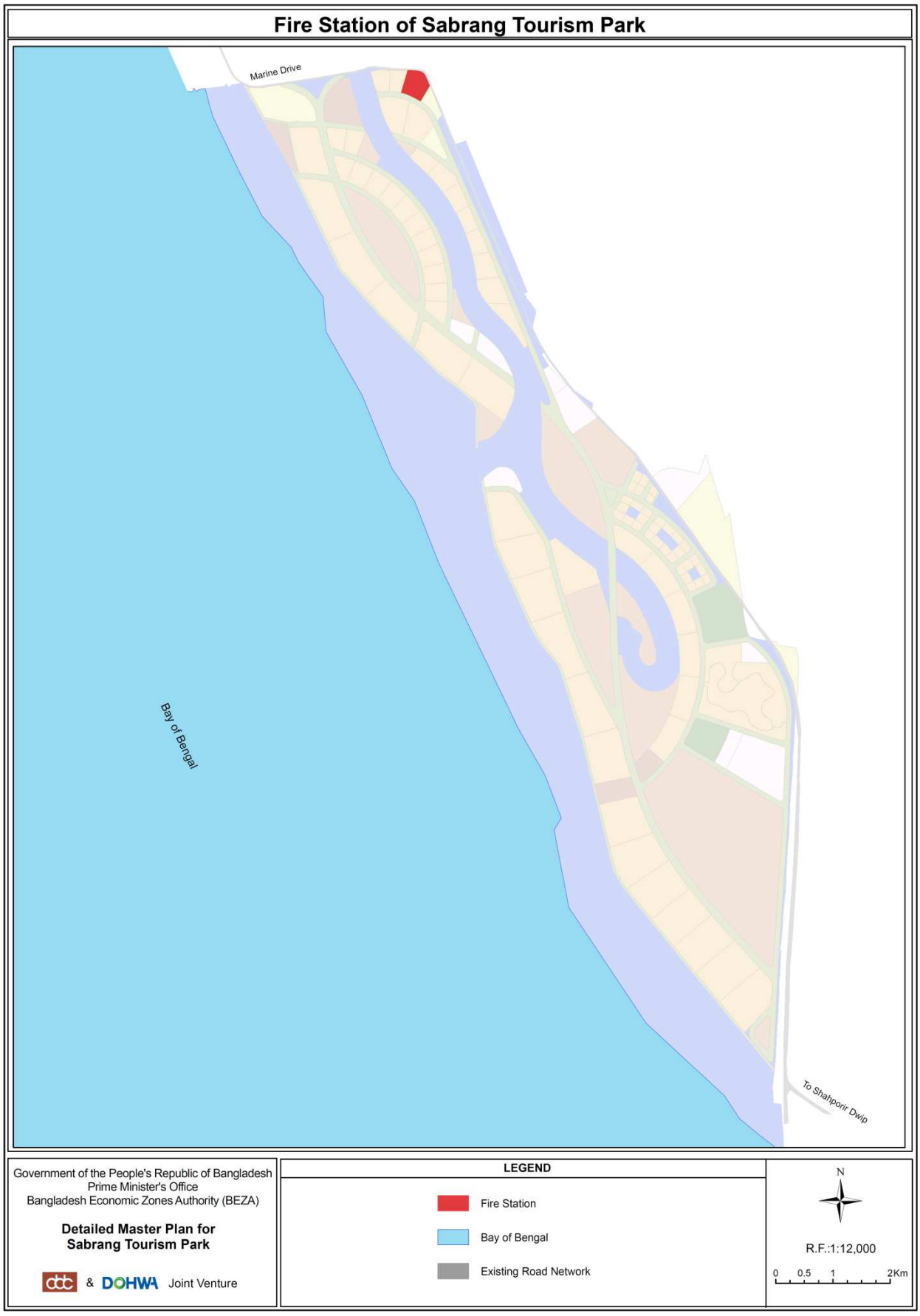
- The design will be based on NFPA/BNBC code;
- Required nos. of fire detectors (smoke and heat), alarm bell and manual pull station;
- A number of portable Fire Extinguishers to tackle small and localized fire;
- A firefighting system (wet riser type) with pumps and nozzles and hoses to tackle relatively large fire for at least 60 minutes and to facilitate the firefighting workers;
- Water reservoir, pumps and water line of adequate capacity for firefighting will be considered.

In Sabrang Tourism Park, a one and half (1.96) acre land is reserved for Fire station which is located at the north-east side of the tourism park (Map 8-1 and Figure 8-1).

According to NFPA 1, the central fire hydrant system is not recommended for Sabrang Tourism Park.

8.2 RECOMMENDATIONS

- To serve 24/7 coverage to the proposed tourism park, a fire station is required. Therefore, fire department should have 20 career members and always operates with minimum staffing of 5 members on duty from the phase 1. After Phase 2, the fire station should operate with minimum staffing of 10 members having 40 career members at all time (according to Bangladesh fire service civil defence department).
- The hotels, residential accommodations and other facilities should have adequate firefighting system according to NFPA, IBC, BNBC or Building Construction Act for Bangladesh Economic Zone (e.g. fire water reservoir, passive and active fire systems, fire hydrant system) to assist the fire department. The fire suppression systems should be installed whereas necessary.
- The fire station should have arranged paramedic recertification and other non-fire training (e.g. earthquake, tsunami etc.) programs to the hotel staffs and other permanent workforce to assist the tourist immediately.



Map 8-1: Location of the Fire Station in the Sabrang Tourism Park

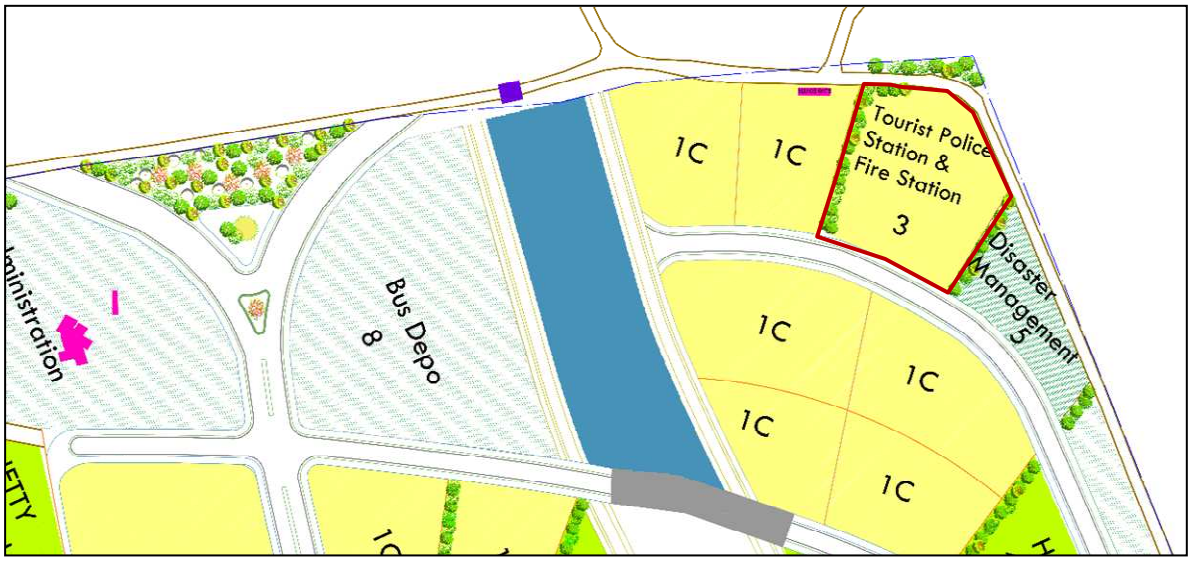


Figure 8-1: Blow up Image of the Location of the Fire Station in Sabrang Tourism Park

9 TELECOMMUNICATION AND INTERNET NETWORKS

9.1 EXISTING SCENARIO

The nearest telephone exchange is at Teknaf (beside Teknaf UNO office) which is approximately 11KM away from Sabrang TP. Optical Fiber has been reached to Teknaf telephone exchange from Cox's Bazar (Figure 9-1). The current capacity of this telephone exchange is 10Gbps with 550 telephone lines.

Figure 9-1:Distance from Teknaf Telephone Exchange to Sabrang Tourism Park

Source: Google Earth and Prepared by the Consultants' Team, 2019

9.2 DEMAND FORECASTING

9.2.1 INTERNET DEMAND PROJECTION

A Telecommunication system will play a vital role in attracting investors into this tourism part. The projection criteria of internet demand are:

- Total area of Sabrang Tourism Park
- Total plot numbers
- Building footprint of each plot
- Room numbers of each hotel/ building
- Maximum number of tourists at a certain period
- Usage of internet

- Web browsing
- Online Audio/ Video calls
- Video streaming
- Video conferences
- Online gaming competition

Considering all the criteria, for internet connection, the requirement will be:

- Each hotel: average 300Mbps.
- Each studio apartment: average 4 Mbps

Calculating all other office buildings, residential buildings, Shopping district and outdoor CCTV and ATM booths the total internet requirement will be 45Gbps.

9.2.2 LANDLINE PHONE DEMAND PROJECTION

Considering 7 phone lines per hotel and 5 phone line per studio apartment building, the requirement for fixed telephone landlines inside the zone will stand at 1100 -1200 lines.

9.3 PLANNING OF TELECOM NETWORK

9.3.1 OFFSITE NETWORK

To install a fixed phone network provided by BTCL, a Fiber Optical Cable (FOC) connection needs to be established between the Teknaf telephone exchange and Sabrang TP. Three telephone exchanges of 512 lines each will be installed in the Sabrang TP compound to provide telephone and internet connections to the buildings. The Figure 9-2 shows the concept of off-site FOC connection.

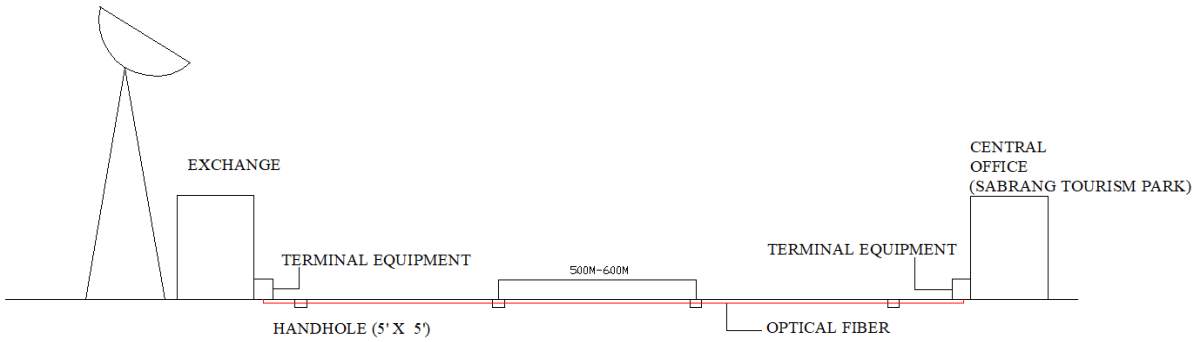


Figure 9-2: Conceptual Drawing of Offsite FOC Connection

9.3.2 ONSITE NETWORK

As the demand is about 1100-1200 lines, the exchanges to be installed inside the zone will be three 512-lines each. The exchange will provide the most modern soft switching technology. To control and maintain the telecom system, a room of 600 sq. ft will be provided inside the Admin building. An FOC line will be provided underground with the power distribution network inside the Sabrang TP. The Figure 9-3 shows the conceptual drawing of an FOC connection to the buildings.

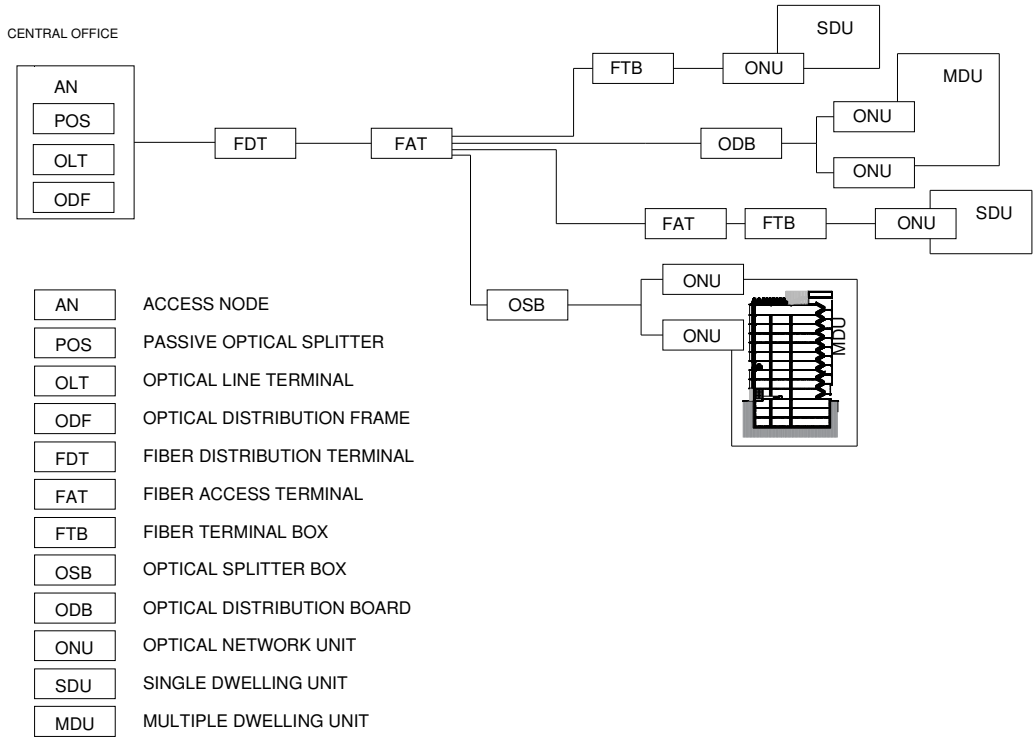


Figure 9-3: Conceptual Drawing of Onsite FOC Connection

Figure 9-4 : Telecommunication Network of Sabrang Tourism Park

9.4 PHASING FOR TELECOMMUNICATION AND INTERNET NETWORKS

The optical Fiber will be used for both internet and telecommunication. It will be implemented under the footpath throughout the road and its phasing will follow the phasing of road network.

9.4.1 PHASING FOR TELECOMMUNICATION NETWORKS

As discussed earlier, three telephone exchanges of 512 lines each will be established in the admin building of Sabrang TP. These telephone exchanges will be placed at phase 1, phase 2 and phase 3. The number of connections in each phase is given in Table 9-1.

Table 9-1: Phasing of Land line telephone connections

Phase	No. of Telephone Landline Connections
1	450
2	450
3	250

9.4.2 PHASING FOR INTERNET NETWORKS

The phasing of internet connection in each plot will follow the phasing of master plan. The internet requirement of each phase is given in Table 9-2.

Table 9-2 Internet Requirement of each phase

Phase	Internet Requirement (Gbps)
1	15
2	15
3	15

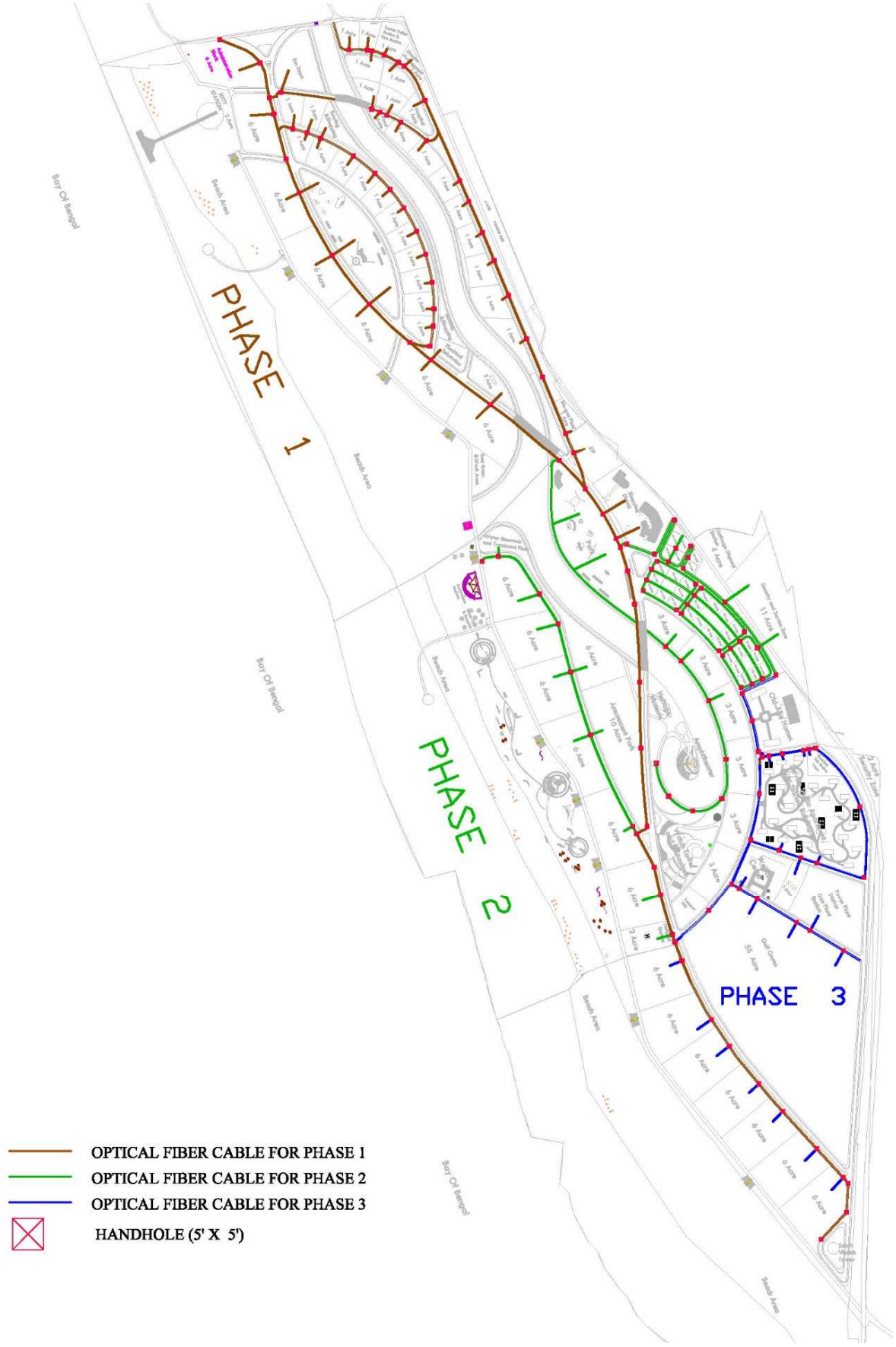


Figure 9-5 : Phasing of Optical Fiber Network

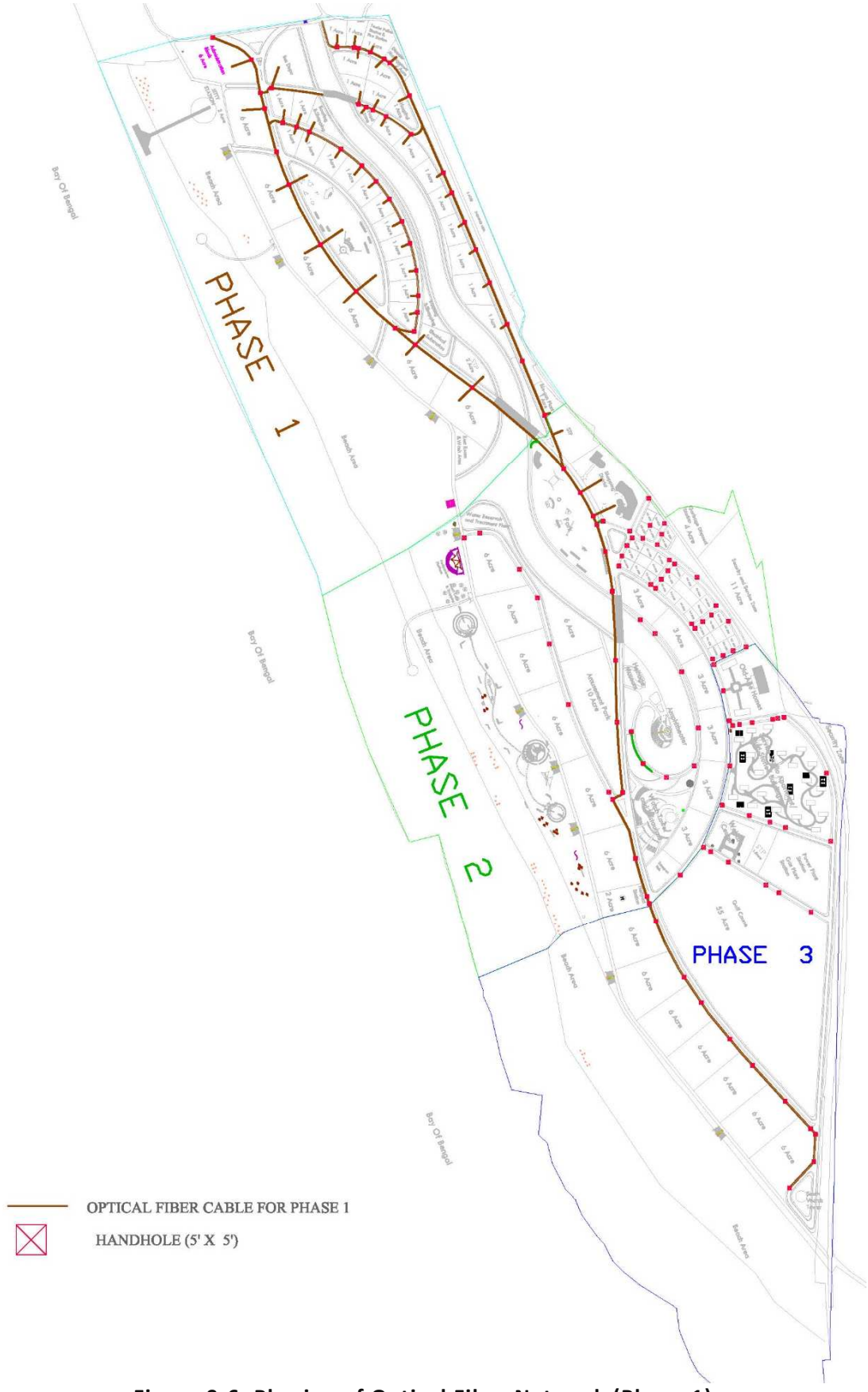


Figure 9-6: Phasing of Optical Fiber Network (Phase-1)

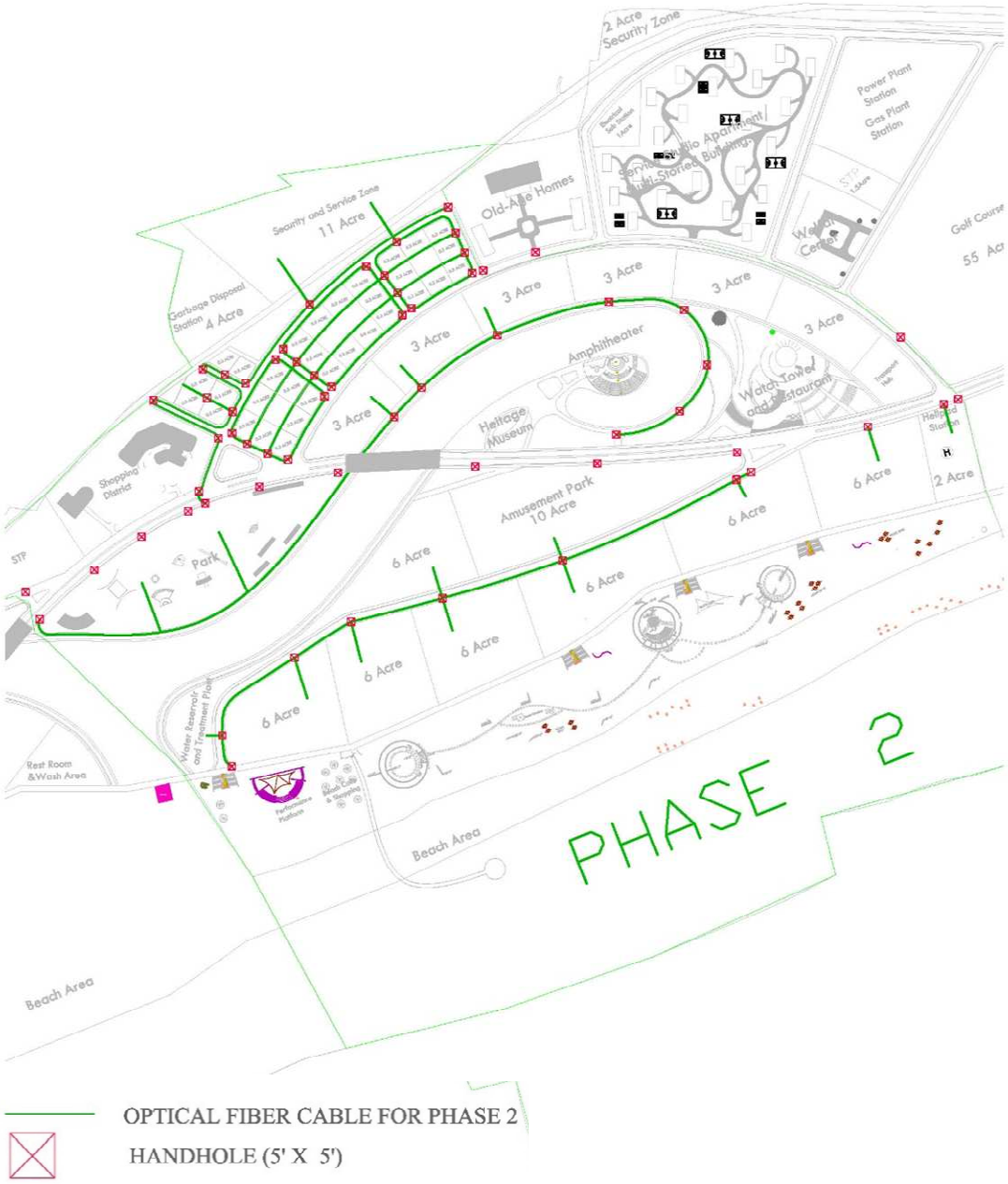


Figure 9-7 : Phasing of Optical Fiber Network (Phase-2)

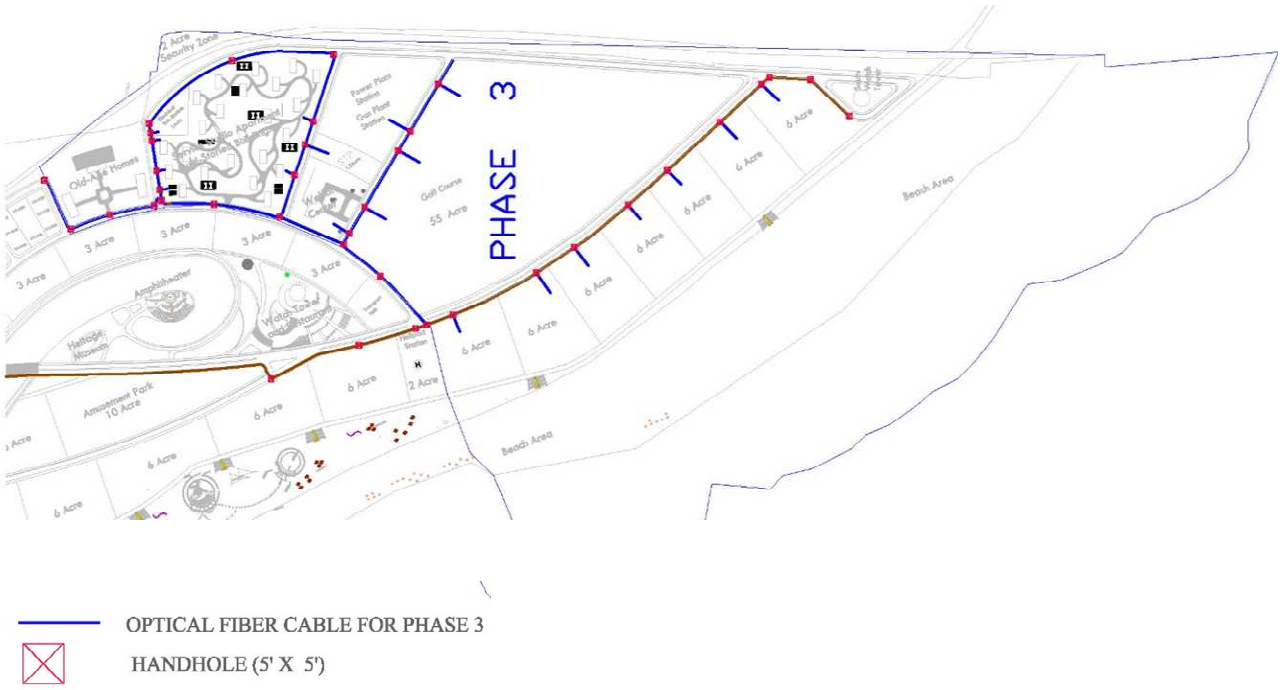


Figure 9-8 :Phasing of Optical Fiber Network (Phase-3)

9.5 COST ESTIMATE

The cost of building optical fiber for this project can be divided into two part:

9.5.1 OFFSITE COSTING

Upgradation of equipment at Cox's bazar is required to increase the capacity of internet bandwidth.

Scope of Work	Cost
Terminal Equipment (offsite, Cox's Bazar)	6,000,000
OFC Cable offsite	600,000
Total	**6,600,000**

9.5.2 ONSITE COSTING

As costing of building underground trench is calculated with road network cost, land excavation cost has been excluded from internal costing.

Scope of Work	Cost
Internet Equipment	22,771,750
Telecommunication	16,391,500
Total	**39,163,250**

10 ONSITE EARTHWORKS

10.1 DETERMINATION OF OPTIMAL DESIGN LEVEL

As observed during site visit and discussions with stakeholders, the flood level during monsoon season varies from 4 feet (1.22 meters) to 5 feet (1.52 meters) within the area of this site. Most area of the site is located below the maximum flood level so that it is important to determine the safe design level for the site because this site lies within high cyclone risk zone. The site is under construction and it is expected that the final level of E.L +4.75m of embankment and E.L +3.61m of the internal site will be filled with the sand from the sea which is located 4km.

According to the result of topographic survey, average spot height is 1.41 meter with maximum 6.98meter and minimum -2.1 meter and majority of spot heights data was between -0.369 meter and -0.4465 meter. Therefore, it is necessary to determine the lowest design level of this site in order to reduce construction cost of earthworks because of way too many earthwork volumes of material for filling is predicted.

In order to determine the lowest design level, Site grading plan should be focused on three main problems such as the flood level of internal open channel, the slope of storm water pipe running naturally under the roads, and the level of site grading. Details of three main problems are shown in the Figure 10-1.

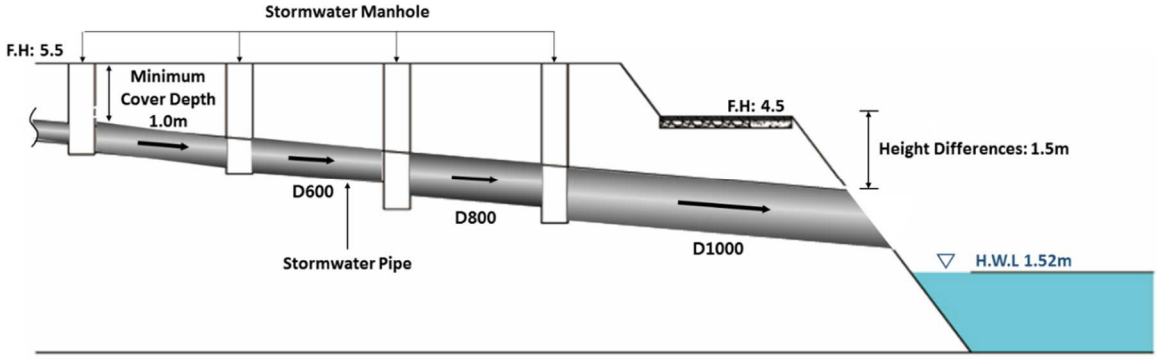


Figure 10-1: Detail of Three Main Problems

The conditions to determine the lowest design level for this site are the follow.

- The flood level of internal open channel: E.L + 1.52m
- The slope of storm water pipe running naturally under the roads including cover depth and diameter of pipe: E.L + 3.50m

Therefore, the optimal design level for this site to reduce the construction cost of earthworks will be planning to be E.L +5.50m in consideration of the change (E.L +0.48) of the slope of storm water pipe.

10.2 SITE GRADING PLAN

The design level of the embankment which is under construction and located in the west part of this site is E.L + 4.50m and the elevation of the existing road which is located in the east part of this site is E.L + 2.50m ~ E.L + 3.00m.

Also, internal area of this site will be planned with the design level which is the follow.

- the elevation of building area: E.L + 5.50m
- the elevation of embankment for internal open channel: E.L + 4.50m
- the elevation of bottom for internal open channel: E.L + 0.00m

10.3 PROJECTION OF EARTHWORK VOLUME

Enormous volume of earthwork for filling is needed because the ground level is lower than the design level. For this reason, it is necessary to estimate the volume of earthwork as well as we can.

Therefore, the site grading volume is calculated in accordance with the square net method because this site is filled area.

$$V = (h1 + h2 + h3 + h4) \times F/4$$

Where:

h1, h2, h3, h4: construction elevation at border points of each square:

F: area of the square.

The result of earthwork volume is given in Table 10-1.

Table 10-1: Earthwork Volume

Works	Volume (㎥)	Remark
Cutting	-	
Filling	4,284,983	

The measures to secure the required filling materials in this site are as follows.

- Sand dredging the river bottom and shoreline;
- Soil borrowing from the adjacent mountain;
- Public disposal from the construction work.

The around 20 percent of the filling soil should have an appropriate soil quality for planting trees to grow and strength for embankment to be stable.

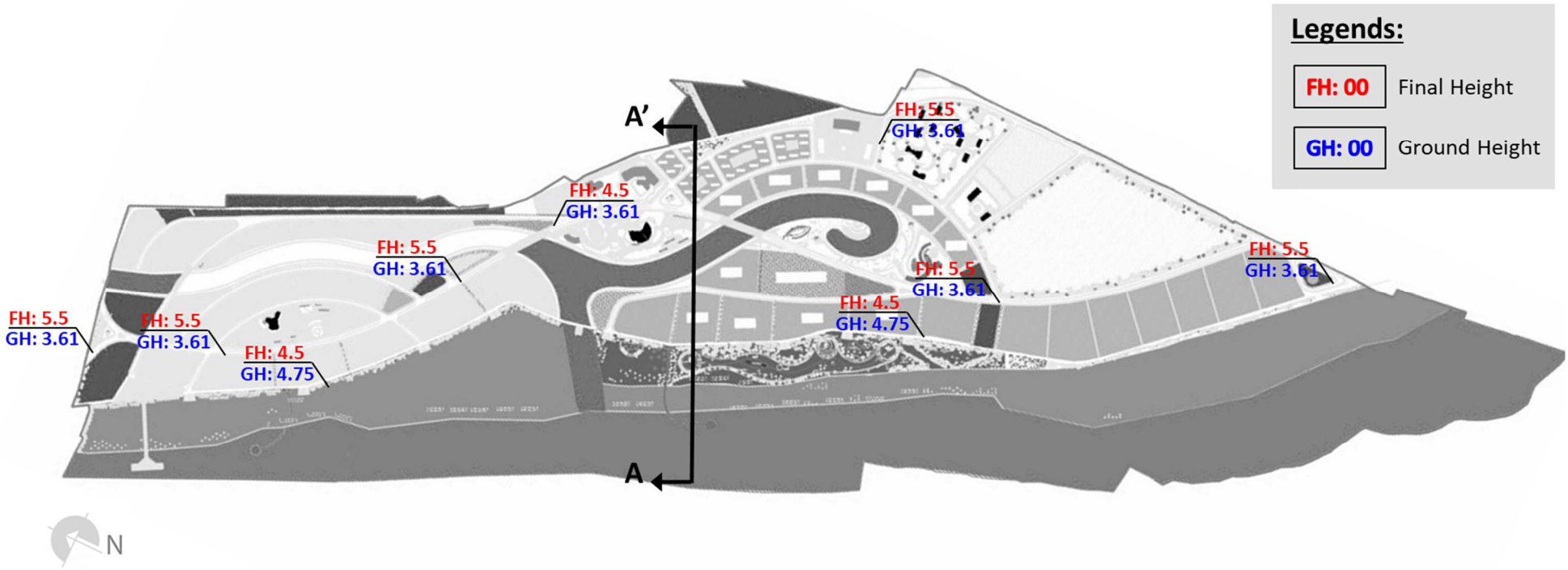


Figure 10-2: Site Grading Plan

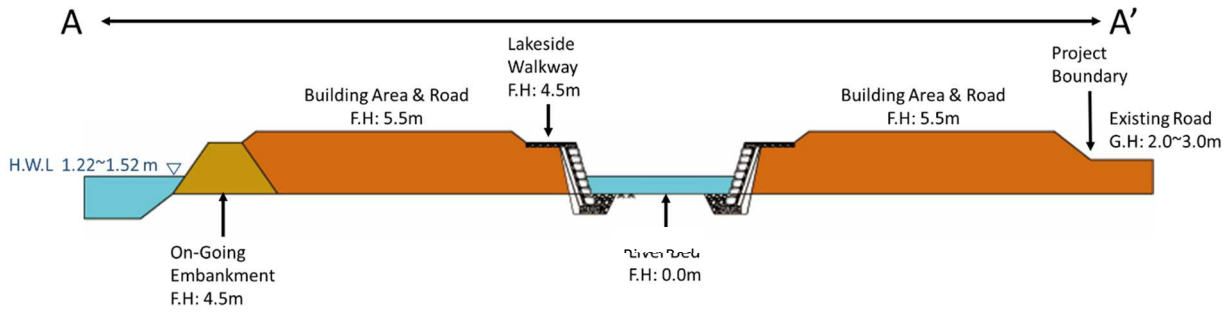


Figure 10-3: Section of Site Grading

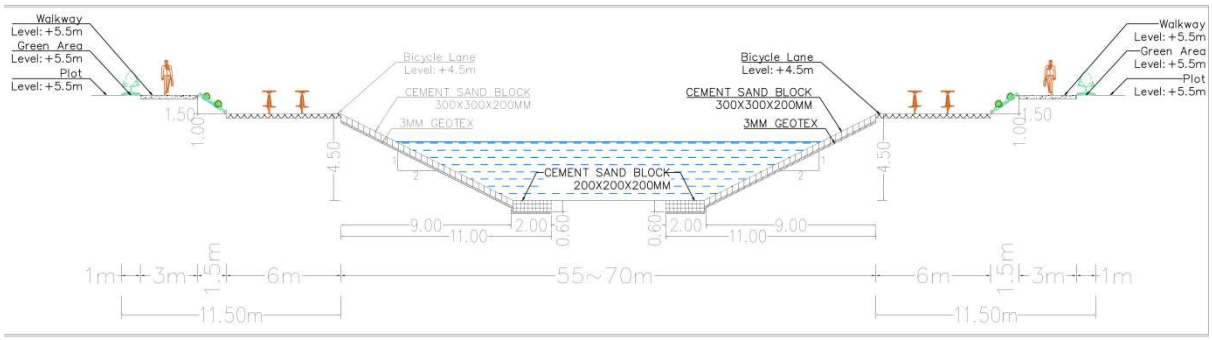


Figure 10-4: Cross Section of Proposed Lake

10.4 WEAK FOUNDATION TREATMENT METHOD

As per the geological map of Bangladesh, the Teknaf area mainly consists of mainly deep brown (some red soil) with a mixture of fine sand of the same color and nodules containing a large percentage of sesquioxides.

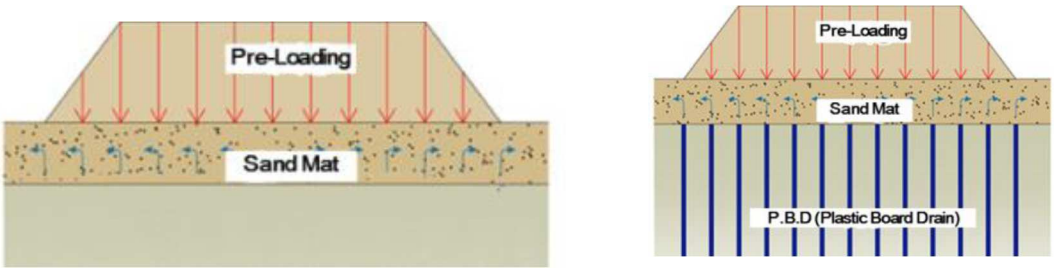
This site is located on the shoreline and considered as the soft soil which is required to be treated for the construction of the infrastructure and building.

Therefore, in order to calculate the rough construction cost, it is assumed that only the major roads (ex. Major arterial road) are subject to weak foundation treatment method. Other than this area such as building area will be subject to weak foundation treatment method by the investors when it is required.

The pre-loading is the most popular and economical method for the soft soil treatment so it is planned to execute the pre-loading for this project.

However, the construction period is extended if only the pre-loading is used. Therefore, the PBD method can be planned together to promote the improvement of the soft soil.

The detail of the weak foundation design will be determined in the next design stage.



Pre-Loading Method **P.B.D. Method**

Figure 10-5: Weak Foundation Treatment Method

10.5 PHASING PLAN

According to the phasing plan, the land development and embankment for the Sabrang TP will be implemented in Phase 1 so the earthwork for development has been implemented in phase 1. The detail is described in Table 10-2.

Table 10-2: Earthworks Volume of Sabrang Tourism Park

Works	Volume (㎥)			Remark
	Phase 1	Phase 2	Phase 3	
Cutting	-	-	-	
Filling	4,284,983	-	-	

10.6 COST ESTIMATE

The cost estimate of Land Development is given below.

Phase	Cutting	Filling in ㎥	Cost in BDT
1	-	4,284,983	1,058,390,801
2	-	-	
3	-	-	
Total		**4,284,983**	**1,058,390,801**

11 IMPLEMENTATION PHASING

11.1 INTRODUCTION

The Master Plan for Sabrang TP has been prepared for development and development control of physical growth of the Tourism Park in a planned manner for a period of 15 years. The implementation of the master plan proposals will be in three phases. The first phase will be for 3-year period for partially operation of the Sabrang TP, 2nd phase will be next seven year and 3rd phase will be implemented after 10 years of development.

The infrastructure of the proposed master plan will be implemented in 3 phases within 15 years so that BEZA can start operation of the tourism park in completion of 1st phase. The Master Plan and Infrastructure Plan phasing are given in Table 11-1 and Table 11-2.

Table 11-1: Master Plan Phasing

Facilities	Phase 1 (2021-2024)	Phase 2 (2024-2031)	Phase 3 (2031-2036)
Beach Side Resort and Hotel	6 Plots	7 Plots	7 Plots
Lake Side Resort & Hotel (North)			
Lake Side Resort & Hotel (South)			
Economy Hotel			
Service Studio Apartment			
Welfare Centre			
Old Age Home			
Administrative Area			
Bio-Gas Plant			
Boating and Shopping			
Bus Depot			
Disaster Management Centre			
Electrical Sub-station	No. 1	No. 2	
Embankment			
Farming Area			
Food Zone			
Hospital			
Jetty Area			
Park	Park- 1	Park - 2	
Rest Room & Wash Room			
STP	STP 1, 2		STP-3
Tourist Police Station and Fire Station			
Amphitheatre			
Amusement Park			
Helipad Station			
Liberation War and Amusement Museum			
Transportation Hub			
Shopping District			
Rain Water Harvesting Pond			
Security and Service Zone			
Watch Tower and Restaurant			

Facilities	Phase 1 (2021-2024)	Phase 2 (2024-2031)	Phase 3 (2031-2036)
Water Reservoir			
Power Plant and Gas Station			
Golf Course			
South Watch Tower			
Jhau Forest			
Green Area			
Lake			
Beach Area			

Note:

Implemented in 1st Phase

Implemented in 2nd Phase

Implemented in 3rd Phase

Table 11-2: Infrastructure Phasing

Work Type	Phase 1 (2021-2024)	Phase 2 (2024-2031)	Phase 3 (2031-2036)
Land Development			
Lake excavation			
Construction of Arterial Road			
Construction of Feeder Road			
Construction of Bus Depot			
Construction of Transportation Hub			
Construction of Jetty			
Construction of Helipad			
Construction of Power Plant			
Construction of Sub-station 1 & 2			
Installation of Electricity Supply Line			
Construction of Water Reservoir and Treatment Plant			
Installation of Water Supply Line			
Construction of STP			
Installation of Sewerage Line			
Construction of Garbage disposal station			
Construction Security and Safety Zone			
Construction of Tourist Police and Fire Station			

11.2 SUMMARY OF COST ESTIMATE

On-site Infrastructure Cost for Sabrang TP are given Table 11-3.

Table 11-3: Summary of Cost Estimate

Type	Description	Unit	Quantity	Cost (Phase I)	Cost (Phase II)	Cost (Phase III)	Cost (BDT)	Cost (USD)	Remarks
Road Network	Arterial Road	Sqm	112006.5	233085527			233085527	2748974.254	PWD Schedule, 2018
	Feeder	Sqm	198501.93	156785974	141210375	115086167	413082516	4871830.593	PWD Schedule, 2018
Sub-Total			**310508.43**	**389871501**	**141210375**	**115086167**	**646168043**	**7620804.847**	
Power Supply	Four 33/11 KV GIS Substation with 2X10/26 MVA Transformer	Set	4	224875000	179750000	134875000	539500000	6362778.63	Analyzed by the Consultants
	2000 KVA Substation	Set	1	26056250			26056250	307303.3377	Analyzed by the Consultants
	2 X 1250 KVA Substation	Set	2	10103850	10103850		20207700	238326.4536	Analyzed by the Consultants
	11 KV and 0.4 KV Underground Distribution Network	Meter		430000000	403070900	300000000	1133070900	13363261	Analyzed by the Consultants
	Street Light	Set		65530208	58701762		124231970	1465172.426	Analyzed by the Consultants
	8 X 10 MVA Generator	Set	8	1,900,000,000.00	1,288,500,000.00	800,000,000.00	3988500000	47039745.25	Analyzed by the Consultants
	33 KV overhead double circuit line from utility substation to onsite substation	Km	2	13000000			13000000	153319.967	BREB, 2020
	33 kV double circuit electrical cable interconnection between two 33/11 kV substation	Km	3.5	63000000			63000000	743012.1477	BREB, 2020

Type	Description	Unit	Quantity	Cost (Phase I)	Cost (Phase II)	Cost (Phase III)	Cost (BDT)	Cost (USD)	Remarks
	1 MWp Solar Energy	KWp	1000	66362500		66362500	132725000	1565337.894	PWD Schedule, 2018
Sub-Total				**2798927808**	**1940126512**	**1301237500**	**6040291820**	**71238257.11**	
Water Supply	Water supply pipe Line	Rm	14896	138635587.3	61921884.69	89314975.25	289872447.3	3418710.311	PWD Schedule, 2018
	Hydro pneumatic pump system	Set	6	20406658	12605358	12605358	45617374	538004.175	PWD Schedule, 2018
Sub-Total				**159042245.3**	**74527242.69**	**101920333.3**	**335489821.3**	**3956714.486**	
Storm Water	375 mm Road Side Drain	Rm	271.7	714571			714571	8427.538625	LGED Schedule, 2020
	450 mm Road Side Drain	Rm	3715.41	10628916	3794305.62		14423221.62	170105.2202	LGED Schedule, 2020
	525 mm Road Side Drain	Rm	909.4	2539936.2	1522353.6		4062289.8	47910.01061	LGED Schedule, 2020
	600 mm Road Side Drain	Rm	3273	10087646.95	4620182.765	4766553.011	19474382.73	229677.8243	LGED Schedule, 2020
	750 mm Road Side Drain	Rm	3367.7	19675608		7535408	27211016	320922.4673	LGED Schedule, 2020
	900 mm Road Side Drain	Rm	1956.01	18030800.96		2119016.493	20149817.45	237643.7959	LGED Schedule, 2020
	1050 mm Road Side Drain	Rm	1639.82	11186000	11771480		22957480	270756.9289	LGED Schedule, 2020

Type	Description	Unit	Quantity	Cost (Phase I)	Cost (Phase II)	Cost (Phase III)	Cost (BDT)	Cost (USD)	Remarks
	1200 mm Road Side Drain	Rm	1348.93	12070075.85	2152783.5	8769652.5	22992511.85	271170.089	LGED Schedule, 2020
	1350 mm Road Side Drain	Rm	200.5		4611500		4611500	54387.30982	LGED Schedule, 2020
	1650 mm Road Side Drain	Rm	181.3	5439000			5439000	64146.71541	LGED Schedule, 2020
Sub-Total			**16863.77**	**90372554.96**	**28472605.49**	**23190630**	**142035790.4**	**1675147.9**	
Sewerage	Soil Pipe Network	Rm	13895	101465772.7	162663270.7	99910950.86	364039994.3	4293430.761	PWD Schedule, 2018
	Sewerage Treatment Plant	No.	3	671386011	409032837	432946255	1513365103	17848391.36	Analyzed by the Consultants
Sub-Total				**772,851,784**	**571,696,108**	**532,857,206**	**1,877,405,097**	**22141822.12**	
Internet Equipment	Router	No.	1	2050000	0	0	2050000	24177.37941	Analyzed by the Consultants
	Firewall	No.	1	850000			850000	10024.76707	Analyzed by the Consultants
	Bandwidth Manager	No.	1	100000			100000	1179.384361	Analyzed by the Consultants
	Network Switch	No.	12	4080000	3060000	3060000	10200000	120297.2049	Analyzed by the Consultants
	Access point	No.	2	60000	60000		120000	1415.261234	Analyzed by the Consultants
	Wireless LAN Controller	No.	1	1000000	0	0	1000000	11793.84361	Analyzed by the Consultants

Type	Description	Unit	Quantity	Cost (Phase I)	Cost (Phase II)	Cost (Phase III)	Cost (BDT)	Cost (USD)	Remarks
	Media Converter	Pair	45	148500	111375	111375	371250	4378.464442	Analyzed by the Consultants
	Armoured 24 Core Fiber Optic Cable	M	100	7200	5400	5400	18000	212.289185	Analyzed by the Consultants
	12 Core Fiber Optic Cable	M	22500	1251000	938250	938250	3127500	36885.2459	Analyzed by the Consultants
	4 Core Fiber Optic Cable	M	45000	1332000	999000	999000	3330000	39273.49923	Analyzed by the Consultants
	Network Rack	No.	10	350000	350000		700000	8255.69053	Analyzed by the Consultants
	UPS	No.	4	340000	340000		680000	8019.813657	Analyzed by the Consultants
	Network Accessories	Lot	1	225000			225000	2653.614813	Analyzed by the Consultants
Sub-Total				**11793700**	**5864025**	**5114025**	**22771750**	**268566.4583**	
Telecommunication	IDF	No.	25	3500000	2625000	2625000	8750000	103196.1316	Analyzed by the Consultants
	Fiber Optic Cable	M	8500	472600	354450	354450	1181500	13934.42623	Analyzed by the Consultants
	Telecommunication cable	M	6800	2584000	1938000	1938000	6460000	76188.22974	Analyzed by the Consultants
Sub-Total				**6556600**	**4917450**	**4917450**	**16391500**	**193318.7876**	

Type	Description	Unit	Quantity	Cost (Phase I)	Cost (Phase II)	Cost (Phase III)	Cost (BDT)	Cost (USD)	Remarks
Land Development	Land Filling	Cum	4,284,983	1,058,390,801			1,058,390,801.00	12482495.59	PWD Schedule, 2018
Sub-Total			**4,284,983**	**1,058,390,801**	**0**	**0**	**1,058,390,801**	**12482495.59**	
Grand Total				**5,287,806,994.26**	**2,766,814,318.18**	**2,084,323,311.30**	**10,138,944,622.70**	**119,577,127.29**	
Miscellaneous				**528780699.4**	**276681431.8**	**208432331.1**	**1013894462**	**11957712.73**	**10%**
Contingency Cost				**528780699.4**	**276681431.8**	**208432331.1**	**1013894462**	**11957712.73**	**10%**
Total Cost				**6,345,368,393.11**	**3,320,177,181.82**	**2,501,187,973.56**	**12,166,733,547.24**	**143,492,552.74**	
Total Cost in Crore				**634.5368393**	**332.0177182**	**250.1187974**	**1216.673355**	**14.34925527**	

Note: US Dollars Rate: 84.79 BDT on 24-12-2020

Appendix A : PROJECTION OF DEMAND OF ELECTRICITY

Land use	Plot Category	Area (Acre)	Area (sft)	Footprint Percentage	Footprint	Floor No	Plot Number	Total Floor Area	Watt/sft	Forecasted load (MW)
			A	B	C=(A×B) ÷100	D	E	F=C×D×E	G	H=F×G
Accommodation	1A	6	261360	12	31363.2	6	15	2822688	13	36.69
Accommodation	1A	5	217800	12	26136	6	2	313632	13	4.08
Accommodation	1B	3	130680	12	15681.6	6	6	564537.6	13	7.34
Accommodation/Residential	1C	1	43560	12	5227.2	6	21	658627.2	13	8.56
Accommodation/Residential	1D	0.3	13068	20	2613.6	6	32	501811.2	13	6.52
Studio Apartment	24	29	1263240	12	151588.8	6	1	909532.8	13	11.82
Old age home	25	7.5	326700	8	26136	6	1	156816	13	2.04
Welfare centre	22	6	261360	12	31363.2	5	1	156816	13	2.04
Golf Course	21	83	3615480	10	361548	6	1	2169288	13	28.20
Heritage Museum	16	1	43560	40	17424	5	1	87120	13	1.13
Watch Tower and Restaurant	18	2	87120	40	34848	5	1	174240	13	2.27
Amphitheatre	17	0.5	21780	40	8712	5	1	43560	13	0.57
Eco Park and Jhaw Forest	26	30	1306800	1	13068	1	1	13068	5	0.07
Shopping district	13	7	304920	20	60984	5	1	304920	13	3.96
Park	9B	13	566280	15	84942	1	1	84942	5	0.42
Park	9A	9	392040	15	58806	1	1	58806	5	0.29
Bus depot	8	2	87120	10	8712	1	1	8712	5	0.04
Administration	2	2	87120	30	26136	6	1	156816	13	2.04
Fire station	3	2	87120	10	8712	1	1	8712	5	0.04
Tourist police station	3	1.5	65340	10	6534	4	1	26136	5	0.13
Hospital	4	1.5	65340	40	26136	5	1	130680	5	0.65
Jetty station	20	3	130680	10	13068	2	1	26136	5	0.13
Bio gas plant	7	1	43560	1	435.6	2	1	871.2	5	0.00
Power/Gas plant Station	23	8.45	348480	10	34848	1	1	34848	5	0.17
Electrical Substation 1	10A	1	43560	1	435.6	2	1	871.2	5	0.00
Electrical Substation 2	10B	1	43560	1	435.6	2	1	871.2	5	0.00

Land use	Plot Category	Area (Acre)	Area (sft)	Footprint Percentage	Footprint	Floor No	Plot Number	Total Floor Area	Watt/sft	Forecasted load (MW)
STP-1	6A	1.96	85378	5	4268.88	2	1	8537.76	5	0.04
STP-2	6B	3.57	155509	5	7775.46	2	1	15550.92	5	0.08
STP-3	6C	1.75	76230	5	3811.5	1	1	3811.5	5	0.02
Garbage disposal station	12	3.6	156816	2	3136.32	2	1	6272.64	5	0.03
Security	28	2	87120	10	8712	4	1	34848	5	0.17
Underground water reservoir	14	2	87120	20	17424	2	1	34848	5	0.17
Amusement park	15	8					1			10.00
External Electrification										0.20
							Total Load without Diversity			**130**
							Total Load with 60% Diversity			**78**

Appendix B : PROJECTION OF DEMAND FOR EXTERNAL ELECTRIFICATION

Type	Length (Feet)	No of Fixtures	Watt/Fixture	Forecasted Demand (MW)
Street Light	45800	916	100	0.09
Mast Light	13768	200	400	0.08
			Total Load	**0.17 MW**

Appendix C : DERIVATION OF LOAD DENSITY OF EXISTING FOUR- & FIVE-STAR HOTELS

1. Dhaka Regency Hotel:

Dhaka Regency Hotel is a renowned 5-star rated hotel.

Total Floor Space=234925 sft

Generator Rating= {(560×1) + (665×2)} KVA

= 1890 KVA

= 1890×0.8 KW

= 1521 KW

Load Density $= \frac{1521 \times 1000 \text{watts}}{234925 \text{sft}}$

=6.44 watts / sft

2. Cox Regency Hotel:

Connected Load= 1850 KW

Average Demand= 1637.5 KW

Diversity Factor = 88.5%

Number of floors = 15

Land Area = 26 Decimals

= 26 × 435.6 sft

= 26 × 435.6 sft

= 11325.6 sft

Total Floor Area = (11325.6×0.8×15) sft

= 135907 sft

Load Density = $\frac{1850 \times 1000\ watts}{135907\ sft}$

= 13.6 watts / sft

3. Royal Tulip Sea Pearl Beach Resort & Spa Ltd.

Total Land Area = 1084.28 Decimal

Number of Floors = 10

Total Floor Space = 445,330 sft

Generator Rating = (1000×3) +150 +100+50 KVA

= 3300 KVA

= 3300×0.8 KW

= 2640 KW

= 2640 KW

Load Density = $\frac{2640\times1000 \text{ watts}}{445{,}330 \text{ sft}}$

= 5.93 watts/sft

4. The Peninsula Chittagong Ltd.:

Total Land Area = 20.50 Decimal

= 20.50×435.6 sft

= 8930 sft

Number of Floors = 15

Assuming 90% building footprint,

Total Floor space = 8930×0.9×15 sft

=120555 sft

Generator Rating = 2×1.65 MW

= 3.3 MW

Load Density = $\frac{3.3\times10^6 \text{ watts}}{120555 \text{ sft}}$

= 27.4 watts/sft

Appendix D : MINIMUM LOAD DENSITIES ACCORDING TO BNBC

Table 8.1.17: Minimum Load Densities

Type of Occupancy	Unit Load (Watts/m^2)	
	Non A/C	A/C
Residence/ Dwelling : Single family	20	75
Residence/ Dwelling : Multi-family (other than hotels)	20	75
Hospitals	32	80
Hotels, including apartment house (excluding any provisions for electric cooking)	24	75
Office and commercial multi-storeyed buildings	28	75
Industrial building (excluding the loads for machines)	16	-
Departmental stores	28	75
Banks	20	75
Restaurants (excluding any provisions for electric cooking)	16	75
Barber shops and beauty parlours	32	75
Schools and colleges	12	70
Parking area in commercial buildings	4	-
Warehouses, large storage areas	2	-

SABRANG TOURISM PARK

VOLUME-III:

DEVELOPMENT MANAGEMENT PLAN

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1 BACKGROUND

1.1 INTRODUCTION

Proper implementation of Sabrang TP Master Plan based on existing laws of the Government of Bangladesh is mandatory to achieve success in both construction and monitoring of the master plan. Specific guidelines must be followed during selection process of developers and also to meet demands of local stakeholders. This chapter provides some introductory discussion on the proposed Development Management Plan (DMP) for STP Master Plan.

1.2 PURPOSE OF THE DEVELOPMENT MANAGEMENT PLAN

Several broad policies have been formulated under the proposed DMP to properly guide the development into several phases and to ensure coordination among all the stakeholders. Sequencing of activities and accomplishment of these activities are pre-condition of the successful implementation of the higher-level plan intent.

The Proposed DMP will provide a broad description of legal framework need to be followed during construction and monitoring phases of the Master Plan. This section will also include construction and environmental management related parameters. Bangladesh Government has broad policies to accelerate growth in tourism section. These policies and initiatives taken by other countries to accelerate growth in tourism sector have been also included under this volume.

It will also include detailed policy-based guidelines to ensure land use management, infrastructure management, environmental management, and traffic/transportation management. These guidelines have been divided into several phases, these are implementation, monitoring, and evaluation. It describes the proposed land use and what rules should be applied to designate the use of the area as permitted or incompatible.

A project of this scale will include developers from both foreign and national sources. Selection process of developers will be according to the guidelines of the BEZA. A detailed list of the benefits provided by the Government of Bangladesh have been also included under the DMP. Proper guidelines regarding stakeholder's management are also a crucial part of the project which has been included under the DMP.

1.3 OBJECTIVE OF THE DMP

The major objectives of the Development Management Plan are mentioned below.

- To review the existing rules and regulations to preparation, establishment, implementation and management of Sabrang TP Master Plan;
- To provide guidelines to manage and development of the proposed landuse plan and infrastructure plan;
- To provide guidelines for institutional development plan to implement of the Master Plan.

1.4 REPORT OVERVIEW

This report is submitted as final deliverables among the 4 deliverables under the contract for consultancy services between the BEZA and the consultants with joint venture of DDCL, Bangladesh and DOHWA, Korea for the Preparation of Detailed Master Plan for Naf and Sabrang Tourism Park project.

The final report is divided into four volumes, those are:

- Volume I: Master Plan
- Volume II: Infrastructure Plan
- Volume III: Development Management Plan and
- Volume IV: Detail Cost Estimate

Volume III: Development Management Plan is describing the implementation strategy of the proposed master plan based on the existing laws and organogram of the BEZA. The Land use and Infrastructure Management strategy also describes in the volume. The management procedure of the Master Plan also describes in this volume.

2 REGULATORY CONTEXT OF THE DMP

2.1 INTRODUCTION

The process of development and development control has to follow a set of rules and regulations and policies formulated by the government in this respect. In Bangladesh a set of Policies, Acts and Regulations are already in vogue. The preparation of the Development Plan for Sabrang TP is guided by these policies, acts and regulations. In this section some of the policies adapted and acts enacted to facilitate physical development and development control has been discussed in brief.

2.2 CURRENT REGULATIONS

The important policies, acts and rules that presently are in vogue in the Tourism Park Development and economic zones development. This section has been analysed several policies which are important during implementation phase of the project. Policies like National Tourism Policy 2010, Bangladesh Economic Zone Act 2010 (BEZA Act of 2010) and BEZA Building Construction Act, 2017 are the major important legal document of the Bangladesh in the field of tourism sector. Proper implementation of these policies will ensure sustainable development from both engineering and environmental perspectives.

2.2.1 NATIONAL TOURISM POLICY 2010

Despite having a slow growth in tourism sector, Bangladesh has a huge potential to do well in this sector. To accelerate the growth in tourism sector, the Government of Bangladesh has taken a major initiative to implement the National Tourism Policy, 2010.

The National Tourism Policy, 2010 has been formulated after bringing some changes in the existing National Tourism Policy 1992. Under this policy, clear importance has been provided on the development of number of sea beaches and islands as attractive tourist spots. It has 30 goals and objectives and to fulfil the goals and objectives, there are 11 policy actions.

Aim and Objectives of Tourism Policy

The main aim and objectives of this policy is to establish tourism industry as one of the developing and sustainable sectors through generating employment, socio-economic development by involving local people with local government organizations, maintain ecological balance and protect bio-diversity. Other aims and objectives are as follows:

- Include tourism in national development strategies, policy and programmes;
- A well-planned development and maintenance of tourism in Bangladesh;
- Prepare an integrated tourism plan to develop tourism; prepare and implement short, mid and long-term work plan and strategic paper;
- Prepare national, regional and zonal master plan to develop tourism industry;
- Categorize tourist products as per international demand; develop and promote the products in accordance with market demand;

- Identify the tourist attractions, develop and take marketing drive;
- Ensure tourism contribution to poverty alleviation through its development and generate employment;
- Ensure significant contribution to national economy from tourism;
- Ensure private sector participation in tourism development while government taking the role of facilitator and develop tourist attractions and the industry as a whole, with joint effort of government and private sector;
- Ensure tourist attraction and service standard; enact law and update;
- Prepare proper ground for local and foreign investment; provide ancillary facilities to waive tax and lend money as and when necessary;
- Initiate vigorous campaign to attract foreign tourists;
- Take integrated steps to attract foreign tourists;
- Take steps for integrated marketing, build image of the country and embassies abroad should be given specific responsibilities with tourism marketing and promotion;
- Ensure coordination among ministries and stakeholders to develop and flourish multi-dimensional tourism in Bangladesh;
- Engage local government agencies to develop, expand and manage tourism;
- Socio-economic development of remote local community by developing niche tourism products including Chittagong Hill Tracts;
- Preserve local culture and heritage, turn those into tourist products and start publicity and marketing activities;
- Diversify the tourist attractions including the development of rural, riverine, agricultural, health, sports, alternative and community tourism;
- Development and maintenance of tourism products by developing eco-tourism while maintaining ecological balance;
- Develop economy domestic tourism;
- Establish and expand quality training institutes for tourism and hospitality industry and develop skilled human resources;
- Prepare a master plan for research, make marketing work plan for the development of tourism industry;
- Ensure easy access to data and information on Bangladesh Tourism in internet and introduction of IT in tourism industry;
- Attract foreign tourists by creating and declaring Exclusive Tourist Zone (ETZ);
- Ensure overall safety for tourists;
- Create tourism friendly facilities;

- Provide financial and institutional support to prepare souvenirs on tourism spots;
- Take integrated regional and sub-regional work plan including SAARC and BIMSTEC countries;
- Increase cooperation with all tourism related international bodies including World Tourism Organization (UNWTO) and increase number of assistances from them.

Main Aspects of Tourism Policy

Socio-economic change is possible by proper conservation, development of tourism and developing skilled human resources. The major features of this policy to achieve the desired goals are:

- Declare the multi-dimensional tourism and hospitality industry as priority industry and allocate budget for the sector;
- Encourage private, foreign and non-resident Bengali investment to develop tourism industry and implement the tourism development projects through public-private partnership programme;
- Identify newer tourism attractive spots and turn those into tourist attractions, preserve, standardize and ensure marketing of the products by government, local government wings and private entrepreneurs;
- Allocate money in the national budget to preserve and develop the identified historical and archaeological sites;
- Encourage private entrepreneurs' participation alongside government steps to develop infrastructures and other surface structures;
- Take integrated effort to present our culture, heritage and festivals attractively as tourism products and create demand in the international market by ensuring active participation of groups, individuals or organizations;
- Diversification of tourism attractions and development of adventure tourism, trekking, surfing, hiking, kayaking, sports tourism, religious tourism, educational tourism, health and healing tourism etc.;
- Develop eco-tourism attractions through coordinating the Ministry of' Forest and Environment and other related ministries and organizations.
- Popularize Bangladesh tourism in the tourist generating countries through proper marketing and easing their travel formalities.

Main Tourism Development Attraction

The important sector of tourism development is given below.

- Development of sea-beach and natural tourism;
- Development of sustainable eco-tourism in Sundarbans and other places of the country;
- Development of Archaeological and Historical Tourism Development;
- Development Riverine and Rural Tourism;

- Development of Pilgrimage Tourism;
- Development of Cultural Tourism;
- Development of Domestic Tourism;
- Development of Youth Tourism;
- Development of Community Tourism;
- Development of Sports Tourism;
- Development of heritage tourism and diversification of other potential tourism.

Implementation Strategy of the Policy

The government will play the role of facilitator and will emphasize the development of private sector-led tourism development and take effective initiative for tourism human resources development in public and private sector, also make vigorous relationship among all the stakeholders related to tourism industry. For sustainability of the tourism development, it is necessary to strike strong a coordination among different ministries and their agencies. Activities will be taken in the implementation strategy creation of institutional infrastructure and its execution, idea generation and planning, development and their implementation; inter-ministerial and agencies coordination; investment of both domestic and foreign; enactment of necessary laws with the co-ordination of public and private sector; identification and classification of tourism attractions and determination of their marketing strategy.

Ministry of Civil Aviation and Tourism will coordinate activities with other concerned ministries/agencies and private sector and play the role of catalysts.

For a well-balanced development of the tourism industry. the following institutional set-up will function from national to local levels. Two level implementation set-ups will be formed to implement and monitoring the policy and programme.

National Level

- National Tourism Council
- Cabinet Committee on Tourism
- Advisory Committee on Tourism
- Inter-ministerial Co-ordination and Implementation Committee

At Divisional and Local Level

- Forming committees on tourism at divisions and city corporations and
- The 'District Tourism Development Committee' headed by Deputy Commissioner.

The Embassies and missions of Bangladesh abroad will be involved in publicity and marketing activities of tourism attractions and officials.

Important Initiative for Tourism Development

Different important initiatives have been proposed for tourism development in Bangladesh. Those are:

- Identification and development of special zones /spots/islands for foreign tourists
- Joint Initiatives by Civil Aviation and National Tourism Organization
- Easy visa process and immigration law for foreign tourists
- Identification of tourist generating country in Asia and other continents
- Marketing and Publicity
- Human Resource development
- Tourism related research
- Joint initiatives
- Tourist Safety and Security
- Miscellaneous: Provide modern tourism facilities, ensure tourist security and determine national income in tourism industry various steps will be taken such as activation of Quality Tourism Service (QTS) or standard tourism service, logo or sign allocation, installation of money exchange centre and Automated Tailor Machine (ATM) booth with the creation of necessary banking facilities and introduction of Tourism Satellite Account (TSA).

The National Tourism Policy gives a detail guideline for development of Tourism sites in Bangladesh. The development of Tourism Park by BEZA is also an initiative to implementation of National Tourism Policy, 2010.

2.2.2 BANGLADESH ECONOMIC ZONES ACT, 2010 (BEZA ACT OF 2010)

The Bangladesh Economic Zones Act, 2010 was published to make provisions for the establishment of economic zones in all potential areas including backward and underdeveloped regions and development, operation, management and control thereof including the matters ancillary thereof with a view to encouraging rapid economic development through increase and diversification of industry, employment, production and export.

Main objective of the Bangladesh Economic Zones Act, 2010 was to develop economically lagging areas of the country by developing industrial land, attracting investment in export and import substitute industries, foster and generate employment and thereby ensure economic development of the country.

The Bangladesh Economic Zones Authority (BEZA) was established section 17 under this act. This law specifies the duties & functions of the authority and also the operation & administration guideline of the authority. BEZA is not only an Economic Zone initiator, but has to take responsibility for ensuring the long-time development in and around the zones. In section 19 of this act describes duties and functions of BEZA. The major functions of BEZA are:

- To identify the and select for industrial or similar sites on availability of resources;

- To acquire land for economic zones identified by own initiative or public-private partnership;
- To appoint economic zone developer on competitive basis to develop and manage the acquired land and different type of infrastructure;
- To prepare infrastructure development plans of economic zones for implementation and management of own establishment and submit it to Governing Board for approval;
- To allot or lease or rent of land, building or site on competitive commercial basis in prescribed manner, to investors applied for establishing industrial units, businesses and service providers in economic zones for implementation and management of their establishment;
- To ensure infrastructure development of economic zones within specified period through monitoring of activities of its own and of economic zone developers;
- To create opportunities for employment through establishing backward linkage industries within or outside economic zones by promoting local and foreign investment including development of skilled labour force;
- To ensure efficient use of land in the light of clustering principles by dividing the land based on infrastructure and on availability of local resources to provide a conducive environment and facilities within economic zones;
- To encourage more efficient management and monitor programmers for implementing commitments on environment and other matters;
- To take steps to establish backward linkage industries in economic zones to meet the requirements of local economy;
- To encourage business organizations to relocate polluting and unplanned industries from metropolitan cities through establishing separate economic zones for different industries;
- To encourage public-private partnership in the development and operation of economic zones;
- To take necessary steps to implement social and economic commitments;
- To establishment the due rights of workers, to ensure their welfare and to establish conducive relationship between owners and workers;
- To take appropriate steps to implement poverty reduction programmes;
- To expedite implementation of industrial policy of the country by promoting planned industrialization of the thrust manufacturing and service sectors; and
- To convert the areas declared as economic zones into economic centres by developing industrial cities, agro-based industrial zones, trade zones and tourism zones through investment of banking sectors and to facilitate availability of skilled labour and efficient service provisions.

In Section 20 of this act describes the administrative and operation procedure of the Authority. The authority is operated by the Governing Board and Executive Board. The Executive Board in discharging

its duties or performing its functions shall follow the orders, directives and guidelines given by the Governing Board.

In Section 4 of this act, four types Economic Zones are categorized to encourage rapid economic development in potential areas including backward and underdeveloped regions of the country through increase and diversification of industry, employment, production and export and to implement the social and economic commitments of the state. Those are:

- Economic Zones established through public and private partnership by local or foreign individuals, body and organizations;
- Private Economic Zones established individually or jointly by local, non-resident Bangladeshis or foreign investors, body, business organizations or groups;
- Government Economic Zones established and owned by the Government;
- Special Economic Zones established privately or by public-private partnership or by the Government initiative, for the establishment of any kind of specialized industry or commercial organization.

In section 7 of this act, the Authority may issue necessary orders to prepare a master plan for the land connected with any economic zone dividing into following areas:

1. Export Processing Area: Specified for export-oriented industries;
2. Domestic Processing Area: Specified for industries to be established to meet the demand of the domestic market;
3. Commercial Area: Specified for business organizations, banks, warehouses, offices and any other organization;
4. Non-processing Area: Specified for residence, health, education, amusements etc.

In section 10 of this act, Government may by notification of official Gazette, provide with tariff benefits to the economic zone or any area of it, for a specific period, and in accordance with the provisions of the Customs Act, 1969 (Act No. IV pf 1969), introduce special arrangement to facilitate import and export operations of the organizations established in the economic zone.

In section 13 of this act, the Government may exempt a zone or any organization thereof from the application and of all or any of the provisions of all or any of the following Acts:

- Municipal Taxation Act, 1881;
- Explosives Act, 1884 (Act No. IV of 1884);
- Stamp Act, 1899;
- Electricity Act, 1910 (Act No. IX of 19109);
- Boilers Act, 1923 (Ac t No. V of 1923);
- Foreign Exchange Regulation Act, 1947;
- Building Construction Act, 1952 (E. B. Act No. II of 1953);

- Income Tax Ordinance, 1984;
- Land Development Tax Ordinance, 1976;
- Fire Prevention and Control Act, 2003 (Act No, VII of 2003);
- Value Added Tax Act, 1991;
- Bangladesh Labour Act, 2006 (Act No. XLII of 2006);
- Local Government Acts (Union Parishad/ City Corporation/ Municipalities), 2009; and
- Any other Act or law as specified by the Government through Gazette Notification.

2.2.3 BANGLADESH ECONOMIC ZONES (CONSTRUCTION OF BUILDING) RULES, 2017

The Bangladesh Economic Zones (Construction of Building) Rules, 2017 is an exercise of the powers conferred under section 38 of the Bangladesh Economic Zones Act, 2010. This Rules given a guideline to construction and operation of industrial plots into the specific area of Economic Zones. The key aspects of the rules are describing below:

2.2.3.1 ECONOMIC ZONES DESIGN REQUIREMENTS

Zoning: The economic zone shall, based on surrounding infrastructure, settlements density, nature and character, comprise of different zones, like-administrative, utility service including water, electricity, gas, telecommunication and internet, healthcare, childcare, old care, hospitals, recreational, open spaces, green area and commercial, educational, restaurants, hotels with essential accommodations, police station, fire station, communication hub and CETP, along with industrial plots and road networks.

Open Space: At least 5% land must be preserved for open space in an industrial plot and minimum size for open spaces per plot must be 600 sq. m.

Other amenities: There shall be 5% of the total land area for administrative, utility services including water, electricity, gas, telecommunication and internet, health care, childcare, old care, hospitals, recreational, commercial, educational, restaurants, hotels with essential accommodations, police station, fire brigade station, communication hub, CETP, and such area may be divided through the zone as per their requirements.

Green Space: 5% of the total land area shall be reserved as green space along the road network; green strip used along the roads may not be less than 1.5 m; green strips less than 3m may not be used for any kind of utility service line; and central green median, road side green strips, cannel, water body are the part of these requirements.

Plot Size: The plot size shall be as per types of economic zone, generally minimum 4000 sqm per plot.

Building orientation: The design of building shall be passive solar design. The orientation and openings to maximize the north and south exposure; orientation and openings to maximize natural cross flow ventilation, e.g. cooling summer breezes; minimizing east and west facing orientation,

openings and windows, or providing adequate shading; and well considered landscaping to provide valuable shade throughout summer and the use of winter sun.

Access to the site: The development of the site shall be designed to enable vehicles to exit the site in a forward direction; If the area of the site is more than 1.0 hectare (10,000 square meters), there shall be provision for all vehicles to enter and leave the site in a forward direction; If the area of the site is more than 0.4 hectare (4,000 square meters), there shall be provision for articulated vehicles to enter and leave the site in a forward direction; Development works shall be designed to ensure easy and safe access of vehicles in the industrial sites; Off-street parking and access arrangements shall be adequate; Industrial uses that rely on heavy vehicle access shall avoid using residential streets; Access arrangements to industrial sites shall ensure accommodation for large vehicles.

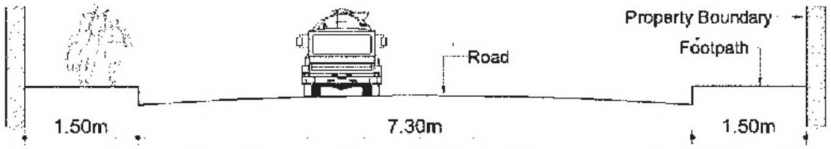
Road Network:

Schedule-I

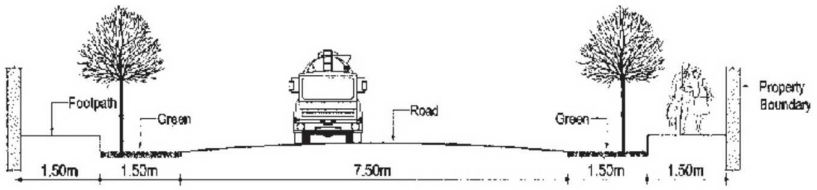
[See rule 7]

Road Network

1. **Secondary road serving maximum 4 Plots**: Two way roads shall be 10.3 [1.5+7.3+1.5] meters wide having 1.5 m road side footpath in both sides as shown below:

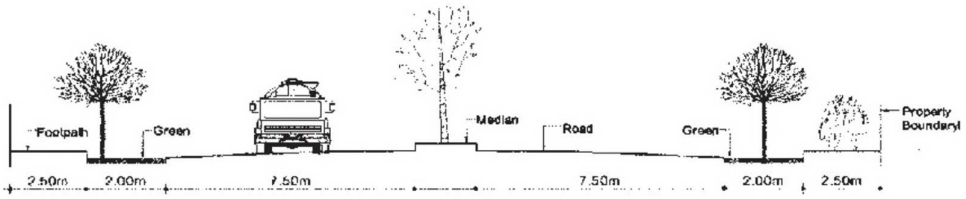


2. **Primary entry road serving maximum 12 Plots:** Two way roads shall be minimum 13.5 [1.5 [footpath] + 1.5 [Green] + 7.5 + 1.5 [Green] + 1.5 [footpath] meters wide having road side footpath and green belt in both sides:

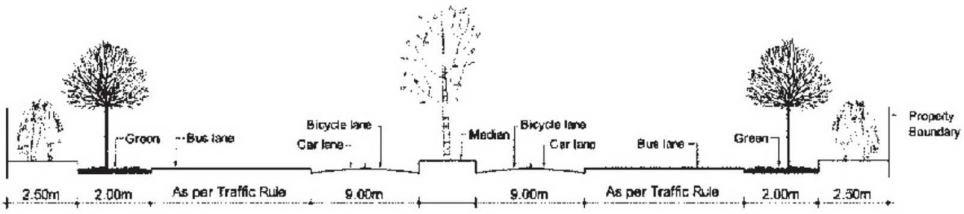


3. **Primary entry road served maximum 36 Plots:** Two way roads shall be minimum 25 or

27 [2.5 [footpath] + 2 [Green] + 7.5 + 1 or 3 [Median] + 7.5 + 2 [Green] + 2.5 [footpath] meters wide having road side footpath and green belt in both sides as designed below:



4. **Primary entry road serving more than 36 Plots:** Two way roads shall be variable [2.5 [footpath] + 2 [Green] + Bus lane [as per traffic standard] + variable 9 [Minimum with bicycle lane] + 1or 3 [Median] + variable 9 [Minimum with bicycle lane] + Bus lane [as per traffic standard] + 2 [Green] + 2.5 [footpath] meters having road side footpath and green belt in both sides in the following manner:



- There is no opening for U tern, median strip shall provide minimum width of 1 meter, if U-tern is provided, minimum width shall be 3 meters;
- Roads of more than 10.3 meters wide shall have minimum 2.5 meters wide footpath and minimum 2 meters wide road side planters;
- Level deference between footpath, road and entrance of the site shall comply with the universal accessibility for all as per BNBC.
- Underneath of the footpath may be used for different types of service line (electrical, fire line, drainage system, etc.).
- Intersections of minor access roads with collector roads shall be designed to allow articulated vehicles to turn into the collector road without crossing the center line of the collector road. The internal radius for left turns shall be at least 11 meters wide.
- Traffic Impact Assessment shall be done before planning the master plan of the economic zone.
- Where access for B-double trucks is required, a Traffic Engineer's report shall be provided demonstrating that these vehicles may enter and leave the site safely without unduly disrupting other road users or damaging infrastructure or landscaping.

Drainage, waste management: The provisions shall be followed in drainage, waste management and other systems of the economic zones are preparing a master plan of the drainage and sanitary system for the total economic zone showing slopes, retention areas and ultimate discharge point; preparing a master plan of the waste management having CETP with metering system so that individual may be charged as per their effluent discharge; Heterogeneous effluents shall be pre-treated before discharging to CETP as per requirement of CETP; Economic zone shall have STP for individual plot;

economic zones having more than 80 acre in size shall have central power, water supply system with metering system so that individual may be charged as per their use.

Fire Appliance Access Requirements: The fire appliance access requirements in industrial area layouts shall be as follows : every economic zone shall have fire zone as per BNBC; adequate fire brigade stations shall be provided according to the size of the economic zone; each industrial plot shall be provided with vehicular access roads; If a central median is provided in industrial plot, the minimum width of the dual carriageway shall be 7.3m wide for one-way traffic, if constraints do not allow the provision of a central median, the minimum width of a carriageway without a central divider shall be 13.5m for two-lane two-way traffic.

2.2.3.2 INDIVIDUAL BUILDING DESIGN REQUIREMENTS

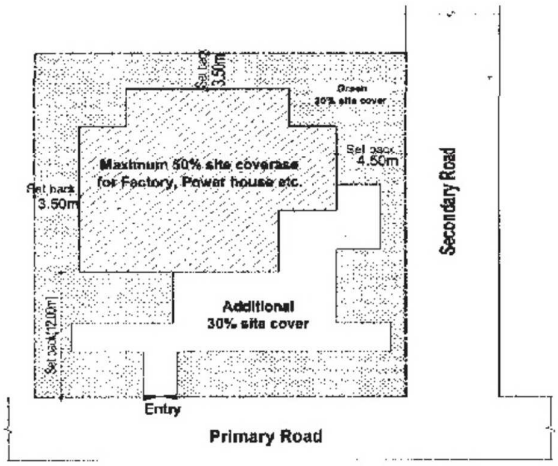
Floor Area Ratio (FAR): In construction of building, FAR shall be based on access to the site which provided that internal roads, open to sky drive way and parking area, tanks, STP, ETP shall be excluded from FAR calculation.

Site Coverage: In the construction site the covered area shall be as follows and the diagram of the Site Coverage shall be as per Schedule- II is: maximum 50% of the total area shall be covered by factory building, power house, storage, covered parking, ETP, overhead STP etc; 30% of the site shall be covered by the drive way, open parking, 50 sqm guard room, fire command center, cycle stand, internal roads, underground water tank and septic tank; and 20% of the site shall be open to sky soak area : Provided that soaking soft pave may be used instead of green grass or naked earth in the open space.

[See rule 11]

Diagram of Site Coverage

The diagram of the Site Coverage is as follows:



Setback: (1) A minimum front setback of 12 (twelve) meters shall apply to the primary street and a minimum setback of 4.5 (four point five) meters shall apply to the secondary street, or streets, unless otherwise determined by the Authority. (2) Side and rear setbacks shall be 3.5 (three point five)

meters. (3) Notwithstanding anything contained in sub-rule (1) and (2), the Authority may, considering the following circumstances, make variation up to a reasonable limit in determining the setbacks, namely:

- General streetscape;
- Properties and buildings near and surrounding the site;
- Fire separation distance;
- Solar aspect and prevailing breezes; and
- Bulk of the development.

Community Open Space for Industrial Plots: (1) For every industrial plot having an area of 1.0 hectare or more, a minimum of 10% of the total area, but not exceeding 0.25 hectare, shall be reserved as community open space and such area shall be contiguous to and shall have a means of access from every unit of the industry for recreational activities of the persons working in the industry and also linked to the external roads for safe exit during emergency. (2) The adjacent road network and the internal open space together shall be used for the assembly area during emergency.

Loading and Service Area: (1) If plots are located near residential area, loading and service areas shall be sited to the rear or side of the property and away from residences; (2) Plots having 0.1 hectare (1000 square meters) or less, loading areas may share access driveways with car parking areas : Provided the visitor car spaces may remain accessible; (3) Loading areas shall not be sited so that vehicles shall reverse onto roads; (4) Loading areas shall be separated from pedestrian access paths.

External Service and Storage Area: Service, storage and bin areas shall be screened behind the front building line and from the street, and landscaping, fencing and gates may be utilized to screen this area.

Fencing: The following provision shall be applicable where a planning permit is required : (a) fencing shall be unobtrusive and shall not detract from the streetscape and it shall generally be semitransparent and articulated with provision of adequate security for the premises; (b) at smaller industrial sites, fences higher than 1.5 meters shall not generally be constructed across the entire frontage, unless there is a requirement for site security; (c) where high fences are used to enclose an industrial site, it is preferable that a section of the front of the premises be open to the street to provide a sense of address and contribute to the streetscape; (d) where site security along the boundaries (not frontage) is required, fencing and gates shall be constructed of black, plastic coated chain link fence or other approved material; (e) fencing shall be provided to ensure that fencing complements the amenity of the area and contributes to an open streetscape and also provide adequate site security.

Fire-fighting Requirements: Fire-fighting requirements shall be as per BNBC.

Car Parking and Traffic Management: (1) For a site of industrial building, there shall be provisions for - (a) one car for every 800 sqm; (b) one truck, goods carrying vehicle, for every 2000 sqm; and (c) a container vehicle loading or unloading bay with turning circle of 11.6m outer radius shall be provided for a site over 2000 sqm. (2) The Authority may fix up the number of car parking bays considering the

requirements of a particular economic zone. (3) Car parking may be placed between the landscape setback and the building line and the bay sizes, driveway widths and turning circles shall be as per BNBC. (4) For facilitating the large size trucks and other heavy vehicles using service roads, street parking shall be discouraged within the economic zone.

Planning of Roadways and Parking: Roadways and parking within the site shall be such planned as may be required for - (a) separation of service or haulage vehicles from visitor and staff parking areas; (b) sitting of parking areas adjacent to areas of buildings that are commonly accessed; (c) provisions of suitable species of shade trees at a ratio of 1 per 4 car-bays, evenly throughout the parking areas; (d) provision of clear paths for pedestrian movement separate from areas of frequent vehicular movement; and (e) consideration of the visitor parking areas as an extension of the corporate or market image in terms of its presentation.

Landscaping: (1) The developer shall submit a landscaping plan to the Authority providing- (a) A 2.5m landscaping strip to any primary frontage; (b) A 1.5m landscaping strip to any secondary frontage; and (c) a shade tree per 4 car parking bays. (2) The developer shall (a) use, where available, topsoil and mulch from stockpiles on the estate; (b) continue the landscaping theme and character of the area; and (c) maintain regularly by a qualified landscape professional to both verge and plot areas for retaining the benefits of good quality landscaping.

Energy Management: (1) The developer and the unit investor may use renewable energy and at least one percent of total requirement shall be consumed from online solar system. (2) The developer and the unit investors shall make necessary arrangement for reducing unnecessary use of energy. (3) For energy management, in the proposed design, the use of the following things shall be taken into consideration:

Rain Water Harvesting: (1) The plot shall incorporate a rainwater harvesting system designed to capture roof run off from a minimum of 200m2 (or 50% of the available roof catchment area for roof areas less than 400m2) during regular rainfall events; (2) The collected rainwater shall be plumbed to supply a seasonally independent water use e.g., toilet flushing; (3) The water harvesting system shall be same standard system for each plot.

Applicability of BNBC: The BNBC shall be applicable for all other issues not mentioned in the preceding rules, such as architectural, structure, plumbing, electrical, mechanical, fire, etc.

2.2.3.3 PERMITS

Permit: No building in the economic zone shall be erected, constructed, enlarged, altered, repaired, moved, improved, removed, converted or demolished without the permission of the Authorized Officer.

Type of permits: Two types of permission needs to development of any plot within the Economic Zone:

- Building Construction Permit;
- Occupancy Certificate.

The Bangladesh Economic Zones (Construction of Building) Rules, 2017 were prepared for development of industrial unit of the Economic Zones. But tourism park development is different than industrial unit development. Some modification is necessary to synchronize the tourism park activities.

2.2.4 BANGLADESH ENVIRONMENTAL POLICY, 2013

The Government of Bangladesh has formulated National Environment Policy 2013 with an aim to conserve and sustain natural resources, biodiversity, wetlands, forests, and animals. Several crucial factors like population growth, poverty, illiteracy, lack of awareness and healthcare services, limitation of arable land, unplanned development and urbanization, and industrialization have been given full consideration under this policy to ensure conservation of the environment. Several key aspects of the act are:

- Preservation of water resource has got special importance in the case on National Environment Policy 2013 and several policy guidelines have been also formulated to control agricultural pollution and other environmental pollution.
- Climate change will have a crucial impact on agriculture, water resources, public health, biodiversity, and infrastructure of Bangladesh, because a large area of Bangladesh belongs to floodplain and coastal plain, which were built by deposition of river-borne sediments over thousands of years.
- Pollution from both point and non-point industrial sources have been given consideration under the Environmental Policy 2013 to tackle threat to human health. It has taken a policy of zero tolerance towards discharge/emission policy in the case of controlling industrial discharge and other pollutants.
- Emission standards has been also fixed in the case of controlling air pollution from industrial sources. If they fail to meet this demand, they will be brought under emission tax.
- Use of toxic chemicals and pollutants with food in hotel and restaurants have been also regulated in the case of controlling water pollution. In the case of urbanization and housing development, importance has been given on green development. Availability of safe drinking water is also a crucial issue in the case of preventing water pollution.
- Primary and secondary pollution sources of air pollution are from cars and trucks. Epidemic diseases, such as cholera and child survival are linked to safe sources of drinking water and it has given crucial importance under the Environmental Policy 2013.
- People have concerns to meet basic needs like food, water, and housing in Bangladesh. Over population does not only cause environmental pollution, in case of natural disasters it also creates extra pressure.

Bangladesh Environmental Policy 2013 does not only address traditional aspects of environmental pollution in Bangladesh, it recognizes the significance of managing all aspects of the environment in a sustainable manner. It discusses old policies in the context of new reality of the climate change. It is

hoped that the draft NEP 2013 will be revised to address the shortcomings, and that the promises outlined in the document will be followed with action.

2.2.5 ENVIRONMENT CONSERVATION RULES, 1997

The Government of Bangladesh has issued the Environment Conservation Rules, 1997 to exercise the power conferred under the Environment Conservation Act (Section 20), 1995. Issues covered by the new rule are:

- Declaration of ecologically critical areas
- Classification of industries and projects into four categories
- Procedures for issuing the Environmental Clearance Certificate
- Determination of environmental standards.

Under the rule several factors have been considered to declare an area as 'ecologically critical area' (ECA). It has given an authority to the Government of Bangladesh to declare an area as 'ECA', if it is satisfied that the ecosystem of the area has reached or is threatened to reach a critical state or condition due to environmental degradation. Under the rule, Ministry of Environment and Forest (MOEF) has prohibited certain activities in Sundarban, Cox's Bazar-Teknaf Sea Shore, Saint Martin Island, Sonadia Island, Hakaluki Haor, Tanguar Haor, Marzat Baor and Gulshan-Baridhara Lake. Beside these, recently the government of Bangladesh has declared four rivers such as Buriganga River, Turag River, Shitalakha River and Balu River around the Dhaka City as ECA.

Under Environment Conservation Rules 1997, industrial activities and projects have been classified into four categories depending on environmental impact and location for the purpose of issuance of Environmental Clearance Certificates (ECC). These four categories are Green, Orange A, Orange B, and Red.

A detailed description of these four categories of industries has been given under the Environment Conservation Rules 1997.

- All existing industrial units and projects and proposed industrial units and projects, that are considered to be low polluting are categorized under "Green" and shall be granted Environmental Clearance.
- For the proposed industrial units and projects falling in the Orange-A, Orange B and Red Categories, firstly a site clearance certificate and thereafter an environmental clearance certificate will be required.
- Apart from general requirement, for every Red category proposed industrial unit or project, the application must be accompanied with feasibility report, Initial Environmental Examination (IEE), and Environmental Impact Assessment (EIA).

A clear procedure of obtaining ECC has been mentioned under the Environment Conservation Rules 1997. Any person or organization wishing to establish an industrial unit or project must obtain ECC from the Director General. The application for such certificate must be in the prescribed form together

with the prescribed fees laid down in Schedule 13, through the deposit of a Treasury Chalan in favor of the Director General.

2.3 PLANNING MANAGEMENT PROCEDURE

The control of planning and building is the responsibility of authorized officers and their staff in BEZA. The Bangladesh Economic Zones Authority (BEZA) Act, 2010 provides that in any area where Government may extend its application, all construction requires prior permission from the designated officer.

Processing of Application involve two stages:

Building Construction Permit: This is detailed design to get permission of building, and is based on the provisions of the Bangladesh Economic Zones (Construction of Building) Rules, 2017. After a series of checks and clarifications, the application is approved and reject by the Authorized Officer.

Occupancy Certificate: The Occupancy Certificate shall be perpetual unless any change in use and physical properties is made from the date of issue of such Certificate.

2.4 STANDARDS AND CONTROLS

The proposed Master Plan will help to:

- Minimize the spill over effects where a landuse in one location imposes environmental or other costs on adjoining sites or the community as a whole;
- Increase efficiency by guiding development to preferred locations and uses;
- Allocate land for infrastructure and community services;
- Create an attractive tourist friendly environment;
- Preservation of Natural environment and habitants;
- Create environment of natural habitants living with the humans.
- The master plan will be affordable, understandable, permit the use of traditional and readily available materials and be simple and precise.
- The master plan also provides modern and luxuries facilities for the tourism development.

2.4.1 PLANNING RULES

There are no specific rules to prepare a master plan and development control of the master plan. The BEZA's Building Construction Act, 2017 is the only guideline for development and development control of the Economic Zone. This act is prepared for Industrial Economic Zone but for special economic zone like Tourism have no guideline for Development and control. The Bangladesh National Building Code have given some guideline for establishment of Hotels which is not sufficient for the Special Tourism Park. The planning control is specified into 3 form. Those are:

- A bar on all construction not conforming to the land uses specified in Master Plan and various Zonal Plan;

- Set-back of the Building and
- Regulations on minimum road widths.

2.4.2 PLANNING STANDARDS

There is no planning standard found for the Master Plan for Tourism Park. There have not any specific standards for building height, land use standard in the current regulations in Bangladesh.

2.4.3 BUILDING RULES AND STANDARDS

Bangladesh Economic Zones (Construction of Building) Rules, 2017 provided detail guideline for construction of Individual Building with FAR, Site coverage, set beck, community open space, loading and service area, external service and storage area, fencing, firefighting requirements, car parking and traffic management, planning of roadways & parking, Landscaping, Energy Management, Rainwater harvesting etc. for the industrial units. Residential and hospitality have not any specific guideline in these rules.

2.4.4 INFRASTRUCTURE STANDARDS

There are no specific Onsite and Off-site infrastructure standard are found for economic zones. Standards for Road Network into the economic zones are provided Bangladesh Economic Zones (Construction of Building) Rules, 2017. Rain water harvesting and energy management also provided in these rules.

2.5 RECOMMENDATION

The existing standards, rules and regulations are not sufficient to implement and management of Tourism Park. Some recommendations are proposed to control and management of Proposed Tourism Park.

2.5.1 LAND DEVELOPMENT

The Proposed Master Plan for Tourism Park should be basis for giving permission of plots within the boundary of the Tourism Park. Based on the land use recommendation, the planning rules accompanying Master Plan in the form of regulations defining limitations in terms of physical dimensions (minimum set-backs, height etc.).

2.5.2 DENSITY CONTROLS

Density control is generally one of the preferred development management tools as densifies define the overall size or bulk of construction while also expressing the demand that will take place on its infrastructure. In this Sabrang Tourism Park Master Plan, maximum densities are given to control development and smooth functioning of Tourism Park.

Table 2-1: Height Restriction for Sabrang Tourism Park

Land Use type	Height Density	Area Density/acre
Beach view plot	G+9 storied	250
Lake View Plot South Side	G+9 storied	250

Land Use type	Height Density	Area Density/acre
Lake View Plot North Side	G+9 storied	400
Economy plot	G+9 storied	300
Service studio apartment/multi storied building	G+6 storied	150
Old home and Welfare Centre	G+6 storied	100

In special permission from BEZA, 30% beach view plots may be developed G+14 storied with proper maintenance of public access. Common facilities, Recreational Facilities and utility facilities recommended building height is G+6 storied except watch tower cum restaurant. The area density of utility facilities should be limited 100 to 150 person/acre.

2.5.3 BUILDING STANDARDS

Apart from the planning rules and standards, there are also more specific construction related building rules and standards to be observed. The consultant's team are proposed standards for the development of Sabrang TP Master Plan. Those are:

2.5.3.1 RECOMMENDED PLOT SIZE

In Sabrang TP, accommodation facilities are vital issues to provide tourism services for the tourist. The recommended plots size for the residential and hospitality zone are given Table 2-2.

Table 2-2: Recommended Plot Size of Sabrang Tourism Park

Land use type	Plot Size
Beach View Plot	6 acres
Lake View Plot South Side	3 acres
Lake View Plot North Side	1 acre
Economy Plot	0.3 Acre

Plot size for Common facilities, Recreational Facilities and utility facilities are calculated based on the tourist accommodation facilities of the Sabrang Tourism Park Master Plan which is specified on the Proposed Master Plan. In special consideration of investors design proposal, BEZA may be revised the plot size.

2.5.3.2 SETBACK PROVISIONS

Minimum setback provisions are recommended for all types of plot. The setback is fixed to consider the firefighting clearance and emergency evacuation at the disaster time. The recommended setback of residential plots is given in Figure 2-1, Figure 2-2, Figure 2-3.

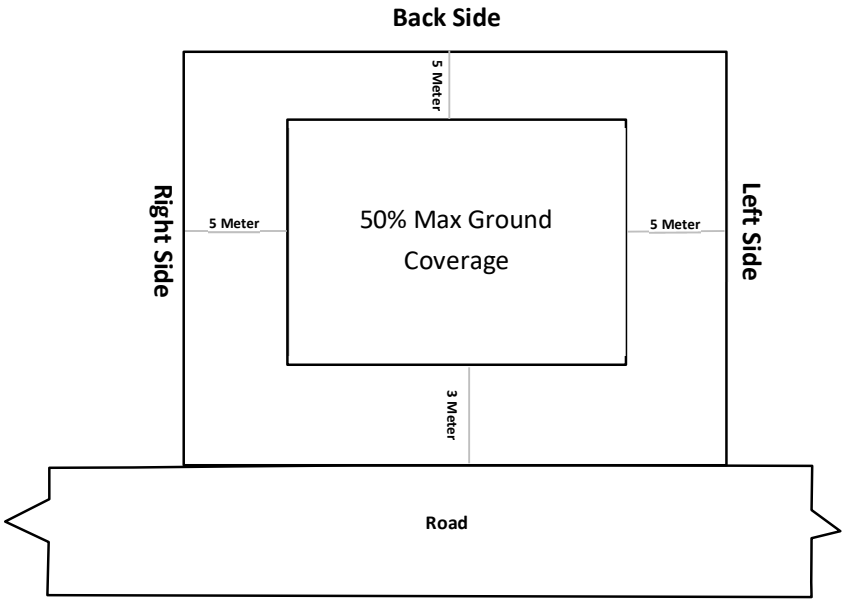


Figure 2-1 : Recommended Setback of Beach View Plots

The setback for Lake View Plots is recommended as follows:

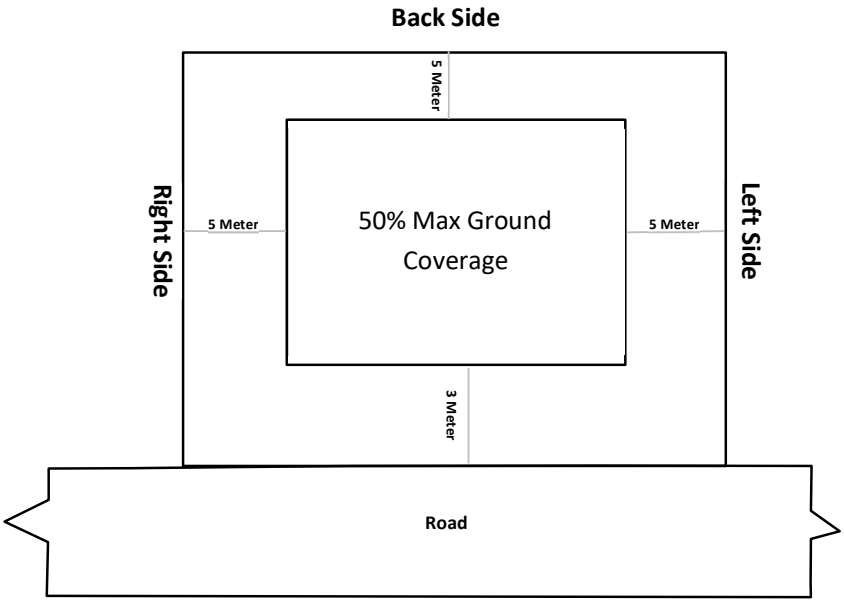


Figure 2-2 : Recommended Setback of Lake View Plots

The setback for Economy Plots is recommended as follows:

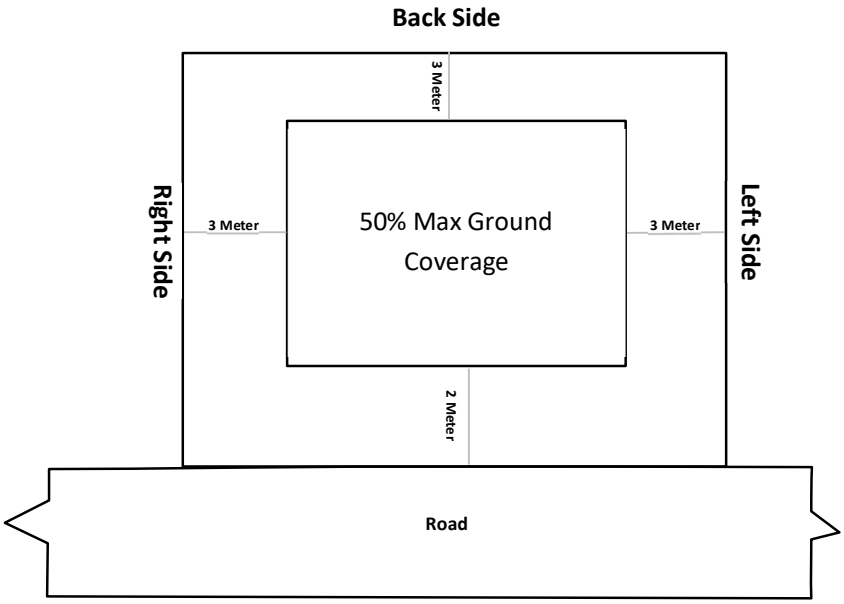


Figure 2-3 : Recommended Setback of Economy Plots

2.5.3.3 BUILDING HEIGHT AND FLOOR AREA LIMITATIONS

The Building Height and Floor Area limitation are recommended for Sabrang TP is provided in Table 2-3.

Table 2-3: Maximum Building Height and Ground Coverage

Land Use type	Max. Building Height (m)	Max. Ground Coverage
Beach view plot	G+9 storied	40%
Lake View Plot South Side	G+9 storied	50%
Lake View Plot North Side	G+9 storied	50%
Economy plot	G+9 storied	50%
Service studio apartment/multi storied building	G+6 storied	50%
Old home and Welfare Centre	G+6 storied	50%

Common facilities, Recreational Facilities and utility facilities recommended building height is G+6 storied except Park, Golf Course, Farm Land, watch tower cum restaurant. The Maximum ground coverage for the Common facilities, Recreational Facilities and utility facilities are 50%.

2.5.4 SPECIAL DESIGN STANDARDS

The Sabrang TP is established in disaster and environmental sensitive area. Special precaution is recommended to sustainable development of the Tourism Park. The special design standards for Sabrang TP are given below.

- The ground floor of buildings constructed in Sabrang TP should be open. The ground floor can be used for parking, building maintenance facility, guard room etc. or can be left open to avoid any damage from water surges during any natural disaster.

- According to BNBC, the guideline for the construction of building in the Surge Prone Area is given below.

A. Elevation: The habitable floor of any building in a surge prone area shall not be located below the design surge height. For buildings of height two storeys or higher, the roof shall be accessible with an exterior stair. For building three storeys and higher, the floor immediately above the design surge level shall be accessible with an exterior stair.

B. Enclosures below Design Surge Height: Spaces of a building in the SPAs (surge prone area) below the design surge height shall not obstruct any flow of water during the occurrence of surge.

C. Foundations: Foundations of the buildings erected in the SPA's (surge prone area) shall be located well below the ground level so that they are protected from erosion or scour during the occurrence of surge. If piled foundations are used, they shall be designed to withstand with adequate factor of safety the loss of support due to scour.

D. Restrictions: No other institutional or commercial or heavy industries are not permitted in the hotel plots. Utilities services like laundry and stationary shops can be permitted inside the plots to serve the guests of the respective hotel only.

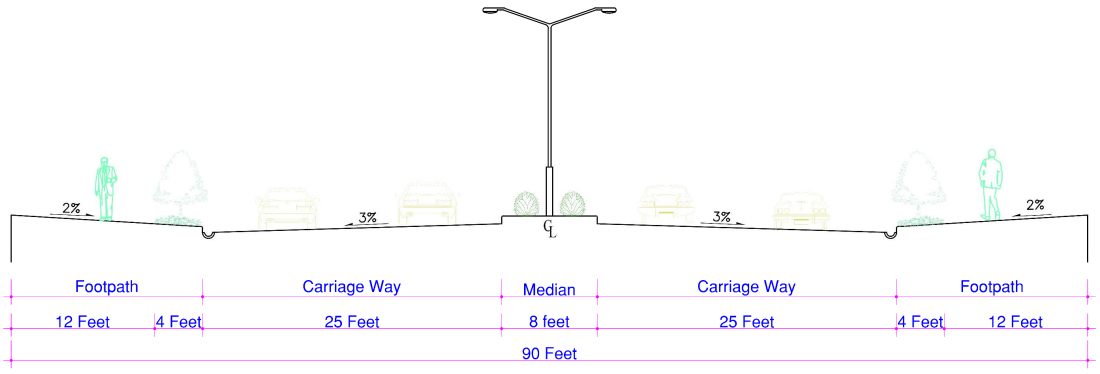
E. Vehicular access: Road should be accessible for fire trucks, ambulance and all emergency vehicles to provide necessary services when required.

2.5.5 INFRASTRUCTURE STANDARD

Infrastructure Standards are needed for different uses. They should be appropriate and capable of incremental improvement. Recommended infrastructure standards are intended for use of proposed land use. The recommended standards are summarized below:

2.5.5.1 ROAD STANDARDS

90 feet and 62 feet road width are proposed for the Sabrang TP. The standards of road cross section and width have been adopted from "Bangladesh Economic Zone (Construction of Building) Rules, 2017", (Rule-7, Schedule-1). A design speed of 25 km/hr is recommended throughout the tourism park area. Road geometry and alignment have been designed considering Single Unit Truck (SU). The vehicle length, width and height are 12.2m, 2.6m and 3.7m respectively (Figure 2-4 and Figure 2-5).



Road Width 90.00 feet

Figure 2-4: Cross Section of Arterial Road

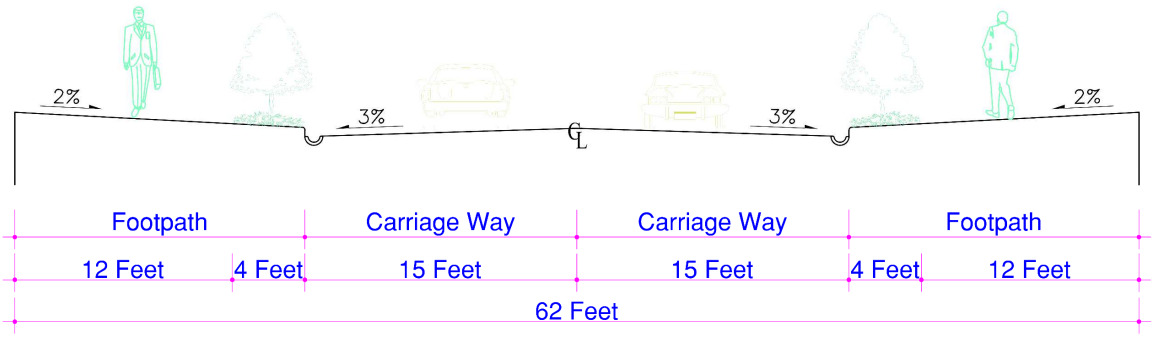


Figure 2-5: Cross Section of Feeder Road

2.5.5.2 WATER SUPPLY

The basic water supply system is considered to be piped line. The water for Sabrang Tourism Park is extracted from aquifer. The outlines standards cover the basic requirements for water supply including main distribution line and Central Underground water reservoir.

2.5.5.3 DRAINAGE

The main concerns are to collects street drainage and minor plot run-off and to conduct the storm water into the main water courses. For street drainage, covered box-drainage are recommended for the built-up areas and open drains for the green areas. The proposed Lake will work as a main outfall for Sabrang TP.

2.5.5.4 SANITATION

Sanitations recommended cover sewers and on-site sewerage system. Sewerage Treatment Plant (STP) is proposed to treatment sewerage waste.

2.5.5.5 SOLID WASTE

The main solid waste management system depends on the location of collection points; ease of collection vehicles access, adequate space around containers for emptying and cleaning, a well-drained container base and generally an open location visible to the public to minimise misuse of the container.

2.5.5.6 ELECTRICITY

Electricity supply considerations include the location of power lines, adequate line clearances, location for transformers and street lighting arrangements.

3 IMPLEMENTATION OF THE PLAN

Implementation of the Master Plan based on the existing laws of the country is the most essential part of achieving success in planned urban development. This chapter provides details of the implementation process that should be carried out by the appropriate local authorities within the boundary of the Sabrang TP.

3.1 LEGAL FRAMEWORK FOR THE PLAN IMPLEMENTATION

Implementation of the proposed master plan will be guided by several acts of the Government of Bangladesh. These acts are National Tourism Policy 2010, Bangladesh Economic Zone Act 2010 (BEZA Act of 2010), Building Construction Act BEZA, 2017, Bangladesh Environmental Policy 2013, and Environment Conservation Rules 1997. All the proposals provided under the master plan are in compliance with these acts. Implementation of the master plan in divided into several phases. Separate proposals have been provided for the development of transportation system, utility supply system, environmental management, and power generation system. Bangladesh Economic Zone Authority (BEZA) will work in coordination with several other ministries for the proper management of development initiatives related to the master plan.

Some acts although applicable at the national level will play a crucial role in the case of achieving project objectives at local level. Acts like Bangladesh National Building Code (BNBC) 2017 and the Building Construction Act 2008 will ensure proper implementation of setback rules and Floor Area Ratio (FAR). It will minimize human casualty and damage of properties in the case of an earthquake and other natural calamities. Proper implementation of proposals under Bangladesh Environment Conservation Act, 1995 and the Environmental Conservation Rules, 1997 are crucial to protect endangered species and environmental sustainability. Waste generation from tourism sites are also a subject of consideration and proper management of drainage system are mandatory to ensure environmental sustainability.

There are national policies for most of the sectors. The relevant sector policies like National Land Use Policy 2001, National Housing Policy 2016, National Environment Policy 2013, National Agriculture Policy 2013, and National Water Policy 1999 as discussed earlier will play that role. These sector policies will be important for adopting measures of executing development projects as indicated in the plan documents.

3.2 CUSTODIANS OF THE PLAN

Bangladesh Economic Zones Authority (BEZA) is the custodians of the Plan prepared under the current project. The present Sabrang TP Master Plan has been prepared by the consultant under direct supervision of BEZA. Proposed Sabrang TP Master Plan addresses all aspects of tourism related development in the proposed site. Under the proposed plan, multi-sectoral tasks to be carried out by multiple stakeholders within the boundary of the study area.

The public authorities, like Bangladesh Railway, Roads and Highways, Bangladesh Inland Water Transport Authority (BIWTA), Civil Aviation Authority of Bangladesh, Bangladesh Power Development Board etc. will play crucial role to effectively run of the proposed tourism park. These authorities are

responsible for the provision of different services for the tourism park. Provision of utility services, and movement of tourists throughout the region will be under direct supervision of these authorities. BEZA in coordination with these authorities will monitor utility services, vehicular movement, and environmental sustainability within the proposed tourism park. Bangladesh Coast Guard and Bangladesh Police will be responsible for the safety and security of the entire tourism park from both external and internal threats.

Implementation of the master plan is a long-term process and BEZA will play the crucial role of proving long-term monitoring and other financial support in coordination with the all these agencies. Implementation is a difficult task and generating public awareness and making people aware of the legal bindings is not an easy task. There is a multi-dimensional professional need for the execution of the plan. An appropriate authority to oversee the activities performed under the plan will be required for the smooth functioning of the proposed tourism park.

3.3 PLAN AMENDMENT

Any amendment in the master Plan can be made with the approval of the BEZA. However, the necessity of reviewing the plan at any given point of time can be raised by the stakeholders related to the proposed tourism park.

3.4 LAND ACQUISITION AND MANAGEMENT

Under the proposed 1047.7 acres land has been already acquired by the Bangladesh Economic Zones Authority (BEZA) for the construction of the proposed Sabrang TP. Planning Area Demarcation was a vital stage of the master plan preparation. Consultant has quite efficiently completed this task using advanced technology. Land acquisition is a crucial part of the project due to a lack of community facilities and congested development in urban areas. Proposed Sabrang TP is situated beside the Bay of Bangle and the area is almost empty. Major initiatives must be taken for the provision of utility services.

In the case of land development importance must be given on preserving agricultural land and provision of financial and other types of compensation to the local people. Resettlement is also a crucial part in case of land acquisition. People must be provided with adequate financial resources in the case they lose trees, boundary wall, tube well, and other resources. They must also be resettled in other parts in close proximity if they lose their house. Currently the proposed site is not containing any human habitation so that resettlement issues are not needed for the Tourism Park boundary. It is comparatively easier to acquire land in fringe than in the core areas. Fringe areas are usually characterized by low density, where land value is also comparatively low.

3.4.1 LAND DEVELOPMENT TECHNIQUES

Bangladesh Economic Zones Authority (BEZA) will follow direct land development approach under the project. Land development and management involves huge investment. Sabrang TP is a large-scale project of BEZA and they have already acquired land and development related activities are currently going on within the project boundary. Both to control illegal development and protection of natural habitat for endangered species and marine wildlife restrictions might be enforced in specific areas.

BEZA already started some development activities to established tourism park. Some pictures of Development works are given below.

Figure 3-1: Construction of Super dyke of Sabrang Tourism Park

Figure 3-2: Ongoing Land Development of Sabrang Tourism Park

Figure 3-3: Construction of Administrative Building of Sabrang Tourism Park.

Figure 3-4: Construction of Clock Tower of Sabrang Tourism Park.

3.4.2 LAND USE ZONING

Land use planning is an essential part of any project. Land use planning refers to the process by which a society, through its institutions, decides where, within its territory, different socioeconomic activities such as agriculture, housing, industry, recreation, and commerce should take place. Proposed land use within the boundary of the project area has been classified into seven classes, these are:

1. Residential/Hospitality Zone
2. Administrative Zone
3. Common Facilities
4. Institutional Zone
5. Utility Zone
6. Transportation Zone
7. Waterbody and Open Space

A detailed list of these facilities has been included in master plan report. Maintenance of density was also a crucial part during land use zoning process. According to Bangladesh Economic Zones (Construction of Building) Rules, 2017, Floor Area Ratio (FAR) is the only tool to control population density but this rule is applicable for the industrial plot. But there do not have any specific guidelines for tourism parks. Apart from FAR, there are several standards to achieve desired population density such as number of dwelling units per acre, maximum room occupancy etc. each with their comparative effectiveness.

3.5 RESOURCE MOBILIZATION FOR DEVELOPMENT

Allocation of resources in an efficient way is a crucial task of the project implementation authorities. Bangladesh Economic Zones Authority (BEZA) will be responsible for management of the entire resource mobilization process. Implementation of development projects proposed in the plan will be

a challenging task as they will require a huge number of resources. BEZA needs to work with other Government and private agencies to participate in revenue generation activities.

Financing of development projects is one of the most critical aspects of land development and management. Selling plots will be a crucial part of revenue generation under the project. Proposed Tourism Park will significantly increase land value in surrounding area.

3.5.1 DEVELOPMENT FUNDED BY PRIVATE INDIVIDUAL

Development through individual private investment is the most popular form of land management and development in Bangladesh. In this process individuals' investors can lease a plot of land and thereby develop that with own money. The individual may borrow from banking sources, but that becomes his individual liability. Land development through this approach leads to sprawl and spontaneous development. Investment from large private enterprises is going to be the most like sources of finance for development within the study area.

3.5.2 DEVELOPMENT FUNDED BY PUBLIC INSTITUTIONS

To improve funding situation for land development projects fund can be arranged through the participation of public organizations. Public individuals will like to invest in land development projects under government umbrella. In this case land development projects will be undertaken by any public agency and fund will be obtained through government bond. The project has to be implemented within the scheduled date. Very high level of managerial skill will be needed for implementation of these types of initiatives.

3.5.3 PUBLIC-PRIVATE PARTNERSHIP

Funding through Public Private Partnership (PPP) scheme is becoming one of the important funding sources of development projects, especially projects of infrastructure development. PPP may be defined as a contract between a public sector agency/development authority/municipality and a private party wherein the private party undertakes greater financial, technical and managerial risk in the designing, financing, building and operation of a project. In PPP arrangement private party may perform the institutional/municipal function or private party assumes the public property for its commercial purposes. In the process, arrangement may take the form of private party receiving payment from the agency/municipality for the services or private party directly collecting fees or charges from the uses for the service or a combination of the two. In the Sabrang TP, proposals for Parks, Amusement Park, beach developments, Golf Course or Framing Land have been made to be implemented preferably through PPP arrangement.

3.6 INVESTMENT BY THE FOREIGN INVESTORS

Development through foreign fund will be one of the main sources of investment under the project. Investors from all over the world will be invited to invest under the project. Government should provide different types of tax deduction and other types of benefits to make foreign investors interested to invest under the tourism park project. Provision of efficient transportation system and adequate safety/security will encourage people to foreign investors to invest in hotel construction and

other types of related activities. Port facility improvement projects and construction of the new roads in the project area will be dependent on the availability of foreign fund.

3.7 COMMERCIAL PROJECTS

Proposed master plan will have a significant number of restaurants, hotels, shopping malls etc. commercial facilities. These commercial projects will be able to attract a significant number of investors from both foreign and domestic sources. Specialized commercial Development projects can be undertaken within the boundary of the tourism park. This can also be done in the private sector. The government and private agencies both must fulfill their responsibilities and they must be equally responsible in the case of implementation of commercial projects.

3.8 DEVELOPMENT CONTROL

Prevention unauthorized and unlawful development in surrounding areas of the tourism park is a crucial issue especially along the Marine Drive road. Unauthorized development will deteriorate entire living condition of the tourism park. This area is also home to several endangered species and uncontrolled development might create environmental imbalance. Any unauthorized or unlawful development within and beyond the tourist park should be controlled to fulfill the aim of planned development of the tourism park.

3.8.1 RESTRICTION ON THE USE OF LAND CONTRARY TO THE PLAN

According to the proposed master plan, developments related to the tourist park will be permitted. Any type of development related to housing or industrial development will be prohibited. Laws should be equally applicable for both public and private sector within the boundary of the master plan proposal. Legal actions must be taken by the BEZA in the case of any violation related to construction related activities. No compensation shall be payable to any person owing to the demolition of any construction made in violation of the plan provisions.

3.8.2 BUILDING PERMISSION AND CONSTRUCTION APPROVAL

Development control mechanism will be one of the major plan implementation instruments to be carried out through the Building Construction Act BEZA, 2017 and the proposed master plan. The Plans proposes a number of development projects and entire land boundary has been already acquired by the BEZA.

Surrounding areas of the project are predominantly agricultural and major initiatives must be taken to ensure development in these areas in balance with the proposed tourism park. No development in these lands by their owners will be allowed without the approval of the local government of this area. BEZA should be monitor the development works beyond the Tourism Park area to smooth functioning of the tourism park. BEZA in coordination with other stakeholders should take necessary initiatives to implement proposal provided under the plan. Landowners might receive a financial or another form of compensation in applicable cases.

3.8.3 PARKING IN COMMERCIAL AND MIXED-USE AREAS

According to the Bangladesh National Building Code (BNBC) 2017 and the Building Construction Act 2008, there is the specific rule in the case of controlling parking related activities in the commercial and residential area. In the BC Rules 2008, specific provisions are made for parking in housing and commercial areas. But no provision has been suggested for mixed-use areas. According to the rules in a commercial area, 23 sqm area has to be reserved for every 200 sq. m of commercial space. The BC Rules for parking in the commercial area can also be applied for mixed-use areas under the current plan. These standards will be properly implemented during master plan implementation phase. New developers must also provide a detailed parking plan during taking permission for building construction from the responsible authority.

3.9 PUBLICITY OF THE PLAN DOCUMENTS

Making local agencies and local people aware of the master plan project related activities are a crucial part of the project. It will not only increase public participation during project implementation phase, but it will also decrease project expenditure. Distributing of leaflets is an easy way to generate public awareness. To create awareness among the general public, the plan documents must be widely circulated. Copies of plans and reports should be made available for purchase by the local people. The copies of plan documents should also be sent to public offices of the local governments. This is necessary to make the agencies aware of their responsibilities to coordinate their projects as per provisions in the plan. Seminars can also be arranged with notable public speakers to make local people more aware of the development related activities. This will strengthen governance by enabling stakeholders participating in the planning and development process. Uploaded Master Plan in BEZA website is also a way of publicity for the Master Plan not only for local stakeholder but also to attract investors to invest in Tourism Park. The consultant's team are prepared a promotional video to attract investors and tourist in the tourism park.

3.10 CAPACITY BUILDING OF THE BEZA

BEZA will set up a local office to directly participate in development related activities and to provide technical support to all the stakeholders. BEZA should have administrative building to monitor the development works and to control the violation of Master Plan.

Use of modern technology during tax collection and to keep track of development-related activities are a might decrease workload and it can also save a lot of financial resources. Automation in mapping, planning and database creation using computer technology like GIS can enable quick retrieval, updating, and presentation of maps and numerical data. Use of modern technology will increase efficiency in planning and record keeping and expedite the decision-making process of the BEZA. The online server might also be created to provide an updated version of project related activities so that responsible authorities and the general public can keep a track of project development related activities.

4 DEVELOPMENT MANAGEMENT POLICIES

4.1 STRATEGIC MANAGEMENT

Development Management Plan proposals cover the entire area of Sabrang TP. The Master Plan is prepared for the whole Sabrang TP which is situated on the Bank of Bay of Bengal. The proposed master plan for Sabrang TP is considered the geographical advantages, environmental sensitivity, existing infrastructure facilities and socio-economic condition of the Teknaf region and potentiality of the Tourism sector in and around the Cox's Bazar District. The tourism park is ecological sensitive area so that the development and development control of the island will be more sophisticated and eco-friendlier. The Strategic Management of the area is prepared for the broad level development control of the Sabrang TP. The Strategic Management Policies are given below.

- The Sabarng TP is strictly prohibited outsider public vehicle, only personal vehicle is allowed in the tourism park. The parking facilities of those vehicle will be provided by the individual plots.
- Tourist can reach Tourism Park from other region of the country by using Marine Drive, people also can reach this park by water vessel or helicopter. Jetty are separated from the tourism park so that jetty can serve for the whole region not only for Tourism Park. Entry and exit point of Jetty are different from the main entrance of Tourism Park. Direct entry from Tourism Park to Jetty are strictly prohibited to maintain safety and security of the Tourism Park.
- The Sabrang TP area should be protected by a primary buffer with deep vegetation to secure land erosion and safety. The local mangrove species like Shiakul, Arjun, Shirish, Hogvine, Bhatia, Babla, Garjan, Baen, Chaplasha, Kakra and Ukhsi/Gesolota are recommended to create deep vegetation which also help to preserve local ecosystem of the Park;
- Embankment is proposed beside the Bay of Bengal to protect from tidal surge of the tourism park. Vehicle are not allowed in the embankment to maintain the sea side view of the park.
- 50% of the total area should be buildable area used for civic facilities only;
- Construction of multi-stored building are strictly prohibited. The height restriction of the park is varying according to sea side view, any development above the height is not permissible;
- The activities should be concentrated within specific zones of the site rather than spreading out;
- Proposed land uses like residential/hospitality, common facilities, transportation, utilities should be developed environment friendly and green technology like solar energy, rain water harvesting are suggested for development of any plot;
- Any development works will be taken in the tourism park which should be social, environmental and culturally match with the local area.

4.2 LAND USE MANAGEMENT

Land use management is a crucial issue to implement a master plan as per its vision, objective and aspiration. Effective land use management will help to protect haphazard growth also from unnecessary growth. The theme, vision of the master plan will be reflected at the time of implementation if proper land use management policies are taken. BEZA will control the development

of the tourism park as per the master plan and its land use management plan. The investors should be following the prescribe broad land use and its permitted land use to development their plots. The vision, value proposition, permitted use are describe in this section which will give guideline for BEZA at the time of development and development control.

The Sabrang TP is divided into 3 blocks, each block contains different type of plots which will helps BEZA to implement Master Plan in a systematic and organized way. Every usable plot contains a unique number which will help to provide allotment of the plots. The number of plots and land use of each block are given in Table 4-1 and shown in Map 4-1.

Table 4-1: Description of Blocks

Block No	Number of Usable Plots	Land Use Category
Block A	46	Administrative office, Jetty, Bus Depot, Beach Side Resort & Hotel, Lake Side Resort & Hotel (North), Boating and Shopping, Rest Room and Wash Room, Disaster Management Centre, Electrical Sub-Station-1, Hospital, Park-1, STP-1, Tourist Police Station and Fire Station, Bio-gas Plant and Framing Area
Block B	59	Amphitheatre, Amusement Park, Beach Side Resort & Hotel, Economy Hotel, Helipad, Lake Side Resort & Hotel (South), Jhau Forest, Liberation War and Amusement Museum, Park-2, Rain Water Harvesting Pond, Security and Service Zone, Shopping District, Solid Waste Centre, STP 2, Transportation Hub, Watch Tower and Restaurant, Water Reservoir
Block C	19	Beach Side Resort & Hotel, Electrical Sub-station 2, Golf Course/recreational space,, Old Age Home, Power Plant and Gas Station, Security Zone, Service Studio Apartment, South Watch Tower, STP-3, Welfare Centre.

Note: Lake, Road, Embankment and beach area are not considered in the plot numbering.

4.2.1 TYPE OF LANDUSE

The Sabrang TP is designation into various types of landuse zones according to theme, vision, current trend of tourism demands and geographical context of the site. The volume of open space and green area indicates that the tourism park master plan is prepared in context of sustainable development goals. The ecology and eco-system of the area given high priority of the master plan. The land use zones proposed in the Sabrang TP Master Plan are given Table 4-2.

Table 4-2: Land Use Category of Sabrang Tourism Park

Zone Number	Zone Name
Zone A	Residential/Hospitality Zone
Zone B	Administrative Zone
Zone C	Common Facilities
Zone D	Institutional Zone
Zone E	Utility Zone
Zone F	Transportation Zone
Zone G	Waterbody and Open Space

LAND USE ZONE

Map 4-1: Block wise Land Use Map of Sabrang Tourism Park

4.2.2 ZONE A: RESIDENTIAL/HOSPITALITY ZONE

4.2.2.1 VISION OVERVIEW

Residential/Hospitality Zone is intended primarily for giving world class accommodation for the Foreign and National Tourist. The Residential/Hospitality Zone is proposed to provide different categories accommodation facilities like 5-star hotel facilities on beach side and lake side, general hotels for budget/backpacking tourist and service studio apartment/high rise apartment for long stay tourist. The hospitality zone may also include a range of other uses particularly those that have essential to spend daily life and recreation such as laundry shop, beauty and health centre, Kid's play lot, swimming pool, small scale community gathering facilities and so on. Limited commercial facilities within this zone shall be allowed and developed as an integral retail unit (Map 4-2).

4.2.2.2 VALUE PROPOSITION

The prime objective of this zone is to provide the space for accommodation as well as to meet the daily needs of the tourists. The value proposition of this zone is:

- Zone A will provide accommodation facilities for short stay, long stay, business and budget tourist.
- Zone A will provide for tourist accommodation facilities, associated services and to protect and improve hospitality facility.
- Zone A will provide facilities for business tourism; business meeting, conference for the multi-national company, environmental research team, retirees living, bird lovers and holiday homes.
- Improve the quality of conventional accommodation facilities and strengthen the existing hospitality facilities of the country.
- Control unscheduled development on individual lots or tracts, promote economical and efficient landuse.
- Provide for a variety of accommodation facilities to improve current and future hospitality facilities.

4.2.2.3 LANDUSE DESIGNATION

The land use designation of the Zone A is Residential/Hospitality. This zone is divided into different sub-zones like Beach side hotel/resorts, lake side hotel/resorts, general hotels and service studio apartment.

4.2.2.4 ZONING

The permitted uses within the residential/hospitality zone are:

- Hotel
- Cottage
- Resort
- Service Studio Apartment
- Assisted Living or Elderly Home
- Tourist Home or Resort
- ATM Booth
- Amusement and Recreation (indoor)
- Assisted Living or Elderly Home
- Barber Shop
- Beauty and Body Service
- Cleaning/Laundry Shop
- Community Centre
- Cyber Café
- Coffee Shop/Tea Stall
- Community Hall
- Day care Centre
- Drug Store or Pharmacy
- Fast Food Establishment/Food Kiosk
- Employee Housing (Guards/Drivers)/Ancillary Use
- Fitness Centre
- Gaming Clubs
- Retail Shops/Facilities
- Landscape and Horticultural Services
- Mosque, Place of Worship
- Newspaper Stand
- Pipelines and Utility Lines
- Parking
- Small Children Park
- Water Pump/Reservoir
- Woodlot
- Flowers, Nursery Stock and Florist Supplies
- Plantation (Except Narcotic Plant)
- Temporary Rescue Shed
- Waterbody

4.2.2.5 SPECIAL FEATURES

The Special Features of this zone are:

- Direct Road access are provided to reach plots.
- Beach Side plots height limitation are low to ensure visibility of Bay of Bengal.
- All residential/hospitality plots are well distributed all the tourism park and tourist can enjoy sea without any obstruction and nearby recreational facility.
- On-street parking are totally discouraged. Every plot should have own parking space for private vehicle parking.
- Service Studio Apartment are proposed to ensure long stay of the tourist and it will inclusive zone for the long stay, education tourism and corporate conference. This zone is designated in a concept that all facilities which is necessary for living will be available in this zone so that long stay tourist can take benefit those facility (Figure 4-1). Common restaurant facilities, Laundry, Outdoor gaming facilities, small shopping facilities can be available in this zone.

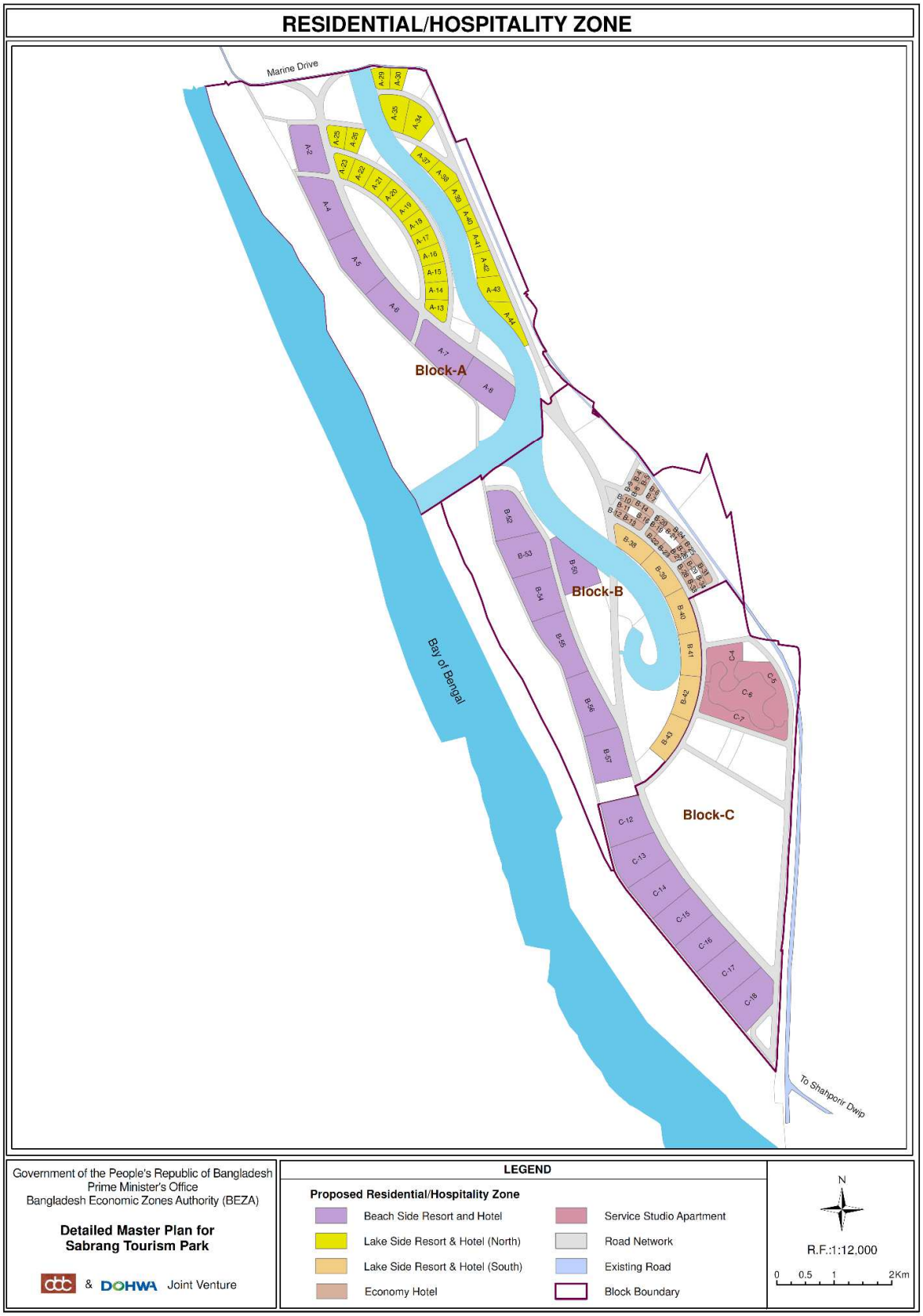
4.2.2.6 SPECIAL ENVIRONMENTAL GUIDELINES

The Special Environmental Guidelines are provided below:

- Tourist Buses are recommended to ensure easy movement of the tourist within the tourism park and also ensure environmental friendly tourism.
- Beach side plots building height is recommended maximum 50% building coverage to ensure the accommodation facilities of tourist within natural ecosystem.
- The ground floor shall be kept open to protect water level rise or use of emergency evacuation for Cyclones or other Natural hazards.

- Around 50% area of this zone shall be open space so that the bio-diversity of the zone remains unaffected. This shall create a natural abode for the birds.

Figure 4-1: Proposed Layout of Service Studio Apartment of Sabrang Tourism Park



Map 4-2: Zone A: Residential/ Hospitality

4.2.3 ZONE B: ADMINISTRATIVE ZONE

4.2.3.1 VISION OVERVIEW

Administrative Zone will house the administrative as well as business offices of the Tourism Park. BEZA's administrative office, Disaster Management, health centre, Service and security facilities are included in this zone. This zone is proposed to provide safety, security and support to enjoy their vacation smoothly in the tourism park (Map 4-3).

4.2.3.2 VALUE PROPOSITION

The prime objective of this zone is to provide administrative, safety and security facility for the tourist. The value proposition of this zone is:

- Zone B provide administrative facility for investors as well as for tourist. All types of administrative facility, internet hub, help desk to function smoothly of the tourism park.
- Zone B provide safety and security facility for the tourist. 24 hours surveillance facility are providing to provide security of tourist.
- Fire station and health facility will provide safety net of the tourist.
- Digital kiosk facility will guide tourist to easily moving the tourism park, information of different event, weather forecasting, transportation information and other information will provide tourist to take decision easily. Free WIFI zone facility also provided in this zone to connect each other through internet.
- Disaster Management Centre will provide emergency response at the time of disaster.

4.2.3.3 LANDUSE DESIGNATION

The land use designation of the Zone B is administrative zone. This zone is divided into sub-zones those are: Administrative Area, Tourist Police Station and Fire Station, Security and Safety Zone, Disaster Management Centre and Hospital etc.

4.2.3.4 ZONING

The permitted uses within the Administrative Zone are:

- Park Management Office
- Administrative office
- Controlling office
- Antique Store
- ATM Booth
- Art Gallery, Art Studio/Workshop
- Bank & Financial Institution
- Courier Service
- Coffee Shop/Tea Stall
- Confectionery Shop
- Cyber Cafe
- Cafeteria
- Library
- Fire Station
- Row Housing for service providers
- Meeting Room
- Mosque, Place of Worship
- Maintenance Structures/Areas
- Outdoor Restaurant
- Laundry
- Rest Room
- Restaurant
- Parking Facility
- Plantation (Except Narcotic Plant)
- Security Structures
- IT Office

- Health and Ambulance Service
- Police Barrack
- General Store
- Stationary shops
- Store Room
- Security Box
- Utility Lines

4.2.3.5 SPECIAL FEATURES

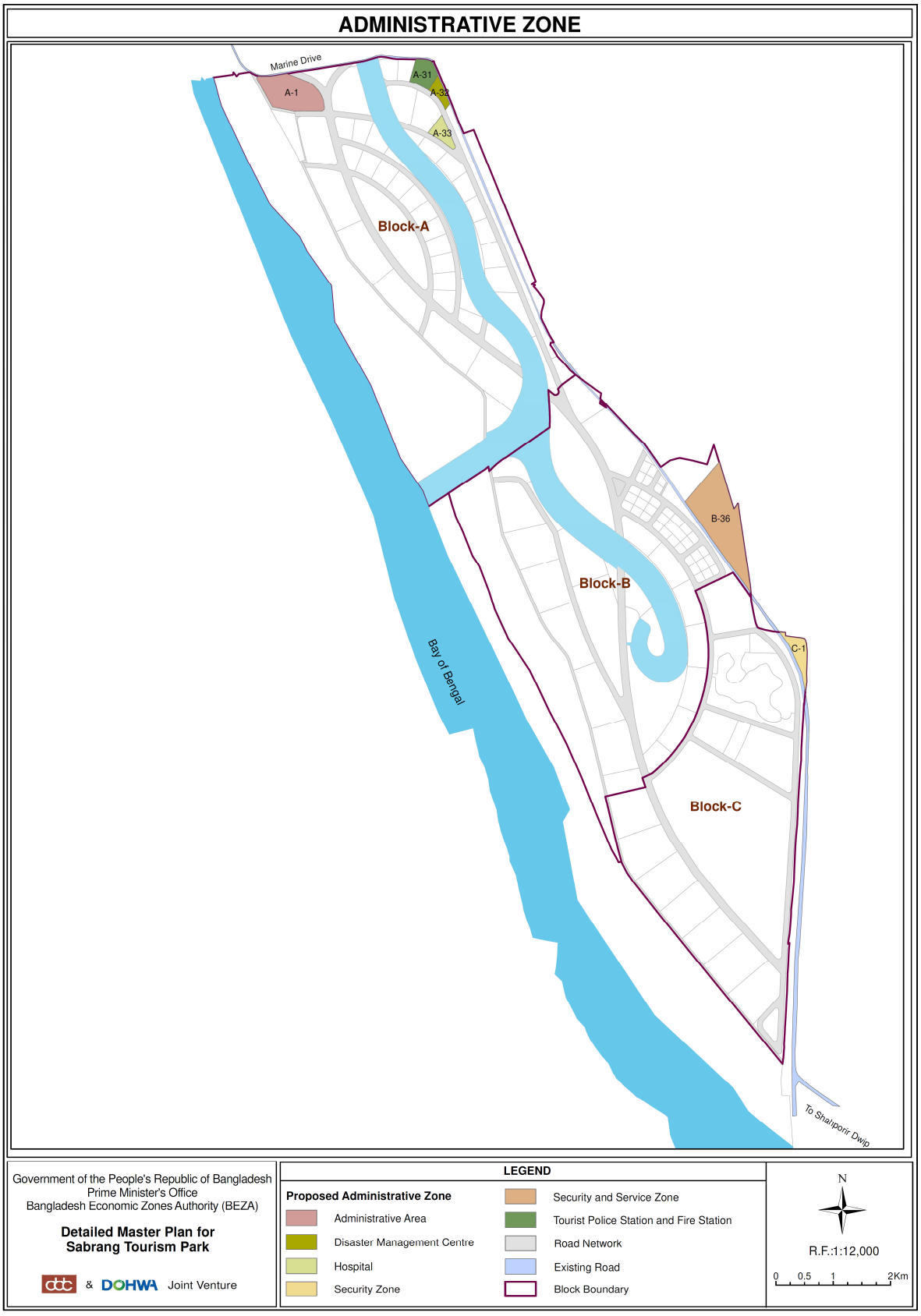
The Special Features of this zone are:

- Administrative area proposed at the entry point of Tourism Park which will provide tourist all types of administrative support at the beginning of the tourism park.
- Direct road connectivity is provided for easy access.

4.2.3.6 SPECIAL ENVIRONMENTAL GUIDELINES

The Special Environmental Guidelines are provided below:

- Tourist Bus are recommended to ensure easy movement of the tourist within the tourist park and also ensure environmentally friendly tourism.
- Administrative building height is recommended maximum G+9 storied to ensure the smooth administrative facilities of tourist within natural ecosystem.
- The ground floor shall be kept open to protect water level rise or use of emergency evacuation for Cyclones or other Natural hazards.
- Around 50% area of this zone shall be open space so that the bio-diversity of the zone remains unaffected. This shall create a natural abode for the birds.



Map 4-3: Zone B: Administrative Zone

4.2.4 ZONE C: COMMON FACILITIES

4.2.4.1 VISION OVERVIEW

The primary uses of this zone are large outdoor activities serving a larger area with large skyline. It may include sporting grounds, Parks, Outdoor recreation, Amphitheatre, Boating and Shopping, Golf Course, Shopping district, watch tower with restaurant, wood land and landscaped areas. High standard of accessibility is given in this zone. Accessibility standard is related to the use of that particular open space. The zone C will promote to develop an eco-friendly tourism park and also given facilities to enjoy the wildness of the nature (Map 4-4).

4.2.4.2 VALUE PROPOSITION

The prime objective of this zone is to provide the space for open recreational facilities, green space, international standard amusement facilities and water-based gaming facilities to enhance the natural tourism for the tourists. This zone is proposed for all kinds of tourist like day long visitor and also for night stay tourist. The value proposition of this zone is:

- The Zone C will provide, protect and improve the provision, attractiveness, accessibility and amenity value of public open space and amenity areas.
- The proposed parks will provide tourist different types of experience to enjoy tourism park. Day time visitor and night stay tourist can enjoy those parks. Those parks will provide developments compatible to the prevailing culture and lifestyle that contribute to and are incidental to the enjoyment of open space.
- This zone will be provided shopping opportunity of the tourist which will encourage local handicrafts, national crafts product and also international products. This zone will provide opportunity for the people to feel, appreciate and be part of the natural and human ecosystem.
- The Golf Course will attract golfer to live long time and spent their leisure time with the international standard facilities beside the beach. The golf course is proposed near the beach side which will provide additional value for the tourist.
- The Heritage and Liberation War museum will provide

4.2.4.3 LANDUSE DESIGNATION

The land use designation of the Zone C is Common Facility Zone. This zone is divided into sub-zones those are: Park, Shopping District, Golf Course, Amusement Park, Liberation war Museum etc.

4.2.4.4 ZONING

The permitted uses within the Common Facility Zone are:

- Amphitheatre
- Auditorium
- Administrative Office
- Aquarium
- Botanical Garden & Arbour
- Public Toilet
- Gallery
- Library
- Pipelines and Utility Lines
- Plantation (Except Narcotic Plant)

- Bus Passenger Shelter
- Boating Facilities
- Carnivals and Fairs
- Circus
- Children Playground
- Crafts Market
- Movie Theatre
- Food Stall
- Golf Course/Recreational Use
- Golf Club House
- Landscape and Horticultural Services
- Reserved Forest
- Open Air Stage for Performing Arts/Music
- Open Theatre
- Park and Recreation Facilities
- Playing Field
- Museum
- Social Forestry
- Special Function Tent
- Tennis Club
- Maintenance Store
- Shops
- Parking
- Woodlot
- Restaurant
- Mini Zoo
- Water body
- Water based sports
- Rain Water Harvesting
- Hall Room

4.2.4.5 SPECIAL FEATURES

The Special Features of this zone are:

- Golf Course/recreational use will be created additional attraction for the Sabrang TP.
- High raised building is strictly prohibited in this zone and minimum building footprint are encourage in this zone.
- Facilities proposed under this zone are well-distributed into the tourism park and well connected with the road network.
- Common Facilities are located beside the Arterial Road so that day long tourist can enjoy those facilities easily.
- Bus Routes are proposed to reach common facilities easily.

4.2.4.6 SPECIAL ENVIRONMENTAL GUIDELINES

The Special Environmental Guidelines are provided below:

- Tourist Bus are recommended to ensure easy movement of the tourist within the tourist park and also ensure environmentally friendly tourism.
- Common facilities zones building height is recommended maximum G+9 storied to ensure the adequate facilities for tourist within natural ecosystem.
- The ground floor shall be kept open to protect water level rise or use of emergency evacuation for Cyclones or other Natural hazards.
- Around 50% area of this zone shall be open space so that the bio-diversity of the zone remains unaffected. This shall create a natural abode for the birds.
- Reserved forest is proposed in the parks to protect existing natural habitation and bio-diversity of the park. Multi storied Structure are not allowed in the Natural Park, Golf Course etc. to maintain skyline line of the park and at the same to give tourist to spent time in close to nature (Figure 4-2, Figure 4-3, Figure 4-4).

Figure 4-2: Proposed Design of Park-1

Figure 4-3: Bird's Eye View of Park-1

Restaurant

Children's Playground

Reserved Forest

Open Theater

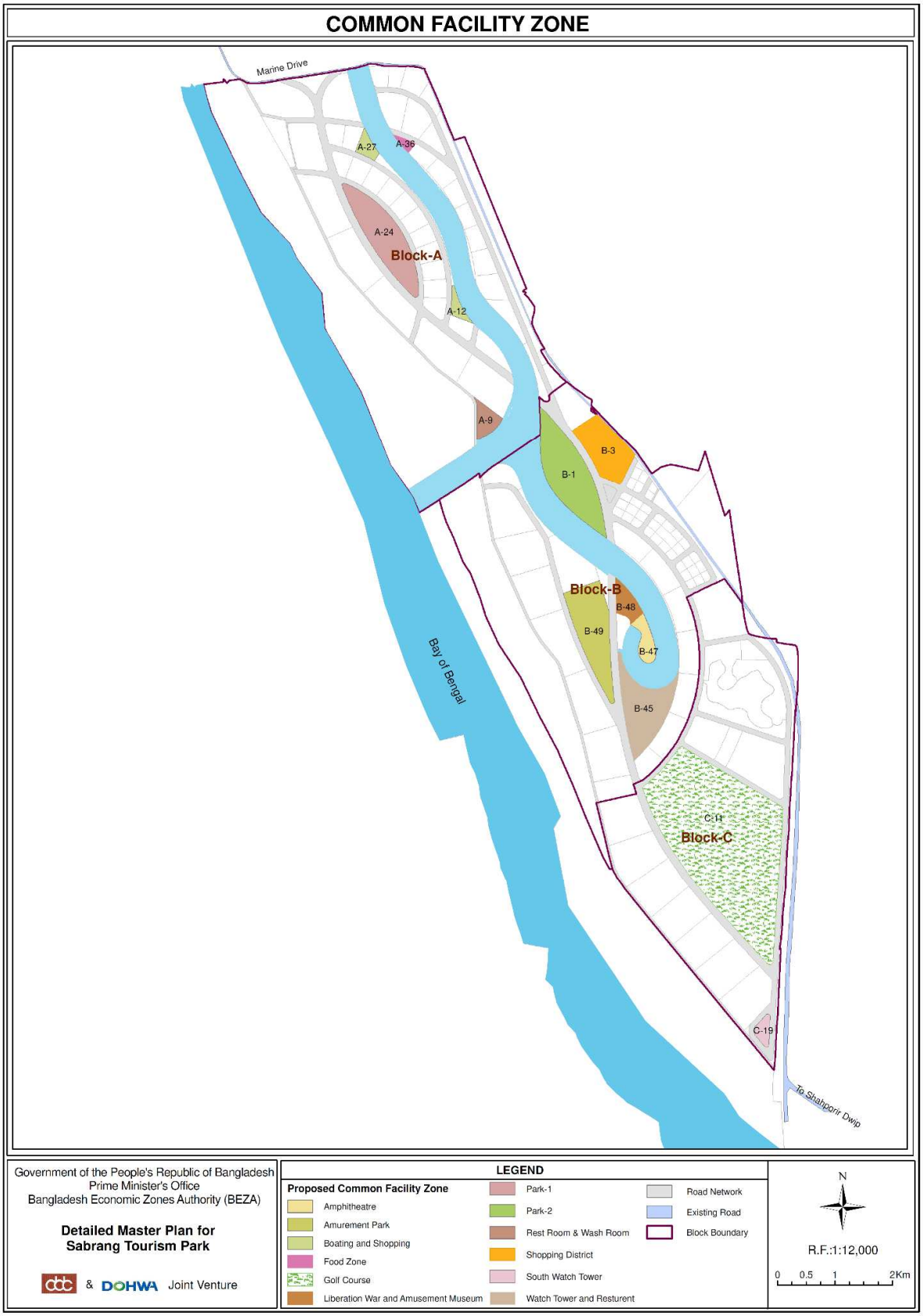
Reserved Waterbody

Crafts Market

Crafts Market

Figure 4-4: Proposed Design of Park -2

Figure 4-5: Bird's Eye View of Park-2



Map 4-4: Zone C: Common Facility Zone

4.2.5 ZONE D: INSTITUTIONAL ZONE

4.2.5.1 VISION OVERVIEW

The primary uses of this zone is to provide some exceptional facilities which are not connected directly with the tourism but this kind of zone will provide new horizon of tourism. This zone will provide for the elderly and sick people who need to spent time in healthy environment for betterment of health. This zone includes old-age home and welfare centre etc. The zone D will promote to develop tourism for all aged people and also to consider all categories of people (Map 4-5).

4.2.5.2 VALUE PROPOSITION

- Zone D provides old age tourist to live in the tourism park in long time and spent their old age/retired time in the healthy environment.
- Zone D provides welfare centre for the sick and mentally imbalance people to spent their treatment in the healthy environment. This zone provides not only accommodation facilities but also provide an inclusive management system for the sensitive people.
- This zone ensure that Sabrang Tourism Park is established all kinds of people to enjoy their leisure time in the healthy environment.

4.2.5.3 LANDUSE DESIGNATION

The land use designation of the Zone D is Institutional Zone. This zone is divided into sub-zones those are: Old Age Home and Welfare Centre etc.

4.2.5.4 ZONING

The permitted uses within the Institutional Zone are:

- Accommodation
- Auditorium
- Administration
- Dormitories
- Cultural club
- Employee Housing (Guards/Drivers)/Ancillary Use
- Fitness Club
- Parking
- Mosque, Place of Worship
- Nature Club
- Health Centre
- Pipelines and Utility Lines
- Public Toilet
- Multi Service Centres
- Council for older persons
- NGO s office supporting old persons
- Rest Room
- Service Staff
- Security Staff
- Language Club
- Volunteering for charity and provider club
- Utility Maintenance Office
- Vehicle Parking

4.2.5.5 SPECIAL FEATURES

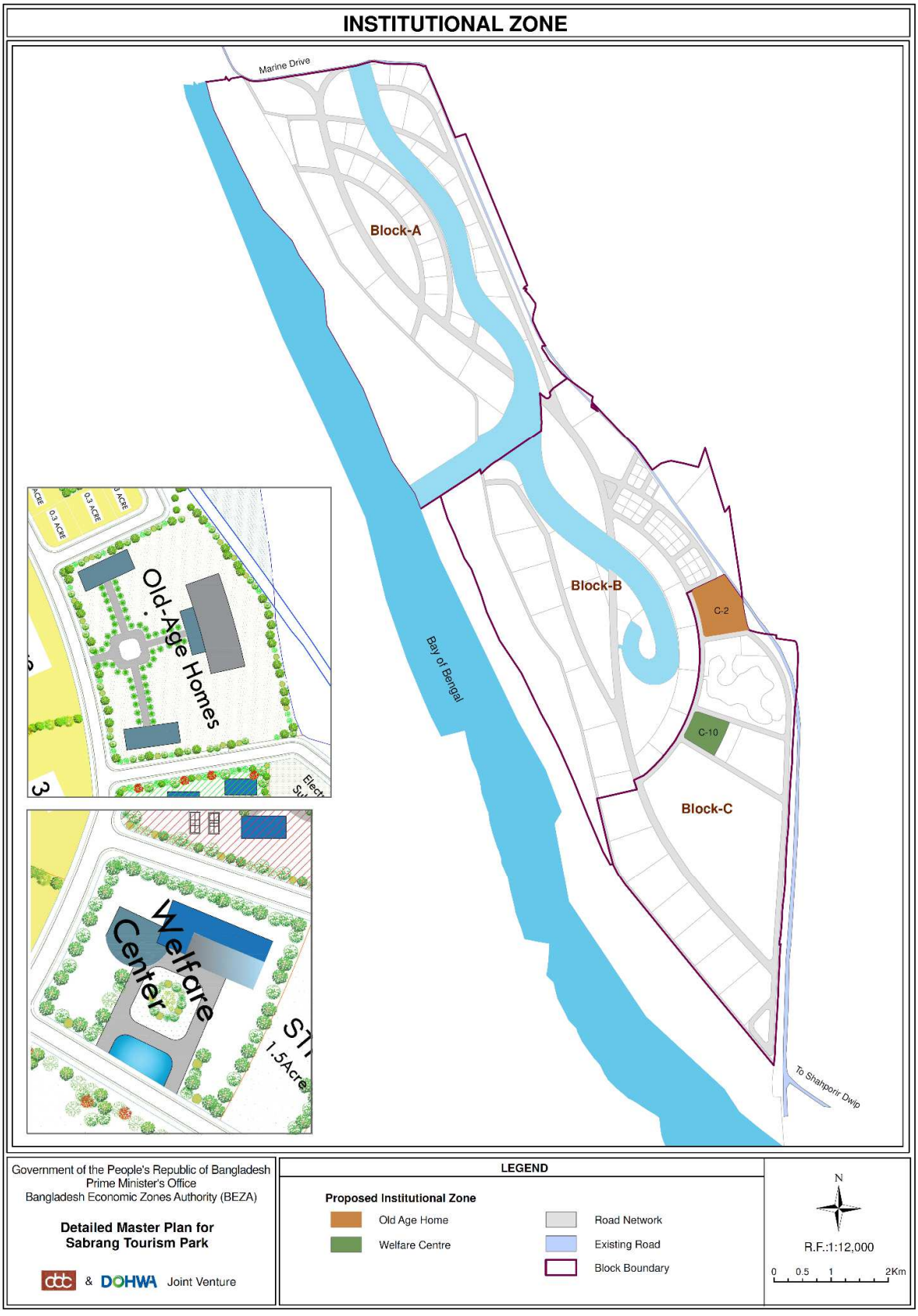
The Special Features of this zone are:

- Direct road connectivity is provided to reach the zone smoothly.
- Specific area is provided for specific utility service.

4.2.5.6 SPECIAL ENVIRONMENTAL GUIDELINES

The Special Environmental Guidelines are provided below:

- This zone must be green buffered from all the other zone.
- No heavy vehicles are allowed.



Map 4-5: Zone D: Institutional Zone

4.2.6 ZONE E: UTILITY ZONE

4.2.6.1 VISION OVERVIEW

The primary uses of this zone is to provide basic utility needs of the tourism park. This zone is well-distributed based on the number of tourists living in this park and facilities provide in this park. This zone is proposed for smooth and effective function of the activities and service are proposed for the tourist. This zone includes Power Plant, electrical sub-station, sewerage treatment plant, waste disposal sites, bio-gas plant etc. The zone E will promote to develop an eco-friendly tourism park and also given facilities to enjoy the wildness of the nature (Map 4-6).

4.2.6.2 VALUE PROPOSITION

- Zone E provides utility facilities which will help to ensure smooth functioning of the tourism park.
- Zone E provides to run the tourism park as a self-sustain park.

4.2.6.3 LANDUSE DESIGNATION

The land use designation of the Zone E is Utility Zone. This zone is divided into sub-zones those are: Power Station, Electrical Sub-station, Sewerage Treatment Plant, Waste Management Plant, Bio-gas Plant, water reservoir etc.

4.2.6.4 ZONING

The permitted uses within the Utility zone are:

- Bus Passenger Shelter
- Employee Housing (Guards/Drivers)/Ancillary Use
- Electrical Sub-station
- Fire Brigade Station
- Garbage Shorting Area
- Jetty
- Law Enforcement Facilities
- Mosque, Place of Worship
- Pipelines and Utility Lines
- Public Transport Facility
- Power Station
- Public Toilet
- Rest Room
- Sewerage Treatment Plant
- Secondary Waste Transfer Station
- Service Staff
- Security Staff
- Utility Maintenance office
- Vehicle Parking
- Water Pump/Reservoir

4.2.6.5 SPECIAL FEATURES

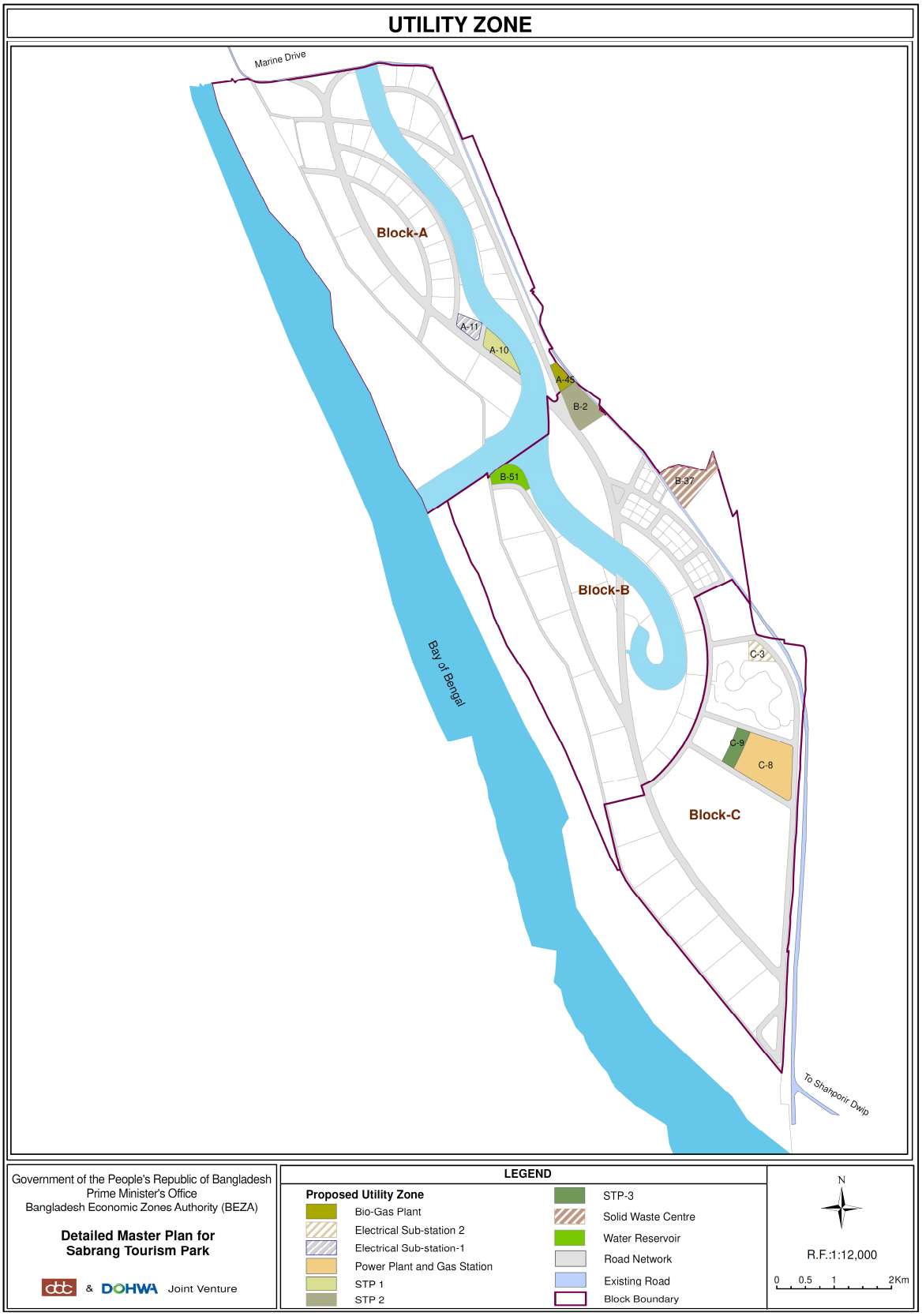
The Special Features of this zone are:

- Direct road connectivity is provided for giving services all around the tourism park smoothly.
- Specific area is provided for specific utility service.

4.2.6.6 SPECIAL ENVIRONMENTAL GUIDELINES

The Special Environmental Guidelines are provided below:

- All the service and utility facilities must be green buffered from all the other zone.
- No heavy vehicles are allowed.
- Green technology is encouraging to energy generation. Solar panels are proposed for renewable energy generation.
- STP are proposed for treatment of generated sewerage waste of Tourism Park.
- 3R technology are encourage to protect nature of the park.



Map 4-6: Zone E: Utility Zone

4.2.7 ZONE F: TRANSPORTATION ZONE

4.2.7.1 VISION OVERVIEW

The primary uses of this zone is to provide communication facilities for the tourism park. This zone is proposed for smooth and effective function of the activities and service are proposed for the tourist and also provide communication around the tourism park. This zone includes Jetty, Helipad and Bus Depot etc. The zone will promote to develop an eco-friendly tourism park and also given facilities to enjoy the wildness of the nature (Map 4-7).

4.2.7.2 VALUE PROPOSITION

- Zone F provides jetty area, helipad area, Bus Deport area which will ensure smooth communication with the Tourism Park and also with the other area of the region.
- The Jetty area provides water transportation facilities for the region. The Teknaf Region is not well connected by the waterway. The Jetty proposed in Sabrang TP will provide waterway transportation for the Teknaf region.
- The Jetty will generate tariff and create another source of income of the BEZA.
- The Jetty is located separately from the other area of Tourism Park to ensure safety of the international tourist (Figure 4-6).
- Helipad is located near the beach side resort and golf course which will provide short distance for movement.
- Bus Depot is located at the entrance of the Tourism Park to park of outside bus and at the same to get in the specific bus for the Tourism Park.

4.2.7.3 LANDUSE DESIGNATION

The land use designation of the Zone F is Transportation Zone. This zone is divided into sub-zones those are: Jetty, Bus Depot, Transportation Hub and Helipad etc.

4.2.7.4 ZONING

The permitted uses within the Service and Utility zone are:

- Coffee Shop/Tea Stall
- Helipad
- Mosque, Place of Worship
- Bus Parking
- Transportation Hub
- Jetty
- Waiting Area
- Souvenir shop
- Restaurant
- Passenger Shelter
- Pipelines and Utility Lines
- Public Toilet
- Rest Room
- Small shop
- Tourist bus stoppage
- Shuttle Car Service
- Bicycle Rent Service
- Woodlot
- Vehicle Maintenance and Repair Shop

4.2.7.5 SPECIAL FEATURES

The Special Features of this zone are:

- Jetty provided new waterway of Teknaf Region.
- All transportation facilities are well connected by Arterial and Feeder Road.

4.2.7.6 SPECIAL ENVIRONMENTAL GUIDELINES

The Special Environmental Guidelines are provided below:

- Low Carbon vehicle are allowed in the tourism park to protect carbon emission of the park.
- Bus route are recommended to reduce traffic generation of the tourism park.
- Green belt should be providing the boundary of the zone to reduce noise pollution and separate from the other facilities of the tourism park.
- The building height of the zone is recommended within G+9 storied to ensure the tourism within natural ecosystem.
- The ground floor shall be kept open to protect water level rise or use of emergency evacuation for Cyclones or other Natural hazards.

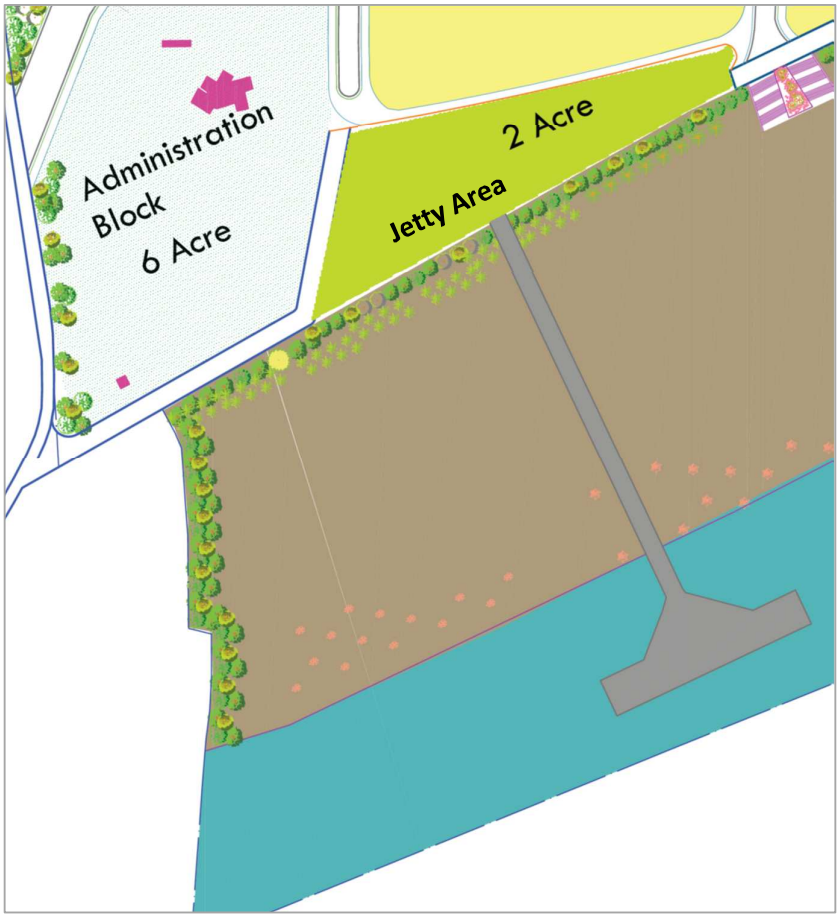
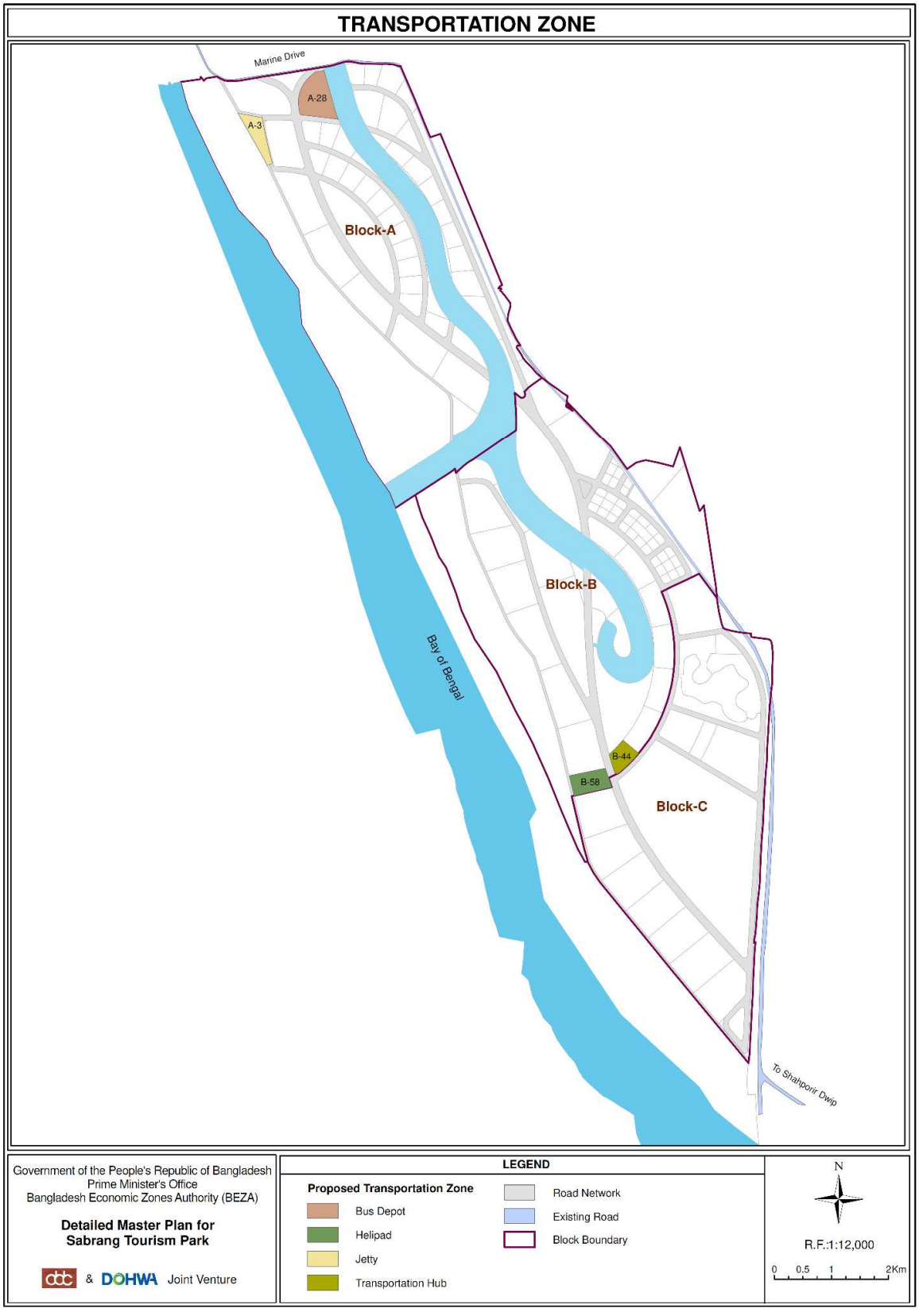


Figure 4-6: Jetty Location of the Sabrang Tourism Park



Map 4-7: Zone F: Transportation Zone

4.2.8 ZONE G: WATERBODY AND OPEN SPACE

4.2.8.1 VISION OVERVIEW

The primary uses of this zone are large outdoor activities serving a larger area with large skyline. It may include sporting grounds, outdoor recreation, wood land and landscaped areas. High standards of accessibility are given in this zone. Accessibility standard is related to the use of that particular open space. The zone G will promote to develop an eco-friendly tourism park and also given facilities to enjoy the wildness of the nature (Map 4-8).

4.2.8.2 VALUE PROPOSITION

The prime objective of this zone is to provide the space for open recreational facilities, green space, and water-based gaming facilities to enhance the natural tourism for the tourists. The value proposition of this zone is:

- The Zone G will provide, protect and improve the provision, attractiveness, accessibility and amenity value of public open space and amenity areas.
- The Zone G will allow only the developments compatible to the prevailing culture and lifestyle that contribute to and are incidental to the enjoyment of open space.
- This zone is encouraging open space that gives opportunity for the people to feel, appreciate and be part of the ecosystem.
- The Zone G provide Jhau forest beside the sea which will be the abode for birds and also maintain the beach ecosystem of the park.
- The proposed elevated walkway in the Jhau Forest to enjoy the scenic beauty of nature.

4.2.8.3 LANDUSE DESIGNATION

The land use designation of the Zone G is Waterbody and Open Space. This zone is divided into sub-zones those are: Jhau Forest, Beach Area, Farming Area, Lake and Rain water harvesting pond etc.

4.2.8.4 ZONING

The permitted uses within the open space and water body zone are:

- Botanical Garden & Arbour
- Carnivals and Fairs
- Circus
- Landscape and Horticultural Services
- Changing Room (Male & Female)
- Open Air Stage for Performing Arts/Music
- Open Theatre
- Park and Recreation Facilities
- Public Toilet
- Pipelines and Utility Lines
- Social Forestry
- Special Function Tent
- Tennis Club
- Maintenance Store
- Woodlot
- Mini Zoo
- Water body
- Water based sports
- Rain water Harvesting
- Jhau Forest

- Plantation (Except Narcotic Plant)
- Playing Field
- Rest Room
- Office

4.2.8.5 SPECIAL FEATURES

The Special Features of this zone are:

- Existing Water body are preserving for maintain natural drainage system.
- Natural Jhau forest will encourage tourist to live in the nature.

4.2.8.6 SPECIAL ENVIRONMENTAL GUIDELINES

The Special Environmental Guidelines are provided below:

- No Motor vehicle are permitted into the zone to ensure environmentally friendly tourism.
- Elevated walkway in the Jhau Forest is proposed to maintain water flow of the area as we as tourist can enjoy forest and sea in close.

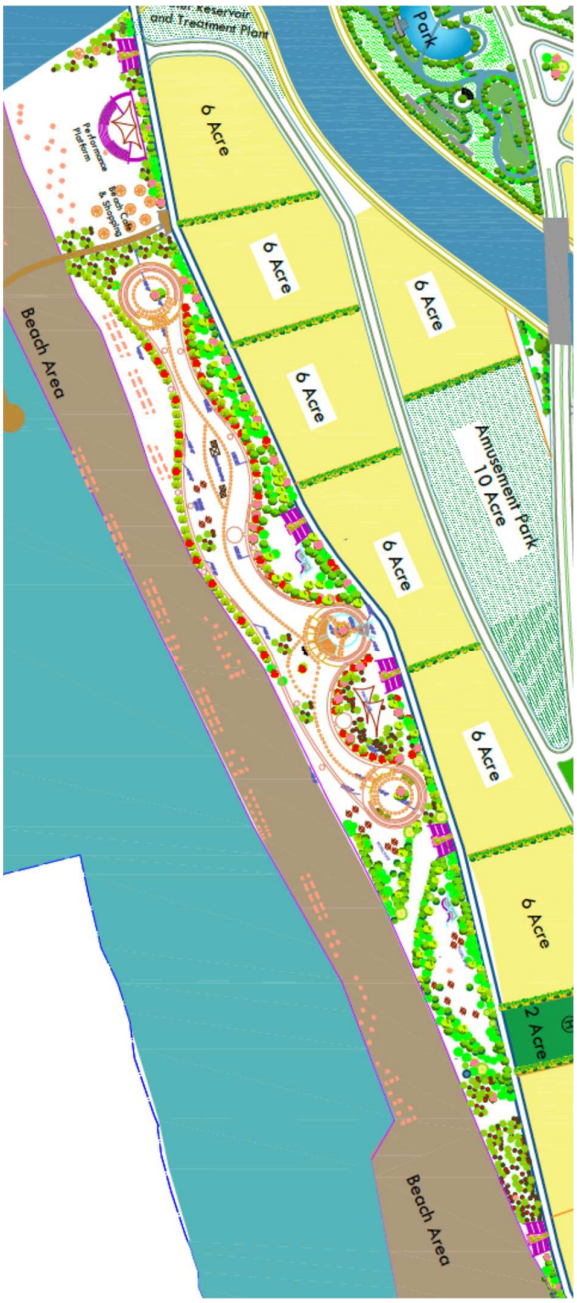


Figure 4-7: Proposed Design of Jhau Forest

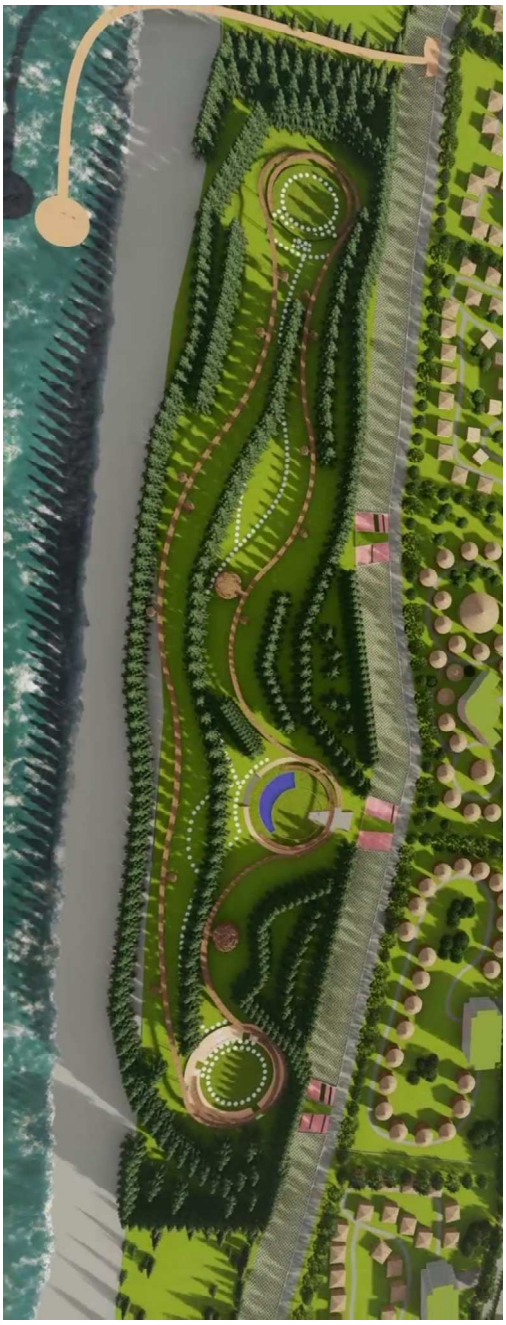


Figure 4-8: Birds Eye view of Jhau Forest

Map 4-8: Zone G: Waterbody and Green Area Zone

4.3 INFRASTRUCTURE MANAGEMENT

Infrastructure, utility services are the vital supports for the people to carry on their living. Energy, water, drainage, sewerage or solid waste management etc. are so obvious elements that one cannot think without them.

4.3.1 DRAINAGE MANAGEMENT PROPOSAL

Drainage proposal of the tourism park is to mitigation of waterlogging problem after establishment of Tourism Park. Except natural hazard such as tsunami or tidal surge, reason behind waterlogging in the project area at calm period is the result of human action. Bay of Bengal is the main outfall for the drain out of rain water through the proposed lake of the tourism park. Piped manmade road side drain is proposed to drain out of rain water.

To overcome to crate waterlogging and promote effective drainage the following proposal is made:

- Establish drainage network as proposed in Drainage Management Plan;
- Regular maintenance and management of drains should be operational;
- Connect drains with outfall through sluices at appropriate embankment points.
- Establish outlets at suitable level of isolated ponds to drain out excess water for preventing inundation of the surrounding land use.
- Existing natural waterbody should be connected with the main channel.

4.3.2 ELECTRICITY

At present electricity supply in the Teknaf Town is subject to load shedding and voltage fluctuations. However, the proposal for setting up of a Power Plant within the Tourism Park area lays the prospect of availability of uninterrupted electricity supply.

Setting up of a power plant of this capacity needs huge investment as well as time for completion of the construction work. On the other hand, mere production does not ensure the supply. Transmission and distribution lines also have to be ensured. This also needs large investment and time for construction. Due to Tourism Park, tourist come here to enjoy vacation without any harassment so that this large investment is recommended to expand to ensure effectiveness of the tourism park. In this respect the electricity generation and distribution plan are provided in the Volume –III (Infrastructure Plan). The Development management policies of the electricity management are given below.

- Supply to immediate needs first. The electricity generated in the Tourism Park should be utilized to meet the tourism park need first. Amid country wide shortage of electricity, it may be directed to national grid for supply after need the tourism park need.
- Bangladesh Power Development Board or Rural Electrification Board will be engaged with a MOU of BEZA to establishment of Power Plant and Sub-station for Sabrang TP.

- Distribution network has to be developed to provide electricity to the Accommodation facilities, transportation facilities, amusement park, heritage and liberation museum etc. on priority basis to facilitate development of tourism related activity.
- Cost of distribution network for different use shall have to be accepted by the Tourism Park Management Authority.
- Electricity should be provided at affordable price. Effective control on cost management should be established and pilferage in the name of system loss should be stopped.
- Fully air-conditioned structures should be least priority areas of electricity connectivity and price for these structures should be at very high premium rate.
- Environmentally friendly mechanism is proposed to establish Power Plant.
- Green belt is recommended surrounding of the Power Plant and Sub-station to protect other area of the tourism park from noise and flume.
- The use of renewable energy in the form of solar electricity are recommended for the Sabrang TP to ensure eco-tourism and environment friendly tourism development. Initially, it needs high initial investment but as environment friendly energy source is unlikely to become popular source of energy throughout the world.
- It is recommended to establish rooftop solar power generation in every building.

4.3.3 WATER SUPPLY

The Teknaf area and its surrounding area is devoid of any dependable source of drinking water. The Tourism Park area due to its location in the coastal zone is salinity prone. River and canal water are saline and unsuitable for human consumption. Water supply includes supply of potable water for drinking purposes and non-potable water for water-based tourism. The IWM is working to identify the source of water for Tourism Park. In Detailed Master Plan, water distribution plan is given to ensure supply of water for the competing uses. Following action may be taken to smooth distribution of water:

- Rainwater harvesting mechanisms are recommended to establishment of hotels, cottages and resort.
- Water reuse mechanisms are suggested to establishment of hotels, cottages and resort.
- Prevent saline water intrusion in to internal water bodies of the park to ensure quality of water of reserve pond.
- Proposed operation and maintenance system should be created by the concern authority of water supply.

4.3.4 SEWERAGE

Disposal of sewage from residential, commercial establishments through sewage treatment plant is recommended for the Tourism Park. The generated sewer waste are passes through pipe line in the treatment plant and after treated the waste water are discharged into the nearby waterbody and

sludge can be use as by product after certain time. The development management policies for sewerage are given below:

- Pipe line should be established with every proposed units.
- Vendors should be hired to establish STP and its maintenance.
- Green belt is recommended surrounding of the STP to protect other area of the tourism park from bad smell and noise.
- The produce sludge can be use in the Bio-gas plant as a raw material of the plant.

4.3.5 SOLID WASTE MANAGEMENT

Solid waste collection system is important to manage generated solid waste for any area. Plot to plot collection through community participation is available system in the world. In a new tourism park development, different types of solid waste will be generated from the tourist, some waste will be biodegradable and some are not. In Sabrang TP Master Plan, area are preserve for solid waste and e-waste management. The management procedure of the solid waste and e-waste are given below.

- CBO initiative has proved effective in household waste collection and it's also recommended for STP. In this system beneficiaries themselves pays for the service which reduces the burden of the BEZA. A site has been proposed for recycling and sanitary dumping of the residues after recycling.
- Every plot of the STP will use two (2) separate bins; one for perishable waste and another for non-perishable waste.
- Garbage van or truck will collect primarily separated waste from door to door. This can be done by NGO or CBO.
- Garbage van or truck will dump the waste in the landfill site.
- The landfill site will have four (4) components:
    1. Waste separation: Paper, glass, plastic, metal, electric waste will be separated from perishable waste.
    2. Composting: Part of perishable waste will go to the composting plant to produce organic fertilizer.
    3. Dumping: Remaining part of perishable waste will be dumped scientifically. Layer of compacted clay, polyethylene liner, geo-textile mat, pea gravel and soil would be laid first before dumping. Leachate collection pipe and gas collection pipes would also be laid appropriately. Waste will be dumped in layers and covered with soil.
    4. Energy recovery: Methane, generated from waste will be collected through gas collection pipe and supplied to methane facility. This methane gas can be used as fuel or can be used to produce electricity.
- Clinical and e-waste will be collected and treated separately depending on chemical composition of the waste.

In the management of wastes recommendations as listed below shall be of immense help:

Reduce Waste

- Reduce use of paper in the office by implementing a formal policy to duplex all draft reports and disseminate information through electronic media.
- Product design in such a way which need fewer materials.
- In the packaging avoid excess material but maintain strength.
- Introduce packaging return and reuse with customers.
- Use reusable containers for transportation of goods.

Reuse

- Reuse materials whenever possible.
- Reuse office stationeries in internal work accomplishment.
- Use durable daily use materials like towel, tablecloths, napkins, dishes, cups, and glasses.
- Reuse incoming packaging materials for delivery of new consignment.
- Encourage employees to reuse office materials instead of purchase of new ones as far as possible.

Adopt an ecologically sound waste management system of:

- Waste reduction
- Segregation at source
- Composting
- Recycling and re-use
- More efficient collection
- More environmentally sound disposal

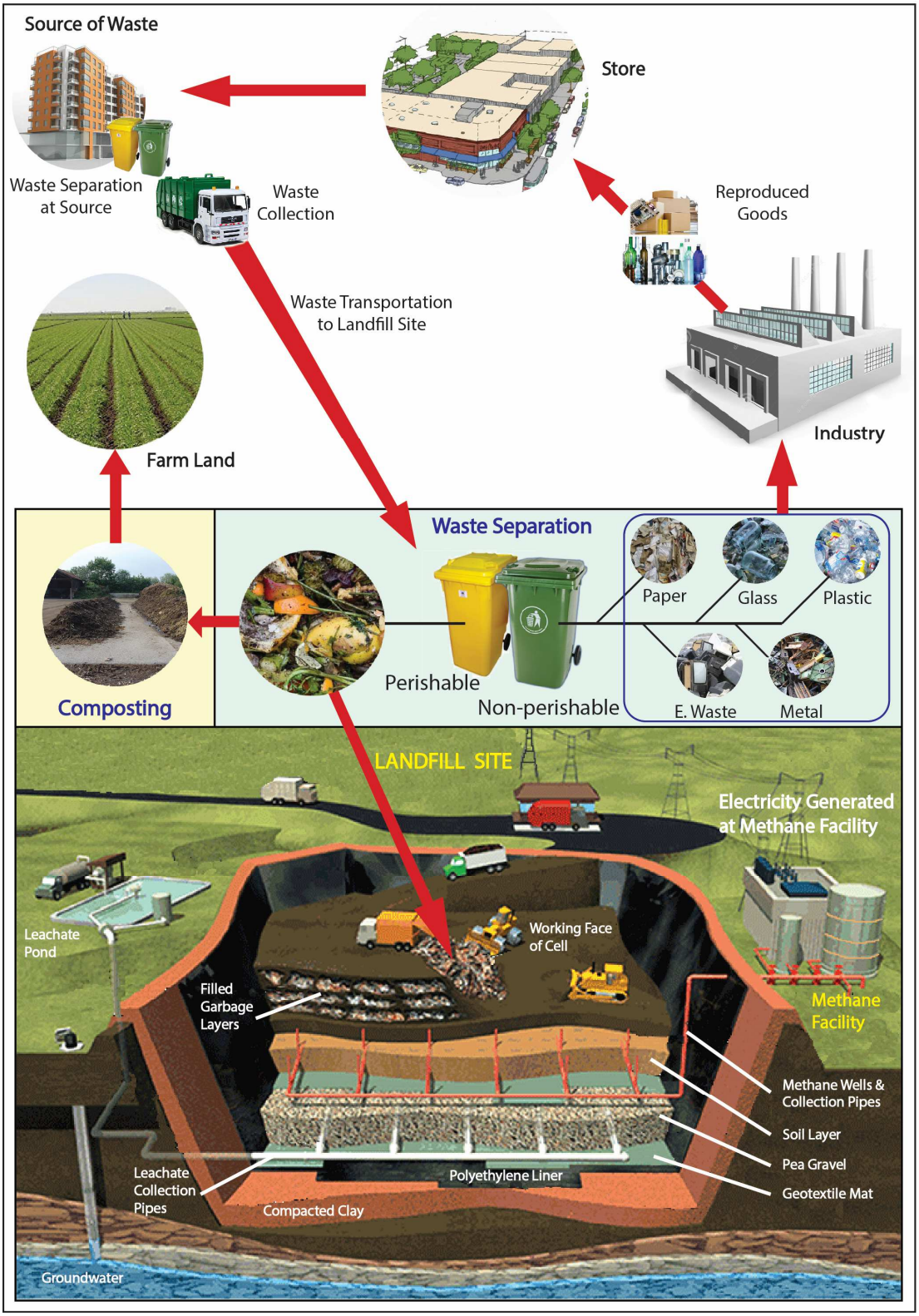


Figure 4-9: Solid Waste Management Procedure

Waste Management Hierarchy should be followed as per Figure 4-10.

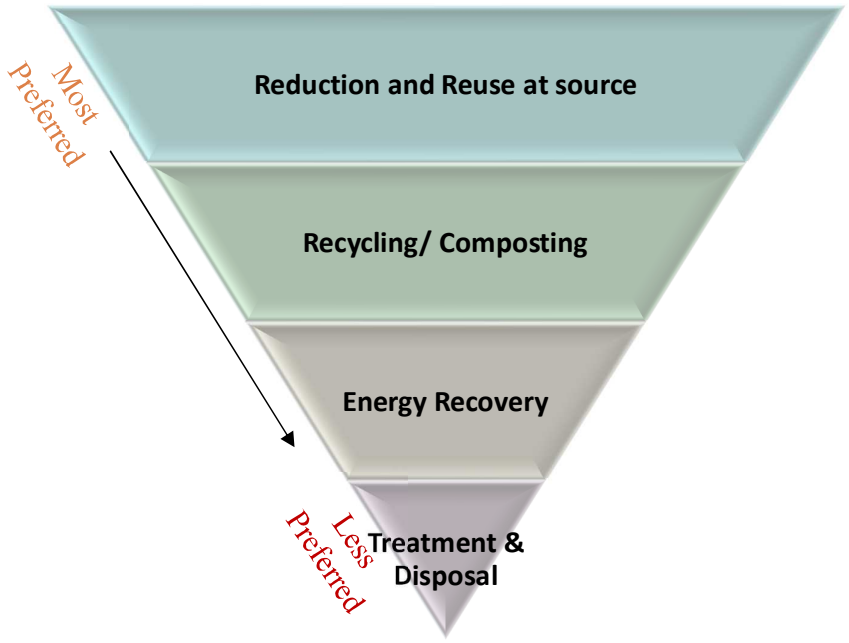


Figure 4-10: Waste Management Hierarchy

4.3.6 TELEPHONE AND INTERNET

Bangladesh Tele-Communication Company Limited (BTCL) provides terrestrial telephone service to the city level. BTCL will establish their set up to provide and maintenance Telephone and internet facilities all the tourism park. Cell phone service is provided by all the private operators of the country. Demand for land phone has substantially reduced in recent years owing to widespread introduction of mobile phone, which is handy and easier to acquire. The BTCL service is also easier and rates are cheaper now.

- To provide better service, the land phone companies need to installation of underground cables for giving smooth service to the tourist.
- A Telephone and internet hub need to be established in the administrative building of the tourism park.

4.4 TRAFFIC AND TRANSPORTATION MANAGEMENT

Connectivity is the most important aspect of development of any area. It is all the more important for the tourism park due to the location of the park. Presently Sabrang TP is connected directly with rest of the country through Marine Drive. Railway link is also underway which is 50 Km away from the Sabrang TP. In the Infrastructure Plan, proposal is given in road transport and also in air and water transport. The Traffic and Transportation Management Plan of Sabrang TP are given below.

4.4.1 ON-SITE TRANSPORTATION MANAGEMENT

Transportation Management is a crucial issue for the Tourism Park. Carbon free Bus Transport Route is proposed in Sabrang TP to ensure environment friendly transportation system. As recommendation of Master Plan and Infrastructure Plan, no heavy vehicle is allowed into the Tourism Park. Only Tourist Bus service will be allowable in the Tourism Park. The Transportation Management proposals of Sabrang TP are given below.

- Outside vehicle are parked in the Bus Depot proposed in the Master Plan.
- Tourist will use bus route for easy movement of the park.
- In Sabrang TP, low carbon tourist bus will pass throughout the park for easy movement of the tourist.
- Parking facilities of the tourist bus is located in the entrance of the park.
- In Sabrang TP, tourist also can reach tourism site by Jetty and Helicopter.
- Proper road operation and maintenance procedure should be followed in transport management.

Figure 4-11: Schematic Picture of Internal Circulation Network of Sabrang Tourism Park.

4.4.2 OFF-SITE TRANSPORTATION MANAGEMENT

Off-site Transportation Management is a critical issue in Teknaf Area. Existing transportation system is not sufficient to establish smooth circulation within city or outside the city. In Infrastructure Plan, proposal given to improve Transportation network of the town with the other part of the country. Transportation management system of the off-site transformations system mainly needed parking facilities improvement, Bus Terminal, Truck Terminal Improvement, improvement of footpath and traffic system management.

4.4.2.1 PARKING PROPOSAL

Private transports depending on the duration and regularity of parking need maybe divided into long term and short-term parking especially for the major traffic generators. Short term private MTs should have surface parking similar to public MTs.

- **Short term Parking**

Major traffic generators such as market places, offices, institutions, hospitals, sports and recreational facilities which are both origin and destination of huge traffic, must have sufficient and steady designed off road parking within its own premise. On road parking of vehicles coming to these facilities shall be strictly prohibited. Non route public transports both NMTs and MTs constitute the major share of parking demand. These off-street parking deserve surface parking at easy visible location with appropriate pedestrian link with the entry to the facility. In case of large parking, MTs and NMTs should be segregated.

- **Long Term Parking**

Long term parking need is generally for the owners, employees, teachers and students depending on the type of facility. For such long-term parking, basement or areas not suitable for any other purpose may be used.

- **Parking of heavy vehicles**

Parking of heavy vehicles such as bus, truck, etc. are generally ignored. Where this provision is not made, they are forced to park on road. Heavier transports owing to their size and manoeuvring requirements create huge congestion in the nearby road. Yards for large vehicles of appropriate size is recommended in outside the city area. However, for commercial zones in the city area, dual use of existing parking during night is recommended.

- **Standard Parking Types**

Standard parking types are universally accepted and practiced worldwide. Their layouts are available in almost all 'time saver' standards. Although many parking options are available depending on the angle the vehicle create with the edge of the parking lot, there is no standard number of parking to suit variable parking demand. However, the most appropriate type and number of parking for particular situation may be adopted depending on the traffic volume, vehicle diversity and duration of parking. Importantly, all parking lot must keep provision for the physically challenged, especially wheel chair users.

4.4.2.2 ROUTE BASED PUBLIC TRANSPORT PROPOSAL

Route based public transport service is the backbone of any city transport system. Depending on the size and shape of city and travel demand in the transport corridors transport routes and means of transport are determined. Due to absence of formal public transport, some route based easy-bike trips are carried out informally maintaining connectivity among important city nodes. Several routes based public bus service sufficiently covering the core area has been recommended. Although routes using smaller vehicles are expected to complement the bus route once realized, at present it is too early to visualize such routes and therefore not recommended.

- **Route based Public Bus Service Proposal**

Route based Public Bus Service is recommended around the city and across the city on major arterial roads connecting important traffic generating areas. It is expected to bring the Public Bus can reach tourist in the city and other tourist spots within core area down to less than 20 minutes' walk.

- **Bays for Route-based Public Transport**

Route-based public transport is comprised of bus, minibus, tempo etc. 'Bay' is developed at the stoppage points with provision of passenger shades and ticket counters depending on passenger load. Elaborate bus bay to suit the road sections at bus stoppages of Teknaf City is propose. For route-based smaller public transports simple bays curved out beside the road are recommended. Such bays are proposed to be developed by the Paurashava as soon as the route permit is issued and stoppages are earmarked for certain route.

Figure 4-12: Proposed Bus bay on major bus routes

4.4.2.3 ROAD-TRANSPORT INFRASTRUCTURE PROPOSAL

Presently two bus terminals and one truck terminals are operating within the urban core area of Teknaf city. Problems most of the terminals facing are: inadequate yard space, or dilapidated terminal building, lack modern facilities including hygienic toilet. Apart from these problems, the one grave drawback common to all these terminals is that they bring in large number of buses and several times smaller vehicles in to the urban core contributing largely to city's congestion. With the increase of economic activity this problem will multiply.

Like bus terminals condition of truck terminals lack acceptable location, yard space, retiring space and toilet facilities. To ensure location suitability, adequate area and to set the city road system free from incremental congestion all of the existing facilities needs to be abandoned.

Bus and Truck Terminals

Complete rebuilding of existing central bus terminal has been recommended and truck terminal also should rebuild.

Railway Facility Proposal

Railway is the future of transportation system in Bangladesh. Political and administrative will can easily improve the railway transportation system making it competitive over road. The under constructed nearby rail station is 50 km away from Sabrang TP. The roadway connectivity between Sabrang TP and Rail Station should be improved priority basis.

Waterway Proposal

Not only to promote waterway transportation, but also to support the drainage system of Teknaf City, it is necessary to maintain the Naf River and existing canals of the Sabrang Tourism Park. Following measures are proposed in this regard.

- Maintain water flow Naf River is recommended to play Teknaf to Saint Martin's cruise ship effectively.
- Establishment of standard jerry facilities at the Sabrang TP on the starting point of park so that the tourist of the park and Teknaf regions can take harbour facility from this jetty.

Airway Proposal

Teknaf is also not served by air way. The nearby airport is located in Cox's Bazar about 85 km north of the city. People want to avail air service have to cover distance of about one hour's journey by non-stop bus service.

4.4.3 ON-SITE TRAFFIC SYSTEM MANAGEMENT

Transportation System Management (TSM) and Operation refer to multimodal transportation strategies intended to maximize the efficiency, safety, and utility of the transportation infrastructure. Traffic system management considers the full range of options for maximizing the performance of existing transportation infrastructure without expanding the infrastructure itself (e.g., adding general purpose lanes, constructing a new interchange, etc.). Traffic system management strategies can include physical changes to the roadway, changes to how the roadway is used, and efforts aimed at reducing demand for use of the roadway (also known as Transportation Demand Management, or TDM).

TSM seeks to achieve the following options:

- Maximize the effectiveness of the use of existing infrastructure and facilities;
- Ensure reliable traffic flow and safe operation of transport;
- Address environmental goals; and
- Ensure fair allocation of infrastructure space (road space, rail slots, etc.) among competing users.

4.4.3.1 TRAFFIC FLOW MANAGEMENT

For road transport, tactical traffic management involves monitoring the actual traffic situation in real-time (including volumes, speeds, incidents, etc.) and then controlling or influencing the flow using that information in order to reduce congestion and ensure safety for passengers. There are many ways of ensuring safe and reliable traffic flow and promoting safety.

As Sabrang TP is an enclosed tourist zone with direct road connectivity by the marine drive, no outside vehicles will be considered in traffic flow management. Tourist bus is recommended to smooth movement of tourist from one place to another within the tourism park. The bus will be operated by an authorized private bus operator. BEZA will be monitor their work to giving international level service and protect mismanagement of the bus. Adequate Bus stoppage and Bus Bay will be designated to smooth function of the tourist bus. Private vehicle is allowed in the tourism park but on-street parking is not allowed within the tourism park. Parking facilities for private vehicle are provided by the plot's investors (**Map** 4-9).

4.4.3.2 AUTOMATED OR MANUAL TRAFFIC SIGNALING

Traffic signals are perhaps the earliest form of "intelligent" traffic management, aimed primarily at safety but also at managing priorities at junctions. If automated traffic signalling is not possible then the Traffic Police are needed to be well trained and informed about the rules and regulations of traffic management strategies.

4.4.3.3 ROAD MARKINGS AND SIGNS

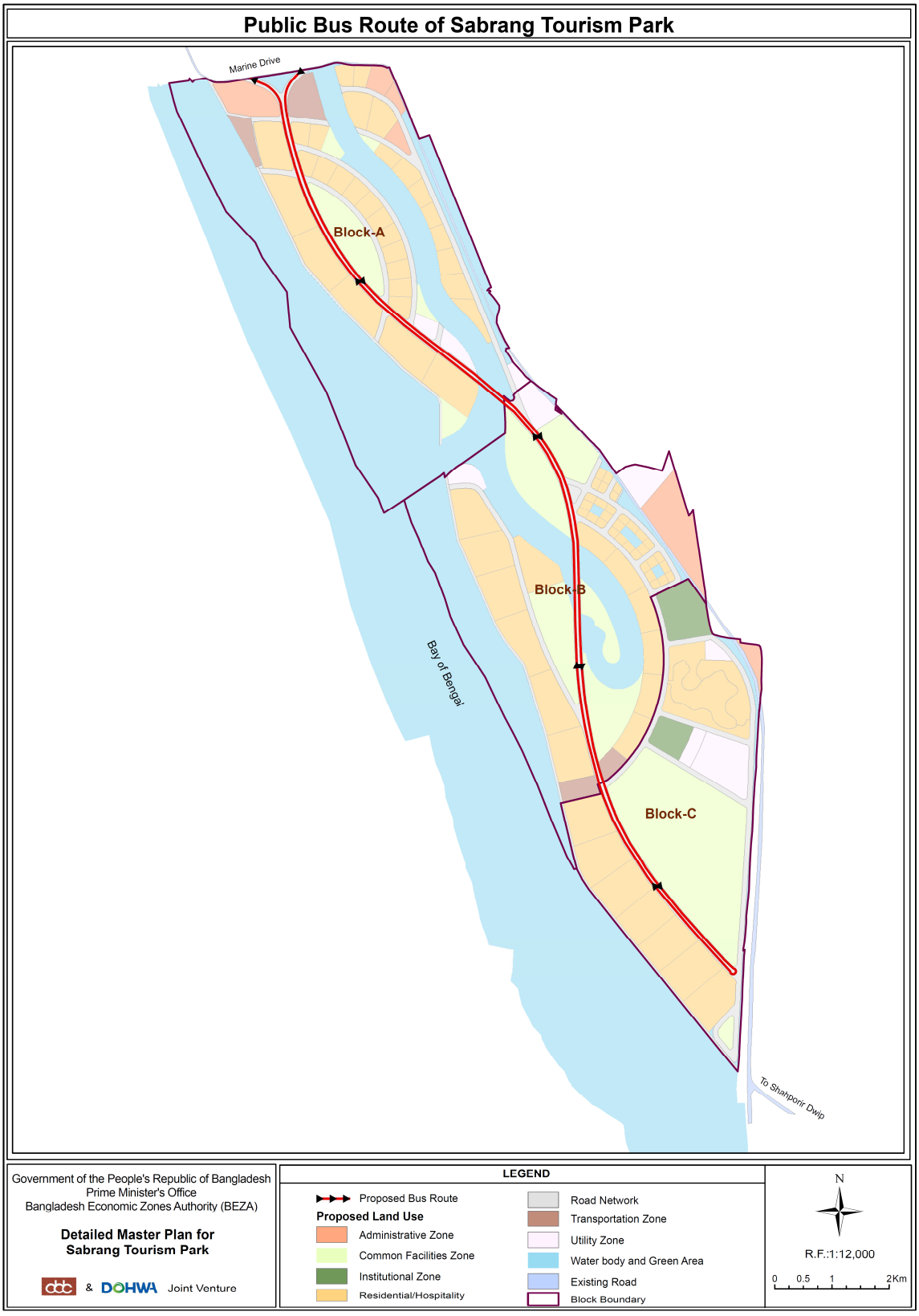
Clear and efficient signing is an essential part of the road system, and a road with poor signing or with badly maintained signs is not functioning well. Road users depend on signing for information and guidance, and road authorities depend on signing for traffic control and regulation, and for road safety. Any type of traffic signs required will be incorporated in the Sabrang TP as per Bangladesh Road Sign Manual, Roads and Highways Department.

4.4.3.4 TRAFFIC SAFETY MANAGEMENT

Major goal of this transport plan is to provide safe and reliable transport network. To accomplish the desired goal, some major strategies concerning safety of the tourists can be carried out.

T-Scale Intersection Management: For proper management of the T-Scale intersections formed at the intersection points of the on-site road network, road markings, signs and traffic signalling will be utilized.

Speed Breaker: To reduce vehicle over speeding, speed breakers will be utilized before pedestrian crossings. The speed breakers will be marked with proper road markings and signs.



Map 4-9: Proposed Bus Route of Sabrang Tourism Park

4.4.4 OFF-SITE TRAFFIC MANAGEMENT PROPOSAL

Roadway should be so designed that the MTs, NMTs and the pedestrians – all can travel quickly, economically and most important of all, safely to their desired destinations.

Safety Management

Pedestrians are the most vulnerable of all modes. Depending on the location safety varies and so does the measures. Various measures have been recommended to improve traffic safety by mitigating the adverse effect:

- Uninterrupted footpath with proper surface to ensure safe pedestrian movement.
- Channelize pedestrian traffic by creating plantation barrier on utility channel and adequate gutter depth between pedestrian path and vehicular lanes.
- Segregation of slow and fast-moving vehicles through proper geometric road section.
- Speed barriers to slow down traffic ahead of road intersections.
- Provision of effective traffic signalling system at the road crossings to avoid vehicular conflict.
- Restriction of through-traffic in residential neighbourhood.
- Visible property boundary (may be grilled) to increase security of the pedestrian traffic, especially during night.
- Blocking high beam of opposite traffic to offset potential danger of temporary invisibility leading to potential accident.

Peak Hour Management

During peak hours regular traffic congestion become unbearable in the corridors around traffic generating facilities like CBD of Teknaf Town at the evening, office block during closing. Measures recommended to keep the peak hour traffic within acceptable level include both direct and preventive provisions:

- Higher parking charge for private car at CBD or at location of peak hour congestion.
- Very high fine against illegal on-road parking on congested roads around traffic generating facilities during the peak hours.
- Road crossing design for easy and efficient traffic movement.
- Lateral access control on different roads other than access road.
- Restricting NMTs to ply on primary and secondary roads.
- Traffic management guided by standards of recommended new functional road classification.
- Applying fiscal measures to discourage buying of small personal vehicle, especially car.
- Mandatory parking provisions within the premise of the facility for all vehicles coming to the facility.

Traffic Calming

In order to maintain traffic volume, speed and noise within desirable level following controlling measures are proposed:

- Construction of speed reducing device in front of schools, bazaars, mosque, hospitals etc.
- Installing of sign posts at appropriate locations showing speed limit and prohibiting horn.

- Discourage development of facilities needing noise free environment at noise prone transport channels or crossings.

4.5 RECOMMENDED RESTRICTION

4.5.1 EMBANKMENT

Embankment is proposed on the Bank of Bay of Bengal to protect the tourism park from tidal surge and erosion of the bank (Figure 4-13). The recommendation related to Embankment are given below.

- The proposed Embankment is proposed not only for disaster protection purpose, it also use for recreational purpose. Vehicle are not allowed in the Embankment.
- Two-layer geo-bag protection are recommended to protect of bank and Tourism Park from erosion.
- Walking, Cycling, Small food stall are allowed in Embankment so that people can enjoy sea from Embankment.
- A green belt is recommended between the boundary line of Embankment and Plots.

Figure 4-13: Proposed Embankment of Sabrang Tourism Park

4.5.2 RAIN WATER HARVESTING POND

Rain water harvesting pond is proposed on the last end of proposed lake to reserve rain water and use water for gardening and other purpose (Figure 4-14 & Figure 4-15). The recommendation related to Rain Water Harvesting Pond are given below.

- The Rain Water Harvesting Pond is proposed for water purpose in general time and emergency time. Water will be supplied by piped line to each plot, this pond will provide emergency water for the Sabrang TP.
- Direct water flow will not allow in the pond, to maintain water flow pipe will be proposed.
- Walking, Cycling is allowed in on the Bank of the reserve pond.

- A green belt is recommended between the boundary line of reserve pond and Plots.

Figure 4-14: Proposed Rain Water Harvesting Pond

Figure 4-15: Schematic View of Bridge between Rain Water Harvest Pond and Bridge

5 GOVERNANCE AND DEVELOPMENT OF TOURISM PARK

To ensure proper development of Sabrang TP, BEZA must consider development at regional scale. It will include coordination with other agencies in both public and private sectors. BEZA have to follow a proper procedure to ensure the efficient supply of utility and community facilities. They have already played a pivotal role in similar scenario under several other projects. Under this chapter, we will focus on the procedure BEZA follows to deal with investors and properly run similar development projects.

5.1 SELECTION PROCESS OF DEVELOPERS

Selection process of developer/operator are governed by BEZA according to the guidelines of Bangladesh Economic Zones Act of 2010 (BEZA Act 2010) under Section 8. Selection process of bidders are separated into three stages, these are:

- Overview
- Submission of Expression of Interest (EOI)
- Submission of Request for Proposal (RFP)

Interested developers must have adequate experience to deal with similar scenario and provision of efficient services defined by BEZA. After the submission of Expression of Interest (EOI) by the interested developers/operators, BEZA should run a selection process based on the opinion of a committee comprising members from both public and private sectors. Shortlisted firms will be invited to submit detailed Request for Proposals (RFP) (with relevant annexures). Bidders must prepare a detailed document under RFP comprising required Technical, Financial and all other data/information as mentioned by BEZA to move to the next stage. During selection procedure, technical and financial aspects will be given priority in decision making.

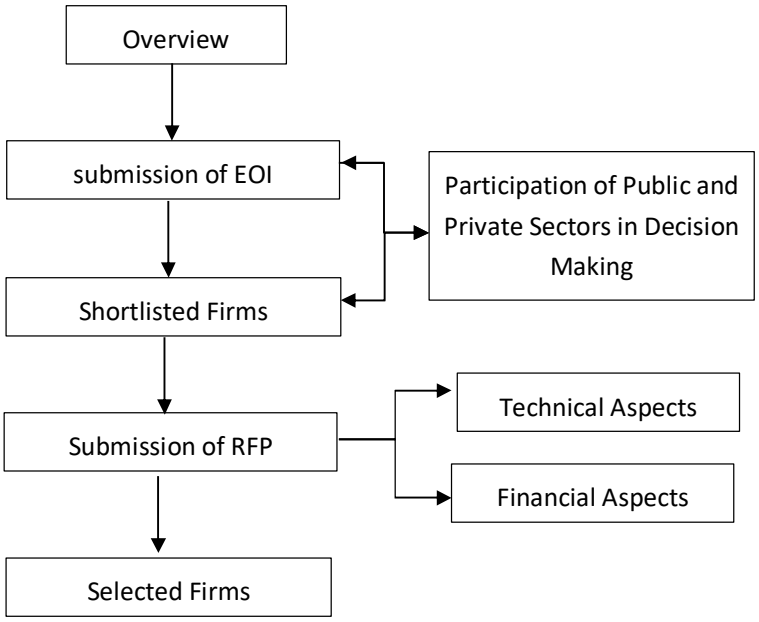


Figure 5-1: Decision Making Process

5.2 PROVISION OF BENEFITS FOR DEVELOPERS

BEZA might consider provision of multiple benefits to encourage developers to invest in Sabrang TP. These benefits might range from income tax exemption to the reduction of capital expenditure. To encourage investment in Sabrang TP, some of the benefits for investors should be considered are:

- Exemption of Taxes
- Custom/excise duties to non-fiscal incentives such as no FDI ceiling
- Issuance of work permits
- Recommendation for resident ship/Citizenship

Tax exemption might be of different types. Some of the tax exemptions, BEZA might consider for developers are:

- Income tax exemption
- Import duty on import materials related tax
- Exemption of stamp duty and registration fees for land registration
- Land Development Tax
- Stamp Duty on registration of loan document related tax
- Exemption of Tax, Sub-Tax, Rate, Toll, Fees
- Immobile asset transferring tax
- Ad source Income Tax on registration of land transfer
- VAT on Utilities

BEZA must negotiate with responsible Government agencies to provide a detailed list of benefits for developers under the Sabrang TP.

Provision of efficient utility services are crucial to encourage investors and proper management of Sabrang TP. BEZA must consult with regional public and private utility service providers like:

- Department of Public Health Engineering (DPHE)
- Bangladesh Power Development Board
- Bangladesh Rural Electrification Board
- Roads and Bridges Division
- Local Government Engineering Department
- Bangladesh Telecommunication Company Limited.

Similar to Chattogram EPZ, BEZA should also consider establishment of local power plants and water/gas storage facility after consultation with Government agencies.

5.3 CONFLICT MANAGEMENT IN THE DEVELOPMENT PROCESS

The development process at local government levels involves multiple public and private investors. It is not welcome that conflict may arise in performing any local development work, but the fact is that there is scope for arising conflicts of diverse nature. Government agencies provide essential services to meet the diverse needs of residents and to drive progress on many development measures. Under the development of Sabrang TP, these issues must be considered with due importance and participation of local residents must be ensured in decision making. For smooth functioning of the Sabrang TP, such conflicts should be avoided or resolved with participation of all parties.

Efficient governance by the BEZA will include wide array of responsibilities, tasks and assignments at various levels. It means the process of decision-making and the process by which decisions are implemented (or not implemented). Smooth functioning of Sabrang TP in a comprehensive way addressing diverse issues, all potential conflicts should be resolved. Some of the key issues must be given consideration are:

- Presence of Rohingya population
- Safety of local and foreign tourists and investors
- Religious and cultural aspects of local residents
- Regional road connectivity and network system
- Provision of utility and infrastructure related facilities

A detailed discussion of possible conflicts and mitigation measures is included under detailed master plan report. The national government plays a pivotal role in local development, through the allocation of resources and making policies, guidelines, rules and laws. Under the proposed development, BEZA must work with local government agencies to ensure safety and efficient management of Sabrang TP. Border Guards Bangladesh and Bangladesh Army must be involved to ensure safety related decision making. Proposed Sabrang TP will play a crucial role to ensure a boost in local employment generation and development of tourism sector in Bangladesh.

5.4 DEVELOPMENT FINANCING OPTIONS

The main characteristics of Sabrang represent and reflect the basic strategies, such as the selection and concentration, place marketing and co-operation and partnership strategies. As per BEZA Act, on

behalf of the GOB, BEZA would control the process of development, operation and management of Sabrang TP. In marketing and promotion efforts, BEZA would adopt cooperation and partnership strategy. BEZA will invites private sector participation in the process of Implementation/development. This section will explore the financial options in the development process of Sabrang TP. Different financial options can be considered in development of Sabrang TP. Those are:

- Government Grant
- Private Sector Investment
- BEZA's Investment
- Public and Private Partnership.

According to Feasibility Report of Sabrang Tourism Park 2016, the consultant's team recommended Public Private Partnership for financial options of Tourism Park. The report analysed different model of PPP and finalized one. The Master Plan consultant's team review of those model and make recommendation based on their study.

5.4.1 MODELS OF PUBLIC AND PRIVATE PARTNERSHIP (PPP)

Today the development and operation of SEZs by the private sector is gaining popularity as a preferred model for development especially in East Asia, Latin America and the MENA region. Generally, each partner for SEZ development makes contributions to SEZ development projects with assets as exemplified in the Table 5-1.

Table 5-1: Potential area of Partners' contribution in PPP

Public Contribution	Private Contribution
- Land Expropriation - Credit for Infrastructure Construction - Investment Incentives (including tax breaks for relocation) - Utility Supply - Regulation (license and Permits etc.)	- Partially or fully financing construction and land development - Utilities provision - Management - Investment promotion and marketing - Maintenance

The project under a PPP scheme can generally be classified into the several types depending on the time of ownership transfer. For example, PPP models can largely be:

- Build-Own-Operate (BOO);
- Build-Operate-Transfer (BOT);
- Build-Transfer-Operate (BTO);
- Design-Build-Finance-Operate (DBFO), etc.

The respective structures of the PPP types are outlined as follows

Table 5-2.

Table 5-2: Typology of PPP Based on the Time of Ownership Transfer

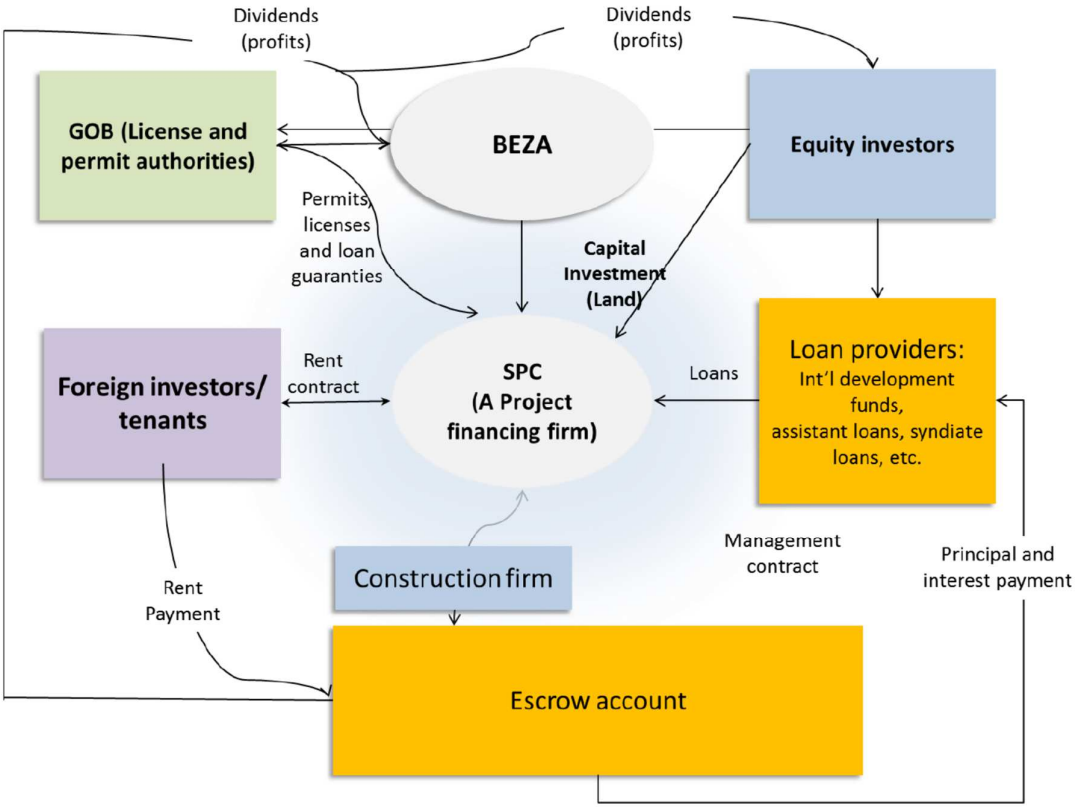
	Public project ← → Private project					
			PPP			
Type of Contract	Public procurement	Franchise	DBFO	BTO	BOT	BOO
Principal of construction :	Public	Public	Private	Private	Private	Private
Principal of operation:	Public	Private	Private	Private	Private	Private
Ownership:	Public	Public	Public	Private → Public	Private → Public	Private
Disbursement of dues:	Public	User	Public/ User	Public/User	Public/User	Public/User
Receipt of dues:	-	Private	Private	Private	Private	Private

There are various models of PPP in economic zone development depending on the level of private participation. Those are:

- One model is that the private sector participates with 100% of its own capital to develop the infrastructure and/or facilities and the government grants concessions to the private-sector partner.
- Another popular model is a joint venture between public and private partners in which the public-sector usually takes responsibility of off-site development while the private partner implements on-site development.
- Typically, the government grants a BOT (Build-Operate-Transfer) arrangement to a special purpose vehicle (SPV)—jointly owned by the private and public partners—providing entitlements for the collection of maintenance charges of utilities, lease income, fees, etc.
- Compared to the 100% private development/operation model, the government can have better control over the land and the operations while the bankability of the project would be increased due to government presence. However, an interest conflict is likely, even though the public sector is exposed to business risk only partially. PPP in general passes along the risks associated with, for example, a construction project, to the private sector (construction risk).

As an alternative to the 100% private-sector participation, a joint-venture (JV) is a popular typology of the PPP model. In this case, the institutional structure will be as follows:

Figure 5-2: Institutional Framework of Joint Venture



The Feasibility study consultants recommends BEZA to develop Sabrang by itself. The reasons are:

- The development of tourism is more than just a development of special economic zone. As the tourism can be said that it is relatively a new industry in Bangladesh and Sabrang is the first tourism park in the nation, BEZA on behalf of the GoB is obligated to develop this as per the proposed master plan and it will be developed to fulfil the main goal of the development. That is, the development of Sabrang is implemented as a part of a Grand National plan of industry diversification. As such, BEZA needs to exercise a full control of land allocation and, subsequently, the rate of rent in line with the strategic goal.
- Investors generally put up more confidence in BEZA to exercise the control of development and management vis-à-vis private developers.

In agreeing with the recommendation of Feasibility Study, the Master Plan consultant's team also recommended that BEZA to be a full control for the development of Sabrang TP by inviting experienced developer/s as an equity partner/s, as the partner/s' experiences in developing and operating a tourism-SEZ can certainly be another viable option for the development and further operation of Sabrang.

5.5 IMPLEMENTATION PHASING

The Master Plan for Sabrang TP has been prepared for development and development control of physical growth of the Tourism Park in a planned manner for a period of 15 years. The implementation

of the master plan proposals will be in three phases. The first phase will be for 3 year period for partially operation of the Sabrang TP, 2nd phase will be next seven year and 3rd phase will be implemented after 10 years of development.

The infrastructure of the proposed master plan will be implemented in 3 phases within 15 years so that BEZA can start operation of the tourism park in completion of 1st phase. The Master Plan and Infrastructure Plan phasing are given in Table 5-3 and Table 5-4.

Table 5-3: Master Plan Phasing

Facilities	Phase 1	Phase 2	Phase 3
Beach Side Resort and Hotel	6 Plots	7 Plots	7 Plots
Lake Side Resort & Hotel (North)			
Lake Side Resort & Hotel (South)			
Economy Hotel			
Service Studio Apartment			
Welfare Centre			
Old Age Home			
Administrative Area			
Bio-Gas Plant			
Boating and Shopping			
Bus Depot			
Disaster Management Centre			
Electrical Sub-station	No. 1	No. 2	
Embankment			
Farming Area			
Food Zone			
Hospital			
Jetty Area			
Park	Park- 1	Park - 2	
Rest Room & Wash Room			
STP	STP 1, 2		STP-3
Tourist Police Station and Fire Station			
Amphitheatre			
Amusement Park			
Helipad Station			
Liberation War and Amusement Museum			
Transportation Hub			
Shopping District			
Rain Water Harvesting Pond			
Security and Service Zone			
Watch Tower and Restaurant			
Water Reservoir			

Facilities	Phase 1	Phase 2	Phase 3
Power Plant and Gas Station			
Golf Course			
South Watch Tower			
Jhau Forest			
Green Area			
Lake			
Beach Area			

Note:

Implemented in 1st Phase
Implemented in 2nd Phase
Implemented in 3rd Phase

Table 5-4: Infrastructure Phasing

Work Type	Phase 1 (2021-2024)	Phase 2 (2024-2031)	Phase 3 (2031-2036)
Land Development			
Lake excavation			
Construction of Arterial Road			
Construction of Feeder Road			
Construction of Bus Depot			
Construction of Transportation Hub			
Construction of Jetty			
Construction of Helipad			
Construction of Power Plant			
Construction of Sub-station 1 & 2			
Installation of Electricity Supply Line			
Construction of Water Reservoir and Treatment Plant			
Installation of Water Supply Line			
Construction of STP			
Installation of Sewerage Line			
Construction of Garbage disposal station			
Construction Security and Safety Zone			
Construction of Tourist Police and Fire Station			

5.6 SUMMARY OF COST ESTIMATE

On-site Infrastructure Cost for Sabrang TP are given Table 5-5.

.

Table 5-5: Summary of Cost Estimate

Type	Description	Unit	Quantity	Cost (Phase I)	Cost (Phase II)	Cost (Phase III)	Cost (BDT)	Cost (USD)	Remarks
Road Network	Arterial Road	Sqm	112006.5	233085527			233085527	2748974.254	PWD Schedule, 2018
	Feeder	Sqm	198501.93	156785974	141210375	115086167	413082516	4871830.593	PWD Schedule, 2018
Sub-Total			**310508.43**	**389871501**	**141210375**	**115086167**	**646168043**	**7620804.847**	
Power Supply	Four 33/11 KV GIS Substation with 2X10/26 MVA Transformer	Set	4	224875000	179750000	134875000	539500000	6362778.63	Analyzed by the Consultants
	2000 KVA Substation	Set	1	26056250			26056250	307303.3377	Analyzed by the Consultants
	2 X 1250 KVA Substation	Set	2	10103850	10103850		20207700	238326.4536	Analyzed by the Consultants
	11 KV and 0.4 KV Underground Distribution Network	Meter		430000000	403070900	300000000	1133070900	13363261	Analyzed by the Consultants
	Street Light	Set		65530208	58701762		124231970	1465172.426	Analyzed by the Consultants
	8 X 10 MVA Generator	Set	8	1,900,000,000.00	1,288,500,000.00	800,000,000.00	3988500000	47039745.25	Analyzed by the Consultants
	33 KV overhead double circuit line from utility substation to onsite substation	Km	2	13000000			13000000	153319.967	BREB, 2020
	33 kV double circuit electrical cable interconnection between two 33/11 kV substation	Km	3.5	63000000			63000000	743012.1477	BREB, 2020
	1 MWp Solar Energy	KWp	1000	66362500		66362500	132725000	1565337.894	PWD Schedule, 2018
Sub-Total				**2798927808**	**1940126512**	**1301237500**	**6040291820**	**71238257.11**	

Type	Description	Unit	Quantity	Cost (Phase I)	Cost (Phase II)	Cost (Phase III)	Cost (BDT)	Cost (USD)	Remarks
Water Supply	Water supply pipe Line	Rm	14896	138635587.3	61921884.69	89314975.25	289872447.3	3418710.311	PWD Schedule, 2018
	Hydro pneumatic pump system	Set	6	20406658	12605358	12605358	45617374	538004.175	PWD Schedule, 2018
Sub-Total				**159042245.3**	**74527242.69**	**101920333.3**	**335489821.3**	**3956714.486**	
Storm Water	375 mm Road Side Drain	Rm	271.7	714571			714571	8427.538625	LGED Schedule, 2020
	450 mm Road Side Drain	Rm	3715.41	10628916	3794305.62		14423221.62	170105.2202	LGED Schedule, 2020
	525 mm Road Side Drain	Rm	909.4	2539936.2	1522353.6		4062289.8	47910.01061	LGED Schedule, 2020
	600 mm Road Side Drain	Rm	3273	10087646.95	4620182.765	4766553.011	19474382.73	229677.8243	LGED Schedule, 2020
	750 mm Road Side Drain	Rm	3367.7	19675608		7535408	27211016	320922.4673	LGED Schedule, 2020
	900 mm Road Side Drain	Rm	1956.01	18030800.96		2119016.493	20149817.45	237643.7959	LGED Schedule, 2020
	1050 mm Road Side Drain	Rm	1639.82	11186000	11771480		22957480	270756.9289	LGED Schedule, 2020
	1200 mm Road Side Drain	Rm	1348.93	12070075.85	2152783.5	8769652.5	22992511.85	271170.089	LGED Schedule, 2020
	1350 mm Road Side Drain	Rm	200.5		4611500		4611500	54387.30982	LGED Schedule, 2020
	1650 mm Road Side Drain	Rm	181.3	5439000			5439000	64146.71541	LGED Schedule, 2020
Sub-Total			**16863.77**	**90372554.96**	**28472605.49**	**23190630**	**142035790.4**	**1675147.9**	

Type	Description	Unit	Quantity	Cost (Phase I)	Cost (Phase II)	Cost (Phase III)	Cost (BDT)	Cost (USD)	Remarks
Sewerage	Soil Pipe Network	Rm	13895	101465772.7	162663270.7	99910950.86	364039994.3	4293430.761	PWD Schedule, 2018
	Sewerage Treatment Plant	No.	3	671386011	409032837	432946255	1513365103	17848391.36	Analyzed by the Consultants
Sub-Total				**772,851,784**	**571,696,108**	**532,857,206**	**1,877,405,097**	**22141822.12**	
Internet Equipment	Router	No.	1	2050000	0	0	2050000	24177.37941	Analyzed by the Consultants
	Firewall	No.	1	850000			850000	10024.76707	Analyzed by the Consultants
	Bandwidth Manager	No.	1	100000			100000	1179.384361	Analyzed by the Consultants
	Network Switch	No.	12	4080000	3060000	3060000	10200000	120297.2049	Analyzed by the Consultants
	Access point	No.	2	60000	60000		120000	1415.261234	Analyzed by the Consultants
	Wireless LAN Controller	No.	1	1000000	0	0	1000000	11793.84361	Analyzed by the Consultants
	Media Converter	Pair	45	148500	111375	111375	371250	4378.464442	Analyzed by the Consultants
	Armoured 24 Core Fibre Optic Cable	M	100	7200	5400	5400	18000	212.289185	Analyzed by the Consultants
	12 Core Fibre Optic Cable	M	22500	1251000	938250	938250	3127500	36885.2459	Analyzed by the Consultants
	4 Core Fibre Optic Cable	M	45000	1332000	999000	999000	3330000	39273.49923	Analyzed by the Consultants
	Network Rack	No.	10	350000	350000		700000	8255.69053	Analyzed by the Consultants

Type	Description	Unit	Quantity	Cost (Phase I)	Cost (Phase II)	Cost (Phase III)	Cost (BDT)	Cost (USD)	Remarks
	UPS	No.	4	340000	340000		680000	8019.813657	Analyzed by the Consultants
	Network Accessories	Lot	1	225000			225000	2653.614813	Analyzed by the Consultants
Sub-Total				**11793700**	**5864025**	**5114025**	**22771750**	**268566.4583**	
Telecommunication	IDF	No.	25	3500000	2625000	2625000	8750000	103196.1316	Analyzed by the Consultants
	Fibre Optic Cable	M	8500	472600	354450	354450	1181500	13934.42623	Analyzed by the Consultants
	Telecommunication cable	M	6800	2584000	1938000	1938000	6460000	76188.22974	Analyzed by the Consultants
Sub-Total				**6556600**	**4917450**	**4917450**	**16391500**	**193318.7876**	
Land Development	Land Filling	Cum	4,284,983	1,058,390,801			1,058,390,801.00	12482495.59	PWD Schedule, 2018
Sub-Total			**4,284,983**	**1,058,390,801**	**0**	**0**	**1,058,390,801**	**12482495.59**	
Grand Total				**5,287,806,994.26**	**2,766,814,318.18**	**2,084,323,311.30**	**10,138,944,622.70**	**119,577,127.29**	
Miscellaneous				**528780699.4**	**276681431.8**	**208432331.1**	**1013894462**	**11957712.73**	**10%**
Contingency Cost				**528780699.4**	**276681431.8**	**208432331.1**	**1013894462**	**11957712.73**	**10%**
Total Cost				**6,345,368,393.11**	**3,320,177,181.82**	**2,501,187,973.56**	**12,166,733,547.24**	**143,492,552.74**	
Total Cost in Crore				**634.5368393**	**332.0177182**	**250.1187974**	**1216.673355**	**14.34925527**	

Note: US Dollars Rate: 84.79 BDT on 24-12-2020

6 STAKEHOLDERS MANAGEMENT AND POLICIES

To ensure proper development of Sabrang Tourism Park, BEZA must consider development at regional scale. It will include co-ordination with many agencies in both public and private sectors. BEZA has to follow a proper procedure to ensure the efficient supply of utility and community facilities. BEZA have already played a pivotal role in similar scenario under several other projects. Under this chapter, we will focus on the procedure BEZA follows to deal with investors and properly run similar development projects.

6.1 IDENTIFICATION OF PROJECT RELATED STAKEHOLDERS

Stakeholder consultation is an essential element of modern planning. Stakeholder involvement helps to get the measure about the aspirations of the stakeholders regarding development. In order to prepare the plan in line with the desire of the people several formal and informal meetings were arranged with the stakeholders. In the initial stage, stakeholders were appraised about the techniques of the plan preparation process.

Under the current project, a detailed list of stakeholders has been prepared by collecting information from different sources before the plan preparation process. After that consultant has made several visits and arranged meeting with the stakeholders to collect their opinion regarding the ongoing project. A detailed list of stakeholders has been already provided under the master plan report. These stakeholders include from small scale organization to large government agencies. Identify stakeholders is also a process of identifying stakeholders regularly throughout the project life cycle and documenting relevant information regarding their interests, independencies, influence, and potential impact on project success.

6.2 CONSIDERATION OF THE SIGNIFICANCE OF STAKES/CLAIMS

Consideration of investment made by the stakeholders under the project is a crucial issue. Different types of government and private organizations are going to be responsible for the provision of utility services and other related facilities. BEZA must provide crucial importance so that the investors do not suffer any type of financial loss and they can eventually regain their investment. Organizations like Bangladesh Police, Bangladesh Coast Guard, and Boarder Guard Bangladesh are going to invest significant amount of money to manage safety of the entire tourism park. BEZA should take major initiatives to manage financial cost of this massive investment. Similar to investment to economic zones, BEZA should consider providing same benefits to stakeholders investing in the proposed tourism park. Stakeholders who are not directly investing under the project must be given importance too. Like in the case of utility services Tourism Park will be heavily dependent on government investment in remote area. Without the investment of government organization in such a remote area, project expenditure will significantly increase.

6.3 CONSIDERATION OF RESPONSIBILITIES TO THE STAKEHOLDERS

All businesses have stakeholders. Stakeholders are the individuals and groups with an interest in or who are affected by what a company produces, where and by what means. For example, treating staff and respecting local communities makes it easier to recruit the new employees necessary for growth

to create more value for shareholders. Not all stakeholders have the same priorities. Employees interested in pay and working conditions may take a different stance from that of shareholders interested in profits and dividends or customers interested both in good quality and low prices. Different governments will take varying views on how far they should benefit from a company's presence in their country, and in what ways.

7 CONCLUSION

7.1 CONCLUSION

With the guidelines of project documents, the Detailed Master Plan of Sabrang TP have been prepared incorporating different types of tourism facilities by the DDC-DOHWA JV Consultant Team. During the preparation stage of Detailed Master Plan, the Consultants Team had made consultation with Honorable Executive Chairman of BEZA, officials of BEZA. Besides, the consultation was taken place with the local officials of different department related to this project. Local people and leaders have been associated with the team from project inception.

It is noticed that Sabrang TP area has gazette on 29th May, 2018 as a Special Economic Zone especially for Tourism. At present, BEZA holds the Authority status and development requirements are enhanced. DMP is prepare to provide guideline for development of Sabrang TP Master Plan to engage local and international investors for tourism development of Bangladesh.

The development approach of master plan and infrastructure plan leads to achieve the vision of the tourism park. The vision of the tourism park is to build an environment friendly, clean, healthy, safe and planned tourism city to provide necessary service to all categories of tourist. In this regard, the Consultants recommend taking Inclusive Approach. It includes relevant department with tourism and service agencies.

Through this participatory process, area improvement, transportation, drainage, solid waste management, sanitation, power generation and distribution network, tele-communication network are prepared to implement.

SABRANG TOURISM PARK

VOLUME-IV:

DETAIL COST ESTIMATE

TABLE OF CONTENTS

1 BACKGROUND

1.1 INTRODUCTION

The cost estimate of the proposed infrastructure plan of Sabrang Tourism Park based on proposed master plan is essential to implement the proposed master plan as well infrastructure plan. The cost is calculated based on the current cost schedule of different govt. agencies like PWD, LGED, BTCL, PDB etc.

1.2 PURPOSE OF THE DETAIL COST ESTIMATE

The main purpose of this Volume is to provide a detail cost estimate of the proposed infrastructure of the Detailed Master Plan. Several sectoral cost have been formulated under the volume to provide proper guideline of the implementation of the development into several phases and to prepared DPP to take initiative of the proposal.

1.3 OBJECTIVE OF THE DETAIL COST ESTIMATE

The major objectives of the Detail Cost Estimate are to prepare a detail cost estimate of the proposed Infrastructure based on the existing cost schedule.

1.4 REPORT OVERVIEW

This report is submitted as final deliverables among the 4 deliverables under the contract for consultancy services between the BEZA and the consultants with joint venture of DDCL, Bangladesh and DOHWA, Korea for the Preparation of Detailed Master Plan for Naf and Sabrang Tourism Park project.

The final report is divided into five volume, those are:

- Volume I: Master Plan
- Volume II: Infrastructure Plan and
- Volume III: Development Management Plan and
- Volume IV: Detail Cost Estimate

Volume IV: Detail Cost Estimate is describing the cost required to implementation of the proposed Infrastructure in Master Plan with the reference cost schedule.

2 COST ESTIMATE OF ROAD NETWORK

Item No	Description	No.	Length (m)	Width (m)	Depth (m)	Sub-Total	Total	Unit	Quantity	Unit Rare (BDT)	Amount (BDT)	Unit Rate Reference
Civil Works:												
DIVISION 1: Flexible Road												
1.01	**Flexible Road:** Construction of 38 mm thick compacted bituminous carpeted road over 150 mm thick sand surface with 75 mm thick end edging, 62 mm–37 mm size brick bats khoa consolidation and compacted water bound macadam of 150 mm thickness, providing tack coat, seal coat and prime coat as per requirement.						**310,508.43**	**Sqm**	**310,508.43**	**2,081.00**	**646,168,043.00**	**Pwd-2018**
	Arterial (Phase 1)	1	3807.00	27.5		104,692.50	104,692.50					
	Arterial (Phase 1)	1	163.00	23.0		3,749.00	3,749.00					
	Arterial (Phase 1)	1	155.00	23.0		3,565.00	3,565.00					
	Feeder (Phase 1)	1	1499.00	19.0		28,481.00	28,481.00					
	Feeder (Phase 1)	1	625.40	19.0		11,882.60	11,882.60					
	Feeder (Phase 1)	1	283.50	19.0		5,386.50	5,386.50					
	Feeder (Phase 1)	1	157.60	19.0		2,994.40	2,994.40					
	Feeder (Phase 1)	1	127.00	19.0		2,413.00	2,413.00					
	Feeder (Phase 1)	1	151.10	19.0		2,870.90	2,870.90					
	Feeder (Phase 1)	1	126.90	19.0		2,411.10	2,411.10					
	Feeder (Phase 1)	1	903.90	19.0		17,174.10	17,174.10					

Item No	Description	No.	Length (m)	Width (m)	Depth (m)	Sub-Total	Total	Unit	Quantity	Unit Rare (BDT)	Amount (BDT)	Unit Rate Reference
	Feeder (Phase 1)	1	90.95	19.0		1,728.05	1,728.05					
	Feeder (Phase 2)	1	1224.00	19.0		23,256.00	23,256.00					
	Feeder (Phase 2)	1	1107.00	19.0		21,033.00	21,033.00					
	Feeder (Phase 2)	1	111.90	19.0		2,126.10	2,126.10					
	Feeder (Phase 2)	1	702.80	19.0		13,353.20	13,353.20					
	Feeder (Phase 2)	1	111.80	19.0		2,124.20	2,124.20					
	Feeder (Phase 2)	1	115.40	19.0		2,192.60	2,192.60					
	Feeder (Phase 2)	1	118.80	19.0		2,257.20	2,257.20					
	Feeder (Phase 2)	1	79.72	19.0		1,514.68	1,514.68					
	Feeder (Phase 3)	1	258.10	19.0		4,903.90	4,903.90					
	Feeder (Phase 3)	1	1828.00	19.0		34,732.00	34,732.00					
	Feeder (Phase 3)	1	456.80	19.0		8,679.20	8,679.20					
	Feeder (Phase 3)	1	367.80	19.0		6,988.20	6,988.20					
DIVISION 1: Flexible Road										**Sub-Total**	**646,168,043.00**	
Grand Total =											**646,168,043.00**	

3 COST ESTIMATE OF POWER GENERATION AND DISTRIBUTION

3.1 COST ESTIMATE OF 33/11KV, 20MVA (2X10MVA) SUB-STATION

Item no.	Description of items	Quantity	Unit	Rate (Taka)	Amount (Taka)
1	Supply, installation, testing and commissioning of outdoor type 33KV, 50 Hz, 25KA, 1250A, 3-pole, isolator with earth switch manual gang operated, outdoor horizontal/Vertical line isolator with mechanically interlock with earth blade complete with mounting/accessories with support structure etc.	1	Set	350,000.00	350,000.00
2	Supply, installation, testing and commissioning of outdoor type 33 KV, 50 Hz, 25 KA, 75 KV BIL lightning arrester complete with surge counter and mounting accessories etc. (3 nos. in one set)	1	Set	300,000.00	300,000.00
3	Supply, installation, testing and commissioning of outdoor oil cooled wound primary type, live tank 33KV C.T., single pole, short time current rating 25KA, Ratio: 200/5/5/5A, core 1 burden 25 VA, class 0.2 for metering, core 2 burden 25 VA class 0.2, core 3 burden 25 VA class 5P20, BIL 170 KV as per technical specification (3 nos. in one set).	1	Set	375,000.00	375,000.00
4	Supply, installation, testing and commissioning of outdoor oil cooled single pole potential transformer having ratio 33 kV/(root3) / 110V/ (root3)/ 110V/ (root3) of 50VA burden as per technical specification (3 nos. in one set).	1	Set	375,000.00	375,000.00
5	**33KV H.T. SWITCHGEAR (VCB)-OUTDOOR**	-	-	-	-
5.1	Supply, installation, testing and commissioning of 1250 A, 36 KV, breaking current 20 KA Outdoor Porcelain clad triple pole, Plinth mountable, self-supporting vermin proof vacuum circuit breaker comprising of:	-	-	-	-
	- Base mounted lattice type support structure for braker mounting painted.	-	-	-	-
	- Circuit Breaker assembly comprising of vacuum interrupters in insert atmosphere, operating links within porcelain housing, top and bottom terminal	-	-	-	-

Item no.	Description of items	Quantity	Unit	Rate (Taka)	Amount (Taka)
	pads arcing horns assembly.				
	- LT Chamber for linkage (between breaker and mechanism) with access covers wherever necessary.	-	-	-	-
	- Sheet steel cubicle, for outdoor use, housing the operating mechanism box and control accessories for breaker operation.	-	-	-	-
	- Motor operated mechanism completes with motor suitable for 220V AC Shunt trip coil suitable for 110 V DC and ON/OFF indicator.	-	-	-	-
	- Set of Aluminum alloy terminal connectors suitable for ACSR conductor (size to be furnished by you along with your order)	-	-	-	-
	- Auxiliary Switch comprising of 6 NO + 6 NC contacts.	-	-	-	-
	- Trip-neutral- close circuit breaker (local) control switch.	-	-	-	-
	- Local/Remote selector switch	-	-	-	-
	- Anti-pumping devise	-	-	-	-
	- Mechanical operation counter	-	-	-	-
	- Necessary LT Fuses for Control Circuit	-	-	-	-
	- Necessary Terminals for Remote Control	-	-	-	-
	- Illumination Lamp with door switch	-	-	-	-
	- Set of fine wires, Fuses, Ferrules, etc.	-	-	-	-
	- Set of Current Transformers as per the specification	1	Set	2,575,000.00	2,575,000.00
5.2	Supply, installation, testing and commissioning of 630 A, 36 KV, breaking current 20 KA Outdoor Porcelain clad triple pole, Plinth mountable, self-supporting vermin proof vacuum circuit breaker comprising of:	-	-	-	-
	- Base mounted lattice type support structure for braker mounting painted.	-	-	-	-
	- Circuit Breaker assembly comprising of vacuum interrupters in insert atmosphere, operating links within porcelain housing, top and bottom terminal pads arcing horns assembly.	-	-	-	-

Item no.	Description of items	Quantity	Unit	Rate (Taka)	Amount (Taka)
	- LT Chamber for linkage (between breaker and mechanism) with access covers wherever necessary.	-	-	-	-
	- Sheet steel cubicle, for outdoor use, housing the operating mechanism box and control accessories for breaker operation.	-	-	-	-
	- Motor operated mechanism completes with motor suitable for 220V AC Shunt trip coil suitable for 110 V DC and ON/OFF indicator.	-	-	-	-
	- Set of Aluminum alloy terminal connectors suitable for ACSR conductor (size to be furnished by you along with your order)	-	-	-	-
	- Auxiliary Switch comprising of 6 NO + 6 NC contacts.	-	-	-	-
	- Trip-neutral- close circuit breaker (local) control switch.	-	-	-	-
	- Local/Remote selector switch	-	-	-	-
	- Antipumping devise	-	-	-	-
	- Mechanical operation counter	-	-	-	-
	- Necessary LT Fuses for Control Circuit	-	-	-	-
	- Necessary Terminals for Remote Control	-	-	-	-
	- Illumination Lamp with door switch	-	-	-	-
	- Set of fine wires, Fuses, Ferrules, etc.	-	-	-	-
	- Set of Current Transformers as per the specification	2	Set	1,750,000.00	3,500,000.00
6	**33KV CONTROL AND RELAY PANEL-INDOOR**	-	-	-	-
	Supply, installation, testing and commissioning of sheet steel clad, dust and vermin proof, free standing floor mounting indoor type 33KV HT Switchgear control panel comprising of:	-	-	-	-
	- 1 No. MCB of adequate rating for PT Secondary protection	-	-	-	-
	- 1 No. Voltmeter, 0 - 36KV with selector switch	-	-	-	-
	- 1 No. Ammeter, 0 - 100A with selector switch	-	-	-	-
	- 1 No. Triple pole IDMT induction type Relay for over current earth fault and	-	-	-	-

Item no.	Description of items	Quantity	Unit	Rate (Taka)	Amount (Taka)
	short circuit protection.				
	- 3 Nos. Indicating Lamps for ON/OFF/Relay for closing.	-	-	-	-
	- 2 Nos. ON/OFF Push Bottom for electrical ON/OFF.	-	-	-	-
	- 1 No. Panel Heater.	-	-	-	-
	- 1 No. Transformer Auxiliary relay.	-	-	-	-
	- Trip ckt supervision relay and tripping relay.	3	Set	1,750,000.00	5,250,000.00
7	**TRANSFORMER**				
	Supply, installation, testing and commissioning of following 3-Phase oil immersed, naturally air-cooled Transformer according to IEC/VDE/BSS standard with 3 HT Bushing and 4 LT Bushings with arranged on tank top, conservator, oil level indicator, drain and filling valves, lifting lugs, bi-directional rollers, with first filling of oil in transformer suitable for operation at 40^0C ambient temperature.				
7.1	i) Capacity : 10/13 MVA				
	ii) Primary voltage : 33KV				
	iii) Secondary voltage : 11KV				
	iv) Percentage impedance : 6% (approx.)				
	v) No load loss : 9000 watts (approx.)				
	vi) Full load test : 85500 watts (approx.)	2	Each	24,500,000.00	49,000,000.00
8	**11KV INDOOR SWITCHGEAR**				
8.1	Supply, installation, testing and commissioning of 1250A, 11KV VCB panel complete with CT, PT etc.	2	Each	1,850,000.00	3,700,000.00
8.2	Supply, installation, testing and commissioning of 1250A, 11KV bus coupler VCB panel complete with CT, PT etc.	1	Each	1,650,000.00	1,650,000.00
8.3	Supply, installation, testing and commissioning of 630A, 11KV outgoing VCB panel complete with CT, PT etc.	10	Each	1,450,000.00	14,500,000.00
8.4	Supply, installation, testing and commissioning of 1250A, 11KV generator	2	Each	1,650,000.00	3,300,000.00

Item no.	Description of items	Quantity	Unit	Rate (Taka)	Amount (Taka)
	incoming VCB panel complete with CT, PT etc.				
8.5	Supply, installation, testing and commissioning of 2000A HDBC copper busbar complete with necessary accessories.	1	Set	7,500,000.00	7,500,000.00
9	**EARTHING SYSTEM**				
	Earthing Materials for Structure/ equipment earthing for 33kV Switchyard and equipment supplied by Supplier, consisting of and as per requirement:				
	70 mm^2 bare copper conductor mesh buried into 1 meter depth rom ground level- 140m				
	10 nos boring upto first water level				
	2 nos boring upto first water level + 6M				
	4-meter-long Earth Electrode-10 nos with 0 SWG HDBC				
	2 Nos earth test link Chamber 600mm x 600mm x 600mm				
	2 Set Earthing 500mm x 1000mm x 10mm				
	Hand clamp for mold				
	Single core 50 mm^2 NYY cable for equipment body earthing	1	Lot	5,500,000.00	5,500,000.00
10	**33KV OUTDOOR H-POLE STRUCTURE**				
	Supply & Installation of Complete turnkey materials for 33kV Outdoor H_POLE structure complete with civil works consisting of:				
	i) H-Pole with U-channel and fittings insulation.				
	ii) 33KV cable for disconnecting switch, CT, PT, VCB, & Transformer connection etc..	1	Lot	6,500,000.00	6,500,000.00
11	**CABLE KITS**				
	Supply and fixing of 33KV heat shrink termination kit (Made in EU countries/US/Japan)	10	Set	45,000.00	450,000.00
12	Supply, installation, testing and commissioning of 33KV Auto Circuit Reclosure (ACR) as per requirement of REB.	1	Set	2,750,000.00	2,750,000.00

Item no.	Description of items	Quantity	Unit	Rate (Taka)	Amount (Taka)
13	Supply, installation, testing and commissioning of 33KV Auto Break Switch (ABS) per requirement of REB.	1	Set	750,000.00	750,000.00
14	**BATTERY WITH CHARGER**				
	Supply, installation, testing and commissioning of 110V DC Battery, 100AH & 110V DC automatic battery charger complete with necessary accessories.	1	Lot	1,550,000.00	1,550,000.00
15	**SUB-STATION BUILDING CONSTRUCTION**				
	Construction of sub-station building as per requirement including necessary yard, trench, box culvert complete with electro-mechanical works complete in all respect.	LS	LS	20,000,000.00	20,000,000.00
16	**33KV LINE CONSTRUCTION**				
	Construction of 1.5KM (approx.) 33KV line construction complete with pole and all other necessary accessories.	LS	LS	5,000,000.00	5,000,000.00
				Total:	**134,875,000.00**
				2x 10 MVA Sub-station (1 set) x 4	**134,875,000.00 x4**
				Grand Total	**539,500,000.00**

3.2 COST ESTIMATE FOR 2000KVA SUB-STATION EQUIPMENT

Item No.	Description of Items	Unit	Quantity	Unit Rate (BDT)	Total Amount (BDT)
1	2	3	4	5	6=5*4
1	Supply, installation, testing and commissioning of outdoor type 11KV, 50 Hz, 5KA (20 KA) dropout fuse complete with mounting accessories etc. (3 nos. in a set).	Set	1	10500.00	10500.00
2	Supply, installation, testing and commissioning of outdoor type11 KV, 50 Hz, 300A, (20 KA), 75 KV BIL lightning arrester complete with mounting accessories etc. (3 nos. in a set).	Set	1	8500.00	8500.00
3	**11KV AUTOMATIC VOLTAGE REGULATOR**				
	Supply, Installation, Testing & commissioning of type tested 219A (min.), 6.35KV, 3 nos. (1 set) of single phase, outdoor type Automatic Voltage Regulator (AVR) in sealed tank with the following data. The AVR must comply with the latest requirements of BPDB. The work shall be completed with 11KV By-Pass switch including all necessary accessories to complete the installation. The work shall be completed as per technical specification and direction of the Engineer-in-charge.				
	Rated Current: 219A (min.)				
	Rated Voltage: 6.35KV single phase/11KV three phase, 50 Hz.				
	Voltage Regulation: ±10% in 32 steps or 5/8% each				
	Complete with following spares for the above Regulation				
	- 6 nos. Fuses				
	- 2 nos. Position Indicator Glass				
	- 6 nos. Oil sight glass	Set	1	4500000.00	4500000.00
4	**H.T. SWITCHGEAR**				

Item No.	Description of Items	Unit	Quantity	Unit Rate (BDT)	Total Amount (BDT)
	Supply, installation, testing and commissioning of type tested locally assembled confirming to IEC 298/694 high voltage switch gear (11KV) of sheet steel clad, dust and vermin proof, free standing, floor mounting, indoor type, 11KV,50Hz, 630A (min.), 350 MVA rated capacity. The switchgear shall be inclusive of withdrawable type Vacuum circuit Breaker (VCB), CT, PT, relay, ammeter, voltmeter, energy meter, bus-bar, interlocked earth switch, internal wiring etc. all equipment and accessories complete as per design, specification, standard, and instruction of Engineer-in-charge.				
	The switchgear must comply with the requirement of DESA/DESCO and relevant local Authority.				
	Incoming Feeder:				
-	1 No. 11KV, 50HZ, 20KA (1 sec), Earthing switch to be interlocked with the vacuum circuit breaker	-	-	-	
	- 1 No. 630A, 11KV, 50HZ, 20KA (3 sec) triple pole totally with-drawable horizontal isolation type Vacuum Circuit Breaker with both manual and motor operated mechanism with closing solenoid, trip button, shunt releases, operating cycle counter, 6 N/O + 6 N/C contacts, mechanical ON/OFF indicators etc.	-	-	-	
	- 2 Nos. 11KV cast resin insulated, double pole potential transformer having ratio 11000/110V, class 0.5, of 50VA burden (in open delta connection) for metering and protection.	-	-	-	
	- 1 No. of TP MCB for PT secondary protection.	-	-	-	
	- 3 Nos. of cast resin insulated 11 KV double core current transformer having ratio 250/5/5A Core-1, 10VA. Class 0.5M10 Core-2, 15VA, Class 10 P10	-	-	-	
	- 1 No. of 0-15KV voltmeter with selector switch	-	-	-	
	- 1 No. of 0-250A Ammeter with selector switch	-	-	-	
	- 1 No. 3 phase 3 wire, two part time of the day solid state micro-computer operated digital KWH meter with indicating "PEAK" & OFF-PEAK energy with maximum demand	-	-	-	

Item No.	Description of Items	Unit	Quantity	Unit Rate (BDT)	Total Amount (BDT)
	indicator in KW with integrating time of 30 minutes.				
	- 1 No. of synchrous time switch for double tariff operation of KWH meter	-	-	-	
	- 3 Nos. of indicating lamps (ON/OFF/TRIP)	-	-	-	
	- 1 No. of panel heater with thermostat	-	-	-	
	- 3 Nos of indicating lamp for presence of three phase (R.Y.B.)	-	-	-	
	- 1 No. of operating handle.	-	-	-	
	- 1 No. of Triple pole solid state microprocessor operated IDMT relay with 2 (two) over current and 1 (one) earth fault protection element with standard settings.	-	-	-	
	The tripping coil of the circuit breakers shall be activated by a capacitor storage tripping device without DC (battery) supply source for trip coil.	Set	1	1050000.00	1050000.00
5	**TRANSFORMER**				
	Supply, installation, testing and commissioning of following dry type cast resin, natural air cooled, 3-phase, 50 Hz, 11KV/0.415KV indoor type distribution Transformer of DYN_{11} vector group having percentage impedance 4 - 6%, basic impulse insulation level 75KV, HV & LV bushings, complete with two windings, earthing terminals, temperature sensor with thermometer, lifting lugs, name plate etc. complete as required and suitable for operation at 40^0C ambient temperature.				
5.1.	**i) Capacity : 2000 KVA.**	-	-	-	
	ii) No load loss : 3500 watts (Maximum)	-	-	-	
	iii) Full load loss : 17000 watts (Maximum)	-	-	-	
	iv) Degree of protection : IP20	Each	1	5200000.00	5200000.00
6	**L.T SWITCHGEAR**				

Item No.	Description of Items	Unit	Quantity	Unit Rate (BDT)	Total Amount (BDT)
	Supply, installation, testing and commissioning of 415V, 3-phase, 50 Hz, indoor type low tension switchgear of following specification completes with voltmeter (0-600V) & ammeter of adequate rating both with selector switch, indicting lamps for ON-OFF, locally factory assembled in 16 SWG sheet steel clad, dust & vermin proof, free standing, floor mounting epoxy resin powder coat painted cabinet. (MCCB's in LT panel must comply NEMA/VDE/IEC/JIS/BSS standard)				
6.1	**LT PANEL-1**				
	Incoming:				
	1 Set- 415V, 5000A, TPN&E hard drawn electrolytic insulated copper busbar.				
	1 x 3200A, 65KA, Triple pole withdrawable type Metal clad Air Circuit Breaker with motor operated electronic controlled time dependent selectively operating with built in adjustable overload, adjustable short circuit protection, under voltage releases and auxiliary contacts.				
	3 Nos.- 415V, 3200/5A ratio current transformer with suitable accuracy and burden.				
	1 - Digital Meter System				
	1 - Push button trip				
	3 - Indicating lamps (ON/OFF/TRIP)				
	3 - Indicating lamps for R.Y.B. phases.				
	Outgoing:				
	1 x 2000A, 65KA, Triple pole with drawable type Metal clad Air Circuit Breaker with motor operated electronic controlled time dependent selectively operating with built in adjustable overload, adjustable short circuit protection, under voltage releases and auxiliary contacts.				
	2 x 1600A, 65KA, Triple pole with drawable type Metal clad Air Circuit Breaker with motor operated electronic controlled time dependent selectively operating with built in adjustable overload, adjustable short circuit protection, under voltage releases and				

Item No.	Description of Items	Unit	Quantity	Unit Rate (BDT)	Total Amount (BDT)
	auxiliary contacts.				
	1x160A (35KA), TPMCCB breaker with thermal overload and instantaneous Electro-magnetic short circuit release				
	1x100A (25KA), TPMCCB breaker with thermal overload and instantaneous Electro-magnetic short circuit release				
	1 x 63A (25KA), TPMCCB with thermal overload and instantaneous Electro-magnetic short circuit release.				
	1 x 40A (25KA), TPMCCB with thermal overload and instantaneous Electro-magnetic short circuit release.	Set	1	2150000.00	2150000.00
6.2	**LT PANEL-2**				
	Incoming:				
	1 Set- 415V, 5000A, TPN&E hard drawn electrolytic insulated copper busbar.				
	1 x 3200A, 65KA, Triple pole withdrawable type Metal clad Air Circuit Breaker with motor operated electronic controlled time dependent selectively operating with built in adjustable overload, adjustable short circuit protection, under voltage releases and auxiliary contacts.				
	3 Nos. - 415V, 3200/5A ratio current transformer with suitable accuracy and burden.				
	1 - Digital Meter System				
	1 - Push button trip				
	3 - Indicating lamps (ON/OFF/TRIP)				
	3 - Indicating lamps for R.Y.B. phases.				
	Outgoing:				
	1 x 2000A, 65KA, Triple pole with drawable type Metal clad Air Circuit Breaker with motor operated electronic controlled time dependent selectively operating with built in adjustable overload, adjustable short circuit protection, under voltage releases and auxiliary contacts.				

Item No.	Description of Items	Unit	Quantity	Unit Rate (BDT)	Total Amount (BDT)
	2 x 1600A, 65KA, Triple pole with drawable type Metal clad Air Circuit Breaker with motor operated electronic controlled time dependent selectively operating with built in adjustable overload, adjustable short circuit protection, under voltage releases and auxiliary contacts.				
	1x500A (50KA), TPMCCB breaker with thermal overload and instantaneous Electro-magnetic short circuit release				
	1x400A (50KA), TPMCCB breaker with thermal overload and instantaneous Electro-magnetic short circuit release				
	1x200A (35KA), TPMCCB breaker with thermal overload and instantaneous Electro-magnetic short circuit release				
	2x160A (35KA), TPMCCB breaker with thermal overload and instantaneous Electro-magnetic short circuit release				
	1x100A (25KA), TPMCCB breaker with thermal overload and instantaneous Electro-magnetic short circuit release				
	1 x 63A (25KA), TPMCCB with thermal overload and instantaneous Electro-magnetic short circuit release.	Set	1	2150000.00	2150000.00
6.3	**BUS COUPLER**				
	Supply, installation, testing and commissioning of 1x3200A, 65KA 3 pole withdrawable type, metal clad Air Circuit Breaker with motor and manual operated electric controlled time dependent selectively ACB with built in adjustable overload and short circuit protection, under voltage release & will be auxiliary contacts. This will be used as BUS COUPLER between the LT PANEL-1 & LT PANEL-2. This breaker and the main incoming breakers of LT PANEL-1 & LT PANEL-2 shall be electrically interlocked such that this bus coupler breaker can only be closed if either one of the main incoming breakers is opened complete with auto/manual closing option.	Set	1	1150000.00	1150000.00
7	**P.F.I. PLANT**				

Item No.	Description of Items	Unit	Quantity	Unit Rate (BDT)	Total Amount (BDT)
	Supply, installation, testing and commissioning of following 415 volt, 3 phase, 50 Hz power factor improvement plants complete with TP busbars and earth block microprocessor control auto power factor correction relay with digital PF reading display, capacitor bank, contactor, fuse, ON/OFF indicators for every stage of capacitor bank (except directly connected one) etc. locally factory assembled in 16 SWG sheet steel clad dust & vermin proof, free standing, floor mounting, epoxy resin powder coat painted cabinet. Contactors, capacitor bank, relays, discharge resistor, fuse etc. shall comply MENA/VDE/IEC/JIS/BSS standard.				
7.1	**PFI CAPACITY 1200 KVAR**				
	3 Nos.- 415V, 2000A hard drawn electrolytic insulated copper busbar				
	1 No. - 415V, 50 KVAR, 50Hz TP Power capacitor bank with built-in/separate discharge coil for connection directly with line through fuse.				
	2 Nos. - 415V, 25 KVAR, 50Hz TP Power capacitor bank with built-in/separate discharge resistor.				
	4 Nos. - 415V, 50 KVAR, 50Hz TP Power capacitor bank with built-in/separate discharge resistor.				
	3 Nos. - 415V, 100 KVAR, 50Hz TP Power capacitor bank with built-in/separate discharge resistor.				
	4 Nos. - 415V, 150 KVAR, 50Hz TP Power capacitor bank with built-in/separate discharge resistor.				
	2 Nos. - 415V, 40 Amps. 50 Hz TP magnetic contactor with AC3 duty				
	4 No. - 415V, 80 Amps. 50 Hz TP magnetic contactor with AC3 duty				
	3 Nos. - 415V, 160 Amps. 50 Hz TP magnetic contactor with AC3 duty				
	4 Nos. - 415V, 250 Amps. 50 Hz TP magnetic contactor with AC3 duty				
	2 Nos.- 415V, 50 Amps TP MCCB				
	5 Nos.- 415V, 100 Amps TP MCCB				

Item No.	Description of Items	Unit	Quantity	Unit Rate (BDT)	Total Amount (BDT)
	3 Nos.- 415V, 200 Amps TP MCCB				
	4 Nos.- 415V, 300 Amps TP MCCB	Set	2	1325000.00	2650000.00
8	**H.T. CABLE WORK**				
	Providing and laying following sizes 11KV XLPE insulated HT cable				
	With HT Cable manufactured by M/S BRB/Paradise Cables Ltd.				
8.1	3x185 sq. mm XLPE insulated HT cable through 6" dia G.I. pipe	Rm	100	16500.00	1650000.00
9	**LT CABLE WORK**				
	Supply, laying including installation, testing and commissioning of the following sizes XLPE insulated and PVC sheathed (N2XY) cable manufactured by M/S BRB/Paradise Cables Ltd.				
9.1	1C-500sq.mm N2XY cable	Meter	200	8795.00	1759000.00
9.2	1C-400sq.mm N2XY cable	Meter	150	6750.00	1012500.00
9.3	1C-150sq.mm N2XY cable	Meter	300	2670.00	801000.00
9.4	1C-70sq.mm N2XY cable	Meter	350	2670.00	934500.00
10	**EARTHING**				
	Earthing the electrical installation with 38.10 mm (1.5") dia G.I. pipe (earth electrode) having 6.35 mm dia holes across the dia at 305 mm interval securedly bonded with 2 SWG HDBC earth lead with washer, nuts, bolts etc. sunk upto undermentioned depth and protection of earth lead by 20mm mm (3/4") dia G.I. pipe upto plinth level run at a depth of 609.6 mm (2 ft.) below G.L. upto main board to be earthed including necessary connecting copper sockets, bolts, nuts including additional vertical run of 12.7 mm dia G.I. pipe upto G.L. from 609.6 mm (2') depth with blind socket for water pouring facility etc. complete for maintaining earth resistance less than 1 ohm.				
10.1	Depth of bottom of main electrode at 37338 mm. (122.5 ft) from GL & length of electrode 36576 mm. (120 ft).	Job	12	36800.00	441600.00
10.2	Construction of Earth inspection pit inside measurement 600mm x600mm with 250mm	Set	12	5500.00	66000.00

Item No.	Description of Items	Unit	Quantity	Unit Rate (BDT)	Total Amount (BDT)
	thick brick in cement morter (1:4) with 100mm thick RCC top slab (1:2:4) with 1% re-enforcement 450mm dia water sealed CI man hole cover with locking arrangement including necessary earth works, site filling and one brick flat soling 75mm thick (1:3:6) base concrete for making inlet channel & 12mm thick (1:2) cement plaster with neat finishing etc. all complete up to a depth of .75 meter.				
10.3	Providing and drawing NO.2 SWG HDBC wire through 19mm (3/4") dia G.I. pipe including fitting, fixing the G.I. pipe in wall or column complete as required. The rate includes the supply & installation of a copper earthing block of size 30"x2.5"x3/4" (approx. as required) to be installed on sub-station wall using suitable insulator.	Metre	350	525.00	183750.00
11	**CABLE KITS**				
	Supply and fixing of heat shrink termination kit outdoor/indoor use complete with DIN lugs earth connection hardware and cable preparation kit (Indoor and Outdoor) at the point of cable termination for 11 KV, 3-core XLPE insulated and PVC sheathed & armored cable of the following sizes (Made in GERMANY/USA/UK/FRANCE)				
11.1	3x240 sq.mm (FOR OUTDOOR USE)	Set	6	15950.00	95700.00
11.2	3x240 sq.mm (FOR INDOOR USE)	Set	8	11900.00	95200.00
12	Supply and fixing of following capacities multipurpose ABCE dry chemical powder stored pressure type with manometer system Fire Extinguisher suitable for repeated use complete with wall bracket, CO2 cartridge, easy refilling system etc. as per sample approved by the Engineer-in-charge.				
12.1	6 Kg. capacity.	Each	12	4000.00	48000.00
13	Supply and installation of required no./quantity of approved type danger sign and rubber floor mat in the sub-station area as per direction of the Engineer.	Job	1	100000.00	100000.00
				Total (Tk.)	**26056250.00**

Note: *Rate shall be inclusive of VAT, Tax, profit, materials/equipment, installation, testing and commissioning including other charges like inland transportation, clearing, forwarding, custom duty, sales taxes, insurance etc.*

3.3 COST ESTIMATE OF 11/0.415KV, 1250KVA SUB-STATION EQUIPMENT

Item No.	Description of Items	Quantity	Unit	Rate (Taka)	Amount (Taka)
1	2	3	4	5	6=3x5
1	Supply, installation, testing and commissioning of outdoor type 11KV, 100A, 50 Hz, 20 KA dropout fuses complete with mounting accessories etc. (3 nos. in a set).	1	Set	10500.00	10500.00
2	Supply, installation, testing and commissioning of outdoor type11 KV, 50 Hz, 100A, (20 KA), 75 KV BIL lightning arrester complete with mounting accessories etc. (3 nos. in a set).	1	Set	8500.00	8500.00
3	**H.T. SWITCHGEAR**				
	Supply, installation, testing and commissioning of type tested locally assembled confirming to IEC 298/694 high voltage switch gear (11KV) of sheet steel clad, dust and vermin proof, free standing, floor mounting, indoor type, 11KV,50Hz, 630A (min.), 350 MVA rated capacity. The switchgear shall be inclusive of withdrawable type Vacuum circuit Breaker (VCB), CT, PT, relay, ammeter, voltmeter, energy meter, bus-bar, interlocked earth switch, internal wiring etc. all equipment and accessories complete as per design, specification, standard, and instruction of Engineer-in-charge.				
	The switchgear must comply with the requirement of DESCO/DPDC and relevant local Authority. The major components shall be manufactured and tested in EU countries/USA/Japan.				
	Incoming Feeder:				
-	1 No. 11KV, 50HZ, 20KA (1 sec), Earthing switch to be interlocked with the vacuum circuit breaker	-	-	-	
	- 1 No. 630A, 11KV, 50HZ, 20KA (3 sec) triple pole totally with-drawable horizontal isolation type Vacuum Circuit Breaker with both manual and motor operated mechanism with closing solenoid, trip button, shunt releases, operating cycle counter, 6 N/O + 6 N/C contacts, mechanical ON/OFF indicators etc.	-	-	-	
	- 2 Nos. 11KV cast resin insulated, double pole potential transformer having ratio	-	-	-	

Item No.	Description of Items	Quantity	Unit	Rate (Taka)	Amount (Taka)
	11000/110V, class 0.5, of 50VA burden (in open delta connection) for metering and protection.				
	- 1 No. of TP MCB for PT secondary protection.	-	-	-	
	- 3 Nos. of cast resin insulated 11 KV double core current transformer having ratio 75/5/5A Core-1, 10VA. Class 0.5M10 Core-2, 15VA, Class 10 P10	-	-	-	
	- 1 No. of 0-15KV voltmeter	-	-	-	
	- 1 No. of 0-75A Ammeter	-	-	-	
	- 1 No. 3 phase 3 wire, two part time of the day solid state micro-computer operated digital KWH meter with indicating "PEAK" & OFF-PEAK energy with maximum demand indicator in KW with integrating time of 30 minutes.	-	-	-	
	- 1 No. of synchrous time switch for double tariff operation of KWH meter	-	-	-	
	- 3 Nos. of indicating lamps (ON/OFF/TRIP)	-	-	-	
	- 1 No. of panel heater with thermostat	-	-	-	
	- 3 Nos of indicating lamp for presence of three phase (R.Y.B.)	-	-	-	
	- 1 No. of operating handle.	-	-	-	
	- 1 No. of Triple pole solid state microprocessor operated IDMT relay with 2 (two) over current and 1 (one) earth fault protection element with standard settings.	-	-	-	
	The tripping coil of the circuit breakers shall be activated by a capacitor storage tripping device without DC (battery) supply source for trip coil.	1	Set	1030000.00	1030000.00
4	**TRANSFORMER**				
	Supply, installation, testing and commissioning of following dry type cast resin, natural air cooled, 3-phase, 50 Hz, 11KV/0.415KV indoor type distribution Transformer of DYN_{11} vector group having percentage impedance 6% (approx.), basic impulse insulation level 75KV, HV & LV bushings, complete with two windings , earthing terminals, temperature sensor with thermometer, lifting lugs, name plate etc. complete as required and suitable for operation at 40^0C ambient temperature with maximum temperature rise 100^0C, manufactured and				

Item No.	Description of Items	Quantity	Unit	Rate (Taka)	Amount (Taka)
	tested in EU countries/USA/Japan in accordance with IEC /NEMA / VDE / BS/JIS standard .				
4.1.	**i) Capacity : 1250 KVA.**	-	-	-	
	ii) No load loss : 2500 watts (Maximum)	-	-	-	
	iii) Full load loss : 12000 watts (Maximum)	-	-	-	
	iv) Degree of protection : IP20 (min.)	1	Each	3250000.00	3250000.00
5	**L.T SWITCHGEAR**				
	Supply, installation, testing and commissioning of 415V, 3-phase, 50 Hz, indoor type low tension switchgear of following specification completes with voltmeter (0-600V) & ammeter of adequate rating, indicating lamps for ON-OFF and locally factory assembled in 16 SWG sheet steel clad, dust & vermin proof, free standing, floor mounting epoxy resin powder coat painted cabinet. The brand of circuit breaker shall be Siemens/Schneider/Eaton/MBH/ ABB/Dorman Smith.				
5.1	**LT PANEL**				
	Incoming:				
	1 Set- 415V, 3000A, TPN&E hard drawn electrolytic insulated copper busbar.				
	1 x 2000A, 65KA, Triple pole withdrawable type Metal clad Air Circuit Breaker with motor operated electronic controlled time dependent selectively operating with built in adjustable overload, adjustable short circuit protection, under voltage releases and auxiliary contacts.				
	3 Nos. - 415V, 2000/5A ratio current transformer with suitable accuracy and burden.				
	1 - Digital Meter System				
	1 - Push button trip				
	3 - Indicating lamps (ON/OFF/TRIP)				
	3 - Indicating lamps for R.Y.B. phases.				
	Outgoing:				
	1 x 2000A, 65KA, Triple pole with drawable type Metal clad Air Circuit Breaker with motor				

Item No.	Description of Items	Quantity	Unit	Rate (Taka)	Amount (Taka)
	operated electronic controlled time dependent selectively operating with built in adjustable overload, adjustable short circuit protection, under voltage releases and auxiliary contacts.				
	1 x 1250A, 65KA, Triple pole with drawable type Metal clad Air Circuit Breaker with motor operated electronic controlled time dependent selectively operating with built in adjustable overload, adjustable short circuit protection, under voltage releases and auxiliary contacts.				
	1 x 400A (350KA), TPMCCB breaker with thermal overload and instantaneous Electro-magnetic short circuit release				
	1 x 100A (25KA), TPMCCB breaker with thermal overload and instantaneous Electro-magnetic short circuit release				
	1 x 80A (25KA), TPMCCB breaker with thermal overload and instantaneous Electro-magnetic short circuit release				
	1 x 63A (25KA), TPMCCB breaker with thermal overload and instantaneous Electro-magnetic short circuit release				
	3 x 40A (25KA), TPMCCB breaker with thermal overload and instantaneous Electro-magnetic short circuit release				
	1 x 32A (16KA), TPMCCB with thermal overload and instantaneous Electro-magnetic short circuit release.	1	Set	1450000.00	1450000.00
6	**P.F.I. PLANT**				
	Supply, installation, testing and commissioning of following 415 volt, 3 phase, 50 Hz power factor improvement plants complete with TP busbars and earth block microprocessor control auto power factor correction relay with digital PF reading display, capacitor bank, contactor, fuse, ON/OFF indicators for every stage of capacitor bank (except directly connected one) etc. locally factory assembled in 16 SWG sheet steel clad dust & vermin proof, free standing, floor mounting, epoxy resin powder coat painted cabinet. Brand:				

Item No.	Description of Items	Quantity	Unit	Rate (Taka)	Amount (Taka)
	Capacitor- Siemens/circutor/Frako/Epcos/Electronicon; Magnetic Contactor- Siemens/Schneider/ABB/Togami; PFC Relay- Siemens/Circutor/Beluk/Epcosshall comply MENA/VDE/IEC/JIS/BSS standard.				
6.1	**PFI CAPACITY 750 KVAR**				
	3 Nos.- 415V, 1500A hard drawn electrolytic insulated copper busbar				
	1 No. - 415V, 25 KVAR, 50Hz TP Power capacitor bank with built-in/separate discharge coil for connection directly with line.				
	3 Nos. - 415V, 25 KVAR, 50Hz TP Power capacitor bank with built-in/separate discharge resistor.				
	3 Nos. - 415V, 50 KVAR, 50Hz TP Power capacitor bank with built-in/separate discharge resistor.				
	5 Nos. - 415V, 100 KVAR, 50Hz TP Power capacitor bank with built-in/separate discharge resistor.				
	3 Nos. - 415V, 40 Amps. 50 Hz TP magnetic contactor with AC3 duty				
	3 Nos. - 415V, 80 Amps. 50 Hz TP magnetic contactor with AC3 duty				
	5 Nos. - 415V, 160 Amps. 50 Hz TP magnetic contactor with AC3 duty				
	4 Nos.- 415V, 50 Amps TP MCCB				
	3 Nos.- 415V, 100 Amps TP MCCB				
	5 Nos.- 415V, 200 Amps TP MCCB	1	Set	800000.00	800000.00
7	**H.T. CABLE WORK**				
	Installation of the following sizes 11KV XLPE insulated HT cable including necessary accessories manufactured by M/S BRB/PARADISE/BBS/super sign Cables Ltd. The rate includes all necessary accessories, PVC/GI pipe, cable tray/ladder, cable trench etc.				
7.1	3x120 sq. mm XLPE insulated 11KV HT cable.	100	Meter	10300.00	1030000.00
8	**LT CABLE WORK**				
	Installation of the following sizes XLPE insulated and PVC sheathed (N2XY) cable including				

Item No.	Description of Items	Quantity	Unit	Rate (Taka)	Amount (Taka)
	necessary accessories manufactured by M/S BRB/PARADISE Cables Ltd. The rate includes all necessary connection accessories, cable tray/ladder/trench, earthing bar etc.				
8.1	1C-400sq.mm N2XY cable	250	Meter	5750.00	1437500.00
8.2	1C-120sq.mm N2XY cable	200	Meter	1750.00	350000.00
8.3	1C-70sq.mm N2XY cable	250	Meter	1040.00	260000.00
9	**CABLE KITS**				
	Supply and fixing of heat shrink termination kit outdoor/indoor use complete with DIN lugs earth connection hardware and cable preparation kit (Indoor and Outdoor) at the point of cable termination for 11 KV, 3-core XLPE insulated and PVC sheathed & armored cable of the following sizes (Made in EU countries/USA/Japan.)				
9.1	3x120 sq.mm (FOR OUTDOOR USE)	4	Set	10500.00	42000.00
9.2	3x120 sq.mm (FOR INDOOR USE)	6	Set	8600.00	51600.00
10	**EARTHING**				
	Earthing the electrical installation with 38.10 mm (1.5") dia G.I. pipe (earth electrode) having 6.35 mm dia holes across the dia at 305 mm interval securely bonded with 2 SWG HDBC earth lead with washer, nuts, bolts etc. sunk upto undermentioned depth and protection of earth lead by 20mm mm (3/4") dia G.I. pipe upto plinth level run at a depth of 609.6 mm (2 ft.) below G.L. upto main board to be earthed including necessary connecting copper sockets, bolts, nuts including additional vertical run of 12.7 mm dia G.I. pipe upto G.L. from 609.6 mm (2') depth with blind socket for water pouring facility etc. complete for maintaining earth resistance less than 1 ohm.				
10.1	Depth of bottom of main electrode at 31242 mm. (102.5 ft) from GL & length of electrode 30480 mm. (100 ft).	5	Set	37500.00	187500.00
10.2	Construction of Earth inspection pit inside measurement 600mm x600mm with 250mm thick brick in cement mortar (1:4) with 100mm thick RCC top slab (1:2:4) with 1% re-enforcement 450mm dia water sealed CI man hole cover with locking arrangement	5	Set	6050.00	30250.00

Item No.	Description of Items	Quantity	Unit	Rate (Taka)	Amount (Taka)
	including necessary earth works, site filling and one brick flat soling 75mm thick (1:3:6) base concrete for making inlet channel & 12mm thick (1:2) cement plaster with neat finishing etc. all complete up to a depth of .75 meter.				
11	The contractor shall be responsible for communicating with the local electric supply office (DESCO/DPDC) and other authority viz. Chief Inspector of electric license board, Govt. of Bangladesh for their inspection/clearance and sanction of electric load. The contractor shall submit the application for required load sanction and other paper formalities on behalf of the employer till the sub-station is commissioned and handed over to the employer. However, the security deposit money and DESCO/DPDC meter panel installation charges for the proposed sub-station will be directly paid to DESCO/DPDC by the employer on submission of deposit slip but other incidental charge will be included in this item.				
	The contractor shall also be responsible for communicating with the local electric supply office (DESCO/DPDC) including all official paper formalities on behalf of the Employer for Ring Main Unit (RMU) installation and line construction if required. All charges for RMU purpose will be paid by the Employer.	1	Job	850,000.00	150,000.00
12	Supply and fixing of following capacities multipurpose ABCE dry chemical powder stored pressure type with manometer system Fire Extinguisher suitable for repeated use complete with wall bracket, CO2 cartridge, easy refilling system etc. as per sample approved by the Engineer-in-charge.				
12.1	6 Kg. capacity.	4	Each	4000.00	16000.00
				Total:	**10103850.00**
				1250 KVA Sub-Station 1 Set x 2	**10103850.00x2**
				Grand Total	**20207700.00**

3.4 COST ESTIMATE OF 11KV UNDERGROUND DISTRIBUTION LINE

Item No.	Description of Items	Quantity	Unit	Unit Rate (Taka)	Total Amount (Taka)	Remarks/PWD SCHDULE 2018 Item no
1	2	3	4	5	6=3*5	
1	**UNDERGROUND CABLE WORKS**					
	Providing & laying of following sizes LT PVC insulated sheathed & armored cable (NYFGbY)/ HT (11KV) PVC insulated, sheathed, screened & armored cable (NYSEYFGbY)/HT (11KV) armored XLPE Cable: All electrical contacts shall be of brass/copper connected through connector or soldering (no twisting shall be allowed) and cables shall be manufactured and tested according to relevant IEC/BDS/BS/VDE standards and as per detailed specification mentioned in Annexure-A. The work shall be carried out as per direction/approval/acceptance of the Engineer.					
(i)	In kutcha ground by cutting 45.70 cm width x 91.40 cm depth trench with necessary brick or tile protection and mending the damages good by refilling trench with proper compaction.					
(ii)	In pucca floor through PVC pipe by cutting trench of necessary size and mending the damages good by brick soling, 75 mm (1:2:4) CC work with neat cement finishing etc.					
(iii)	In pucca ground/road through required size of PVC pipe by cutting 45.70cm width x 91.40 cm depth trench mending good the damages by earth refilling with proper compaction providing 50 mm thick compacted premix bituminous carpeting over one layer of 1st class flat brick soling and 75 mm thick compacted water bound macadam of khoa of brick.					

Item No.	Description of Items	Quantity	Unit	Unit Rate (Taka)	Total Amount (Taka)	Remarks/PWD SCHDULE 2018 Item no
	With cable manufactured by M/S BRB/Paradise/Poly/Citizen/BBS/Super sign cables Ltd.					
1.1	**3C-120 sq.mm XLPE cable.**					
(i)	In Katcha ground	5000	Meter	9998.00	49990000.00	BRB Rate-8280 tk/m +20.75% (PWD analysis)
(ii)	In pucca floor / ground / road through 100 mm PVC pipe having wall thickness of 3 mm.	80000	Meter	10697.00	855760000.00	BRB Rate-10404 tk/m +29.2% (PWD analysis)
1.2	3C-150 sq.mm XLPE cable.					
(i)	In Katcha ground	500	Meter	9998.00	4999000.00	BRB Rate-8280 tk/m +20.75% (PWD analysis)
(ii)	In pucca floor / ground / road through 100 mm PVC pipe having wall thickness of 3 mm.	3000	Meter	10697.00	32091000.00	BRB Rate-10404 tk/m +29.2%(PWD analysis)
1.3	3C-185 sq.mm XLPE cable.					
(i)	In Katcha ground	3000	Meter	9998.00	29994000.00	BRB Rate-8280 tk/m +20.75% (PWD analysis)
(ii)	In pucca floor / ground / road through 125 mm PVC pipe having wall thickness of 3 mm.	13500	Meter	10697.00	144409500.00	BRB Rate-10404 tk/m +29.2% (PWD analysis)
1.4	3C-240 sq.mm XLPE cable.					
(i)	In Katcha ground	200	Meter	12562.00	2512400.00	BRB Rate-10404 tk/m +20.75% (PWD analysis)
(ii)	In pucca floor / ground / road through 125 mm PVC pipe having wall thickness of 3 mm.	1000	Meter	13315.00	13315000.00	BRB Rate-10404 tk/m +28% (PWD analysis)
				Total:	**1,133,070,900.00**	

3.5 COST ESTIMATE OF STREET LIGHTING SYSTEM (PHASE I & II)

Item No.	Description of Items	Quantity (Phase-I)	Quantity (Phase-II)	Unit	Unit Rate (Taka)	Amount (Phase-I)	Amount (Phase-II)	Total Amount (Taka)
1	2	3	4	5	6	7 = 3 x 6	8 = 4 x 6	9 = 7 + 8
1	**UNDERGROUND CABLE WORKS**							
	Providing & laying of the following **XLPE insulated & PVC sheathed cable (N2XY)** with PVC insulated green/white colored ECC wire (BYA) connecting at both ends, through PVC pipe & accessories in the following manner: All electrical contacts shall be of brass/copper connected through connector or soldering (no twisting shall be allowed) and cables shall be manufactured and tested according to relevant IEC/BDS/ BS/ VDE standards and as per detailed specification mentioned in Annexure-A. The work shall be carried out as per direction/approval/acceptance of the Engineer.							
(i)	In kutcha ground by cutting 45.70 cm width x 91.40 cm depth trench with necessary brick or tile protection and mending the damages good by refilling trench with proper compaction.							
(ii)	In pucca floor through PVC pipe by cutting trench of necessary size and mending the damages good by brick soling, 75 mm (1:2:4) CC work with neat cement finishing etc.							
	With cable manufactured by M/S BRB/Paradise/Poly/Citizen/BBS/super sign cables Ltd.							
1.1	1C-2 x 16 sq.mm (N2XY) with 16 sq.mm (BYA) ECC wire through PVC pipe of minimum inner dia 40 mm having wall thickness of 1.9 mm.							
(i)	In Katcha ground	2120	2000	Meter	1205.00	2554600.00	2410000.00	4964600.00
(ii)	In Pucca floor	300	200	Meter	1294.00	388200.00	258800.00	647000.00

Item No.	Description of Items	Quantity (Phase-I)	Quantity (Phase-II)	Unit	Unit Rate (Taka)	Amount (Phase-I)	Amount (Phase-II)	Total Amount (Taka)
1.2	1C-4 x 25 sq.mm (N2XY) with 16 sq.mm (BYA) ECC wire through PVC pipe of minimum inner dia 50 mm having wall thickness of 2.59 mm.							
(i)	In Katcha ground	10500	10000	Meter	1844.00	19362000.00	18440000.00	37802000.00
(ii)	In Pucca floor	800	700	Meter	1927.00	1541600.00	1348900.00	2890500.00
2	**LIGHT FITTINGS**							
	Supply & complete installation of IP65 street light fixture of following types complete with LED lamp of approved type, holder electronic control gear, earthing block and all other accessories as per specification, drawing and direction of the Engineer-in-Charge. The light fixture shall be CE, RoHS, UL certified and manufactured by International reputed manufacturer. The rate includes the necessary arms, bracket and other fixing arrangement with the PC pole of 11KV overhead line.							
2.1	90W LED street light	300	250	Each	9358.00	2807400.00	2339500.00	5146900.00
3	**LIGHT POLE**							
	Supply & complete installation of 7500mm long hot dip galvanized G.I light pole having bottom dia 150mm (6") and top dia 75mm (3") complete with welded base plate suitable for bolting with concrete foundation including 50mm (2") dia bracket arm shall be fixed to the light column as per drawing. The length of the bracket shall be such that the end of light fixture will be 1.5meter (approx.) from the light column. A junction box to be installed at bottom level of the pole fabricated from 2.0mm (min.) mild steel sheet and hot deep galvanized complete with cover including termination unit, circuit breaker and earthing terminal etc. The work shall be completed as							

Item No.	Description of Items	Quantity (Phase-I)	Quantity (Phase-II)	Unit	Unit Rate (Taka)	Amount (Phase-I)	Amount (Phase-II)	Total Amount (Taka)
	per drawing and direction of the Engineer.							
3.1	**Light Pole**	**300**	**250**	**Each**	**55000.00**	**16500000.00**	**13750000.00**	**30250000.00**
4	**GARDEN LIGHT FITTINGS (LED)**							
	Supply & fixing of LED garden / gate light fitting of the following features and model with all necessary elements such as driver, chips etc. complete. Model and sample shall be approved by the engineer							
4.1	**Garden light fittings (LED)**	**2500**	**2200**	**Each**	**8150.00**	**20375000.00**	**17930000.00**	**38305000.00**
5	**DISTRIBUTION BOARD, MCB/MCCB**							
	Supply & installation of outdoor type distribution board made of epoxy powder coated 14 SWG sheet steel with hinge type double doors having built in flash type locking arrangement, complete with copper bus bars (phases & neutral), copper earthing bars and indicating lamps in conformity to the distribution boards ratings as detailed below. The box shall be double door type i.e. one cover door inside through which knobs of MCB/MCCB's are accessible and no live part shall be accessible to an operator. The rate shall include supply & installation of MCB/MCCB, magnetic contractor (Siemens/Dorman Smith/Schneider/Eaton), photo cell, timer etc. The work shall be complete in all respect as per specifications, drawing and direction of the Engineer-in-Charge. Sufficient gap must be maintained between bus bars and back side of the box. The item also includes the fixing of the cable lugs for distribution cables as per drawing and direction of the Engineer-in-Charge.							

Item No.	Description of Items	Quantity (Phase-I)	Quantity (Phase-II)	Unit	Unit Rate (Taka)	Amount (Phase-I)	Amount (Phase-II)	Total Amount (Taka)
5.1	Box size: 650mm x 750mm x 150mm Busbar: 120A SPN & E Incoming: 63A SP/DP MCB 63A SP/DP Magnetic Contractor Photo Cell & Timmer Outgoing: up to 15x16A TP MCB	20	25	Set	55000.00	1100000.00	1375000.00	2475000.00
6	**G.I. PIPE**							
	Supply & installation of G.I. pipe of M/S National Tubes Ltd. or approved equivalent, complete with all accessories as per drawing, specification and direction of the Engineer.							
	a) 38mm nominal inside dia	70	60	Meter	400.00	28000.00	24000.00	52000.00
	b) 50mm nominal inside dia	70	60	Meter	472.00	33040.00	28320.00	61360.00
7	**EARTHING SYSTEM**							
7.1	Earthing the electrical installation with 38.10 mm (1.5") dia G.I. pipe (earth electrode) having 6.35 mm dia holes across the dia at 305 mm interval securely bonded with 2 SWG HDBC earth lead with washer, nuts, bolts etc. sunk upto undermentioned depth and protection of earth lead by 20mm mm 3/4") dia G.I. pipe up to plinth level run at a depth of 609.6 mm (2 ft.) below G.L. upto main board to be earthed including necessary connecting copper sockets, bolts, nuts including additional vertical run of 20 mm dia G.I. pipe up to G.L. from 609.6 mm (2') depth with blind socket for water pouring facility etc. complete for maintaining earth resistance less than 1 ohm.							
7.1.1	Depth of bottom of main electrode at 31242 mm. (102.5 ft) from GL	18	17	Set	36369.00	654642.00	618273.00	1272915.00

Item No.	Description of Items	Quantity (Phase-I)	Quantity (Phase-II)	Unit	Unit Rate (Taka)	Amount (Phase-I)	Amount (Phase-II)	Total Amount (Taka)
	& length of electrode 30480 mm. (100 ft).							
7.2	Construction of earth inspection pit inside measurement 600mm x600mm with 250mm thick brick in cement mortar (1:4) with 100mm thick RCC top slab (1:2:4) with 1% re-enforcement 450mm dia water sealed CI man hole cover with locking arrangement including necessary earth works, site filling and one brick flat soling 75mm thick (1:3:6) base concrete for making inlet channel & 12mm thick (1:2) cement plaster with neat finishing etc. all complete up to a depth of 0.75 meter.	**18**	**17**	**Set**	**6757.00**	**121626.00**	**114869.00**	**236495.00**
7.3	Providing and drawing No.2 SWG HDBC wire through 20mm (3/4") dia G.I. pipe including fitting, fixing the G.I. pipe in wall or column complete as required.	**100**	**100**	**Meter**	**641.00**	**64100.00**	**64100.00**	**128200.00**
Total:						**65530208.00**	**58701762.00**	**124,231,970.00**

3.7 80MW DUAL FUEL HFO POWER PLANT

Sl. No.	Description	Quantity	Capacity (MW)	Total MW	Total Price (Tk.)
1	**Engine and Alternator:**	8	9.78	78.24	2400000000.00
1.1	Engine				
1.2	Alternator				
1.3	Separator				
1.4	LV Panel				
1.5	Engine Gratings				
1.6	Starting and Service Air Compressor				
1.7	Control Panel				
1.8	Radiator				
1.9	Silencer				
1.10	Flexible Coupling				
1.11	Flywheel Cover				
1.12	Common Base Frame				
1.13	Base Frame Fastening Equipment				
1.14	Flexible Connections Between Engine and External Piping				
1.15	Set Steel Springs				
1.16	Engine Maintenance Platform - Prefabricated				
2	**Fuel Tank and Fuel System**	1 Lot	LS	LS	420,000,000.00
2.1	**Fuel System**				
	HFO Tank				
	Fresh Lube Oil Tank				
	Used Lube Oil				
	Top up Tank				
	Sludge Tank				
	Fuel pipe line				

Sl. No.	Description	Quantity	Capacity (MW)	Total MW	Total Price (Tk.)
	Piping and Valves				
	Light fuel oil unloading pump - double				
	Light fuel oil storage tank				
	Light fuel oil storage tank equipment				
	Light fuel oil feeder - double				
	Pilot fuel oil flow meter				
	Pilot fuel oil filter				
	Heavy fuel oil buffer tank				
	Heavy fuel oil buffer tank equipment				
	Heavy fuel oil separator unit - single				
	Heavy fuel oil separator unit - triple				
	Heavy fuel oil day tank				
	Heavy fuel oil day tank equipment				
	Heavy fuel oil engine fuel booster				
	Heavy fuel oil feeder - double				
	Heavy fuel oil flow meter for total fuel consumption measurement				
	Piping and valves - heavy fuel oil system				
	Pipe insulation material - heavy fuel oil system				
	Steam trace heating material - heavy fuel oil system				
2.2	**Gas System**				
	Plant isolation valve (manual)				
	Gas filtering station (if required)				
	Gas flow measuring unit				
	Main safety shut off valve - engine specific				
	Gas regulating unit				
	Flow meter for gas regulating unit				
	Piping and valves - gas system				

Sl. No.	Description	Quantity	Capacity (MW)	Total MW	Total Price (Tk.)
2.3	**Lubricating Oil System**				
	Lubricating oil unloading pump unit - single				
	Lubricating oil loading pump unit - single				
	Lubricating oil storage tank				
	Lubricating oil storage tank equipment				
	Lubricating oil service tank				
	Lubricating oil service tank equipment				
	Used lubricating oil storage tank				
	Used lubricating oil storage tank equipment				
	Lubricating oil transfer pump - stationary				
	Lubricating oil transfer pump mobile				
	Lubricating oil separator unit				
	Oil mist separator (mounted on the EGM)				
	Lubricating oil heat exchanger (mounted on the engine)				
	Lubricating oil thermostatic valve (mounted on the engine)				
3	**Auxiliary Equipment**	1 Lot	LS	LS	300,000,000.00
3.1	**Compressed Air System**				
	Instrument Air Compressor Unit				
	Air Compressor Unit - Double				
	Air Bottle				
	Piping And Valves - Compressed Air System				
3.2	**Cooling System**				
	Set cooling radiator				
	Set cooling radiator ladder and railings				
	Low temperature circuit expansion vessel (mounted on the EGM)				
	Maintenance water tank unit				
	High temperature circuit preheating unit (mounted on the EAM)				

Sl. No.	Description	Quantity	Capacity (MW)	Total MW	Total Price (Tk.)
	Low temperature thermostatic valve (mounted on the EAM)				
	High temperature thermostatic valve (mounted on the EAM)				
	Piping and valves - cooling system				
3.3	**Exhaust System**				
	Exhaust gas branch pipe (mounted on the EGM)				
	Exhaust gas silencer				
	Exhaust gas bellows				
	Safety vent				
	Exhaust gas ventilation fan (mounted on the EGM				
	Exhaust gas ducting				
	Exhaust gas ducting insulation				
	Exhaust gas stack pipe				
	Exhaust gas stack insulation				
	Piping and valves - silencer draining pipe				
3.4	**Heat Recovery System**				
	Full heat recovery boiler with Economizer				
	Boiler service platform				
	Bellows for exhaust gas boiler				
	Bellows for exhaust gas by-pass damper				
	Feed water tank				
	Feed water pump				
	Flow meter for feed water				
	Chemical dosing unit				
	Blow-down tank				
	Control panel				
	Heat recovery container				
	Oil detector with conductivity sensor				

Sl. No.	Description	Quantity	Capacity (MW)	Total MW	Total Price (Tk.)
	Condensate return tank with pump				
	Water softening filter				
	Steam headers for exhaust gas boilers				
	Boiler washing water tank with pump				
	Fuel fired boiler for fuel heating				
	Pipe insulation material - fuel fired boiler				
	Electric trace heating material - fuel fired boiler				
	Piping, pipe supports, valves and insulation for steam generation				
4	**Water Treatment System**	1 Lot	LS	LS	30,000,000.00
	Water treatment unit				
	Treated water storage tank				
	Treated water storage tank equipment				
	Water booster unit				
	Piping and valves - water treatment system				
5	**Substation**	1 Lot	LS	LS	350,000,000.00
5.1	**Medium Voltage System**				
	Main busbar				
	Generator cubicle				
	Neutral point cubicle				
	Outgoing feeder cubicle				
	Station auxiliary transformer feeder cubicle				
	Measuring cubicle				
	Medium voltage power cables				
5.2	**Low Voltage System**				
	Station auxiliary transformer				
	Low voltage switchgear				
	Frequency converter for cooling radiators				

Sl. No.	Description	Quantity	Capacity (MW)	Total MW	Total Price (Tk.)
	Frequency converter - heavy fuel oil separator				
	Frequency converter - engine hall inlet ventilation auxiliary side				
	Frequency converter - engine hall inlet ventilation generator side				
	Low voltage power cables				
5.3	**High Voltage System**				
	Step-up transformer				
	Single Feeder - Line to Transformer Bay				
	High voltage power cables and conductors				
5.4	**DC System**				
	DC system - 24 V				
	DC system - 110 V				
	DC system switchyard control				
6	**Plant Electrification and Earthing**	1 Lot	LS	LS	25,000,000.00
	Cable raceways				
	Earthing above 0-level				
	Fire detection				
	Gas detection				
	IT-network				
	Lighting and building electrification				
	Lightning protection				
7	**Transmission Line**	1 Lot	LS	LS	80,000,000.00
8	**Civil Structures and Material**	1 Lot	LS	LS	40,000,000.00
	Engine Hall Structure				
	Electrical Equipment Buildings				
	Fuel Treatment House Structure				
	Ancillary Buildings and Structures				
	Gas Supply Structures				

Sl. No.	Description	Quantity	Capacity (MW)	Total MW	Total Price (Tk.)
	Fuel and Oil Unloading Station				
	Fuel Storage Structures				
	Outdoor Auxiliary Structures				
	Station Auxiliary Transformer Structures				
	Cables from Mv Room to Power Transformer				
	Power Transformer Structures				
	High Voltage S Witcher D Structures				
	Transmission Line Structures				
	Existing Structures and Demolition				
9	**Platforms, Support Erection Fabrication etc.**	1 Lot	LS	LS	300,000,000.00
	Substructures - other power plant areas				
	Superstructures - other power plant areas				
	Substructures - power transformer area				
	Superstructures - power transformer area				
	Substructures - fuel treatment house				
	Superstructures - fuel treatment house				
	Substructures - day tank area				
	Superstructures - day tank area				
	Substructures - fuel and oil unloading area				
	Superstructures - fuel and oil unloading area				
	Substructures - station auxiliary transformer area				
	Superstructures - station auxiliary transformer area				
	Superstructures - pipe route between unloading station				
	Storage tank area				
	Substructures - gas supply				
	Superstructures - gas supply				
	Substructures - high voltage switchyard area				

Sl. No.	Description	Quantity	Capacity (MW)	Total MW	Total Price (Tk.)
	Superstructures - high voltage switchyard area				
	Substructures - fuel storage area				
	Superstructures - fuel storage area				
10	**Logistic, Training and Others**	1 lot	LS	LS	40,000,000.00
	Total				**3,985,000,000.00**

3.8 COST ESTIMATE OF UNDERGROUND CABLE. 33KV DOUBLE LINE AND SOLAR POWER

Item no.	Description of items	Quantity	Unit	Rate (Taka)	Amount (Taka)	Reference of Cost
1	**33KV Overhead Double Circuit Line**	2	Km	6500000	13000000	BREB, 2020
	from utility Substation to terminal of submersible cable					
2	**33KV Double Circuit Electrical Underground Cable**	3.5	Km	1,80,00000.00	6,30,00000.00	BREB, 2020
	interconnection between two 33/11 kV substation					
3	**1MW Solar Power**	1000	KWp	132725	13,27,25,000.00	PWD, 2020
Total					**208725000.00**	

4 COST ESTIMATE OF WATER SUPPLY SYSTEM

4.1 COST ESTIMATE OF WATER SUPPLY PIPE LINE

Item No.	pwd-2018	Description	Unit	Unit Rate (BDT)	Phase-01		Phase-02		Phase-03		Total Quantity	Grand Total
					Quantity	Amount	Quantity	Amount	Quantity	Amount		
1	2	3	4	5	6	7=5x6	8	9=5x8	10	11=5x10	12=6+8+10	13=5x12
1	02.1	Earth work in excavation in all kinds of soil for foundation trenches including layout, providing center lines, local bench-mark pillars, levelling, ramming and preparing the base, fixing bamboo spikes and marking layout with chalk powder, providing necessary tools and plants, protecting and maintaining the trench dry etc., stacking, cleaning the excavated earth at a safe distance out of the area enclosed by the layout etc. all complete and accepted by the Engineer-in-charge, subject to submit method statement of carrying out excavation work to the Engineer-in-charge for approval. However, engineer's approval shall not relieve the contractor of his responsibilities and obligations under the contract.										
1.1	02.1.3	**Earthwork in excavation** in	Cum	126.00	11,849.2	1,492,999.20	11,539.0	1,453,914.00	9,383.00	1,182,258.00	32,771.20	4,129,171.20

Item No.	pwd-2018	Description	Unit	Unit Rate (BDT)	Phase-01		Phase-02		Phase-03		Total Quantity	Grand Total
					Quantity	Amount	Quantity	Amount	Quantity	Amount		
		foundation trenches up to 1.5 m depth and maximum 10 m lead: in medium stiff clayey soil.			0		0					
2	02.13	Earth filling in foundation trenches and plinth in 150 mm layer with earth available within 90 m of the building site to achieve minimum dry density of 95% with optimum moisture content (Modified proctor test) including carrying watering, leveling, dressing and compacting to a specified percentage each layer up to finished level etc. all complete and accepted by Engineer-in-charge.	Cum	149.00	4,739.68	706,212.32	4,615.60	687,724.40	3,753.20	559,226.80	13,108.48	1,953,163.52
3	03.1	**One layer brick flat soling** in foundation or in floor with first class/picked jhama bricks including preparation of bed and filling the interstices with local sand, leveling etc. complete and accepted by the Engineer-in-charge	Sqm	420.00	5,924.60	2,488,332.00	5,769.50	2,423,190.00	4,691.50	1,970,430.00	16,385.60	6,881,952.00
4	03.4	**Mass concrete (1:3:6) in foundation or in floor** with cement, sand (F.M. 1.2) and picked jhama brick chips including breaking of chips, screening, mixing, laying,										

Item No.	pwd-2018	Description	Unit	Unit Rate (BDT)	Phase-01		Phase-02		Phase-03		Total Quantity	Grand Total
					Quantity	Amount	Quantity	Amount	Quantity	Amount		
		compacting to required level and curing for at least 7 days including the supply of water, electricity, costs of tools & plants and other charges etc. all complete and accepted by the Engineer-in-charge. (Cement: CEM-II/A-M)										
4.1	03.4.1	Mass concrete in foundation (1:3:6) with cement, brick chips and sand of F.M. 1.2	Cum	6,647.00	444.35	2,953,561.22	432.71	2,876,239.99	351.86	2,338,830.04	1,228.92	8,168,631.24
5		Supplying, laying, fitting and fixing of best quality **HDPE water supply pipe** having PE-100 , PN-16 (nominal pressure for PN-16 is & SDR 11(HDPE) for water supply pipe having density 0.940 – 0.970 gm/cm^3 and other physical, chemical, thermal, fire resistivity properties etc. as per BSTI approved manufacturer standards or ASTM/BS/ISO/IS standards ,fitted and fixed in position with necessary joints and fittings with all accessories ,bedding sand(compacted granular materials etc.), complete approved and accepted by the Engineer- in-charge.										

Item No.	pwd-2018	Description	Unit	Unit Rate (BDT)	Phase-01		Phase-02		Phase-03		Total Quantity	Grand Total
					Quantity	Amount	Quantity	Amount	Quantity	Amount		
5.1	Analysis	25mm dia (HDPE Pipe)	Rm	475.58	-	-	-	-	143.00	68,008.57	143.00	68,008.57
5.2	Analysis	32mm dia (HDPE Pipe)	Rm	537.76	-	-	72.00	38,718.91	-	-	72.00	38,718.91
5.3	Analysis	50 mm dia (HDPE Pipe)	Rm	737.36	-	-	251.00	185,077.70	-	-	251.00	185,077.70
5.4	Analysis	75 mm dia (HDPE Pipe)	Rm	1,165.16	-	-	175.00	203,902.53	-	-	175.00	203,902.53
5.5	Analysis	90 mm dia (HDPE Pipe)	Rm	1,515.61	-	-	150.00	227,341.09	445.00	674,445.23	595.00	901,786.32
5.6	Analysis	110 mm dia (HDPE Pipe)	Rm	1,963.71	-	-	140.00	274,918.92	-	-	140.00	274,918.92
5.7	Analysis	125 mm dia (HDPE Pipe)	Rm	2,407.82	-	-	322.00	775,318.09	196.00	471,932.75	518.00	1,247,250.84
5.8	Analysis	140 mm dia (HDPE Pipe)	Rm	2,892.41	-	-	182.00	526,418.62	69.00	199,576.29	251.00	725,994.91
5.9	Analysis	160 mm dia (HDPE Pipe)	Rm	3,588.11	191.00	685,329.28	195.00	699,681.73	-	-	386.00	1,385,011.01
5.10	Analysis	180 mm dia (HDPE Pipe)	Rm	4,446.25	-	-	346.00	1,538,402.31	-	-	346.00	1,538,402.31
5.11	Analysis	200 mm dia (HDPE Pipe)	Rm	5,321.07	151.00	803,481.54	238.00	1,266,414.62	137.00	728,986.56	526.00	2,798,882.72
5.12	Analysis	225 mm dia (HDPE Pipe)	Rm	6,573.18	597.00	3,924,185.68	1,327.00	8,722,603.67	-	-	1,924.00	12,646,789.35
5.13	Analysis	250 mm dia (HDPE Pipe)	Rm	7,943.33	524.00	4,162,306.33	345.00	2,740,449.78	130.00	1,032,633.25	999.00	7,935,389.36
5.14	Analysis	280 mm dia (HDPE Pipe)	Rm	10,023.88	214.00	2,145,110.00	170.00	1,704,059.34	775.00	7,768,505.82	1,159.00	11,617,675.16
5.15	Analysis	315 mm dia (HDPE Pipe)	Rm	12,655.91	505.00	6,391,237.07	316.00	3,999,269.14	132.00	1,670,580.78	953.00	12,061,086.99
5.16	Analysis	355 mm dia (HDPE Pipe)	Rm	15,689.81	440.00	6,903,516.78	361.00	5,664,021.72	269.00	4,220,559.12	1,070.00	16,788,097.63
5.17	Analysis	400 mm dia (HDPE Pipe)	Rm	19,534.29	190.00	3,711,514.31	230.00	4,492,885.74	624.00	12,189,394.37	1,044.00	20,393,794.42
5.18	Analysis	450 mm dia (HDPE Pipe)	Rm	25,429.33	655.00	16,656,212.64	-	-	-	-	655.00	16,656,212.64
5.19	Analysis	500 mm dia (HDPE Pipe)	Rm	35,309.97	605.00	21,362,534.01	375.00	13,241,240.09	1,345.00	47,491,914.44	2,325.00	82,095,688.54
5.20	Analysis	560 mm dia (HDPE Pipe)	Rm	43,632.64	1,314.00	57,333,295.13	50.00	2,181,632.23	-	-	1,364.00	59,514,927.36
6	26.77	Supplying, fitting and fixing of **Water pressure reducing valve** to reduce static and flowing pressures in water distribution systems and it shall be a diaphragm/balanced piston type with integral stainless-steel strainer and a built-in bypass to relieve pressure build-up downstream of the assembly.										

Item No.	pwd-2018	Description	Unit	Unit Rate (BDT)	Phase-01		Phase-02		Phase-03		Total Quantity	Grand Total
					Quantity	Amount	Quantity	Amount	Quantity	Amount		
		The valve shall be spring loaded to open and shall be diaphragm actuated to close under pressure conditions. The valve shall be suitable for supply pressure up to 400 psi and water temperatures from 33º to 180ºF. The valve's internal parts such as the cartridge assembly, strainer, diaphragm, and spring shall be accessible for inspection, repair or replacement without disconnecting the device from the pipeline. In addition, the valve shall have a clean-out feature to allow for removal of the strainer and seat disc without disturbing the pressure setting etc. all complete accepted by the Engineer- in-charge.										
6.1	26.77.6	50 mm dia water pressure reducing valve	Each	12,129.00	-	-	1.00	12,129.00	-	-	1.00	12,129.00
6.2	Analysis	125 mm dia water pressure reducing valve	Each	48,420.20	-	-	1.00	48,420.20	-	-	1.00	48,420.20
6.3	Analysis	225 mm dia water pressure reducing valve	Each	77,009.23	-	-	1.00	77,009.23	-	-	1.00	77,009.23
6.4	Analysis	355 mm dia water pressure reducing valve	Each	120,320.83	-	-	1.00	120,320.83	-	-	1.00	120,320.83

Item No.	pwd-2018	Description	Unit	Unit Rate (BDT)	Phase-01		Phase-02		Phase-03		Total Quantity	Grand Total
					Quantity	Amount	Quantity	Amount	Quantity	Amount		
6.5	Analysis	400 mm dia water pressure reducing valve	Each	135,239.27	-	-	1.00	135,239.27	1.00	135,239.27	2.00	270,478.54
6.6	Analysis	450 mm dia water pressure reducing valve	Each	151,842.05	1.00	151,842.05	-	-	-	-	1.00	151,842.05
6.7	Analysis	500 mm dia water pressure reducing valve	Each	168,444.83	1.00	168,444.83	-	-	1.00	168,444.83	2.00	336,889.66
6.8	Analysis	560 mm dia water pressure reducing valve	Each	188,368.16	1.00	188,368.16	1.00	188,368.16	-	-	2.00	376,736.33
7		Supplying, fitting and fixing approved quality **Air release valve/air vent** with sealant etc. complete as per specification approved and accepted by the Engineer.										
7.1	Analysis	50 mm dia air release valve	Each	4,920.08	2.00	9,840.15	3.00	14,760.23	1.00	4,920.08	6.00	29,520.46
7.2	Analysis	62 mm dia air release valve	Each	6,002.87	1.00	6,002.87	1.00	6,002.87	1.00	6,002.87	3.00	18,008.60
7.3	Analysis	75 mm dia air release valve	Each	7,807.52	3.00	23,422.55	3.00	23,422.55	1.00	7,807.52	7.00	54,652.62
7.4	Analysis	100 mm dia air release valve	Each	10,937.38	-	-	4.00	43,749.53	1.00	10,937.38	5.00	54,686.91
7.5	Analysis	150 mm dia air release valve	Each	14,823.40	2.00	29,646.79	2.00	29,646.79	2.00	29,646.79	6.00	88,940.37
7.6	Analysis	200 mm dia air release valve	Each	18,497.66	3.00	55,492.99	1.00	18,497.66	3.00	55,492.99	7.00	129,483.64
7.7	Analysis	225 mm dia air release valve	Each	21,505.41	2.00	43,010.83	1.00	21,505.41	-	-	3.00	64,516.24
7.8	Analysis	250 mm dia air release valve	Each	24,611.22	-	-	5.00	123,056.08	5.00	123,056.08	10.00	246,112.15
8		Supplying, fitting and fixing of best quality **G.I. gate valve** with sealant etc. complete approved and accepted by the Engineer-in- charge.										
8.1	26.47.4	32 mm gate valve	Each	812.00	30.00	24,360.00	15.00	12,180.00	20.00	16,240.00	65.00	52,780.00
8.2	26.47.5	40 mm gate valve	Each	1,072.00	20.00	21,440.00	15.00	16,080.00	11.00	11,792.00	46.00	49,312.00
8.3	26.47.7	63 mm gate valve	Each	3,387.00	11.00	37,257.00	5.00	16,935.00	9.00	30,483.00	25.00	84,675.00

Item No.	pwd-2018	Description	Unit	Unit Rate (BDT)	Phase-01		Phase-02		Phase-03		Total Quantity	Grand Total
					Quantity	Amount	Quantity	Amount	Quantity	Amount		
8.4	26.47.8	75 mm gate valve	Each	4,519.00	10.00	45,190.00	2.00	9,038.00	8.00	36,152.00	20.00	90,380.00
8.5	26.47.9	100 mm gate valve	Each	7,344.00	8.00	58,752.00	8.00	58,752.00	12.00	88,128.00	28.00	205,632.00
8.6	Analysis	150 mm gate valve	Each	27,212.40	3.00	81,637.19	5.00	136,061.99	4.00	108,849.59	12.00	326,548.78
8.7	Analysis	200 mm gate valve	Each	45,575.68	5.00	227,878.42	2.00	91,151.37	1.00	45,575.68	8.00	364,605.47
8.8	Analysis	225 mm gate valve	Each	62,359.19	1.00	62,359.19	1.00	62,359.19	4.00	249,436.78	6.00	374,155.17
8.9	Analysis	250 mm gate valve	Each	72,226.86	4.00	288,907.44	6.00	433,361.17	6.00	433,361.17	16.00	1,155,629.77
8.10	Analysis	355 mm gate valve	Each	90,319.44	4.00	361,277.75	1.00	90,319.44	6.00	541,916.62	11.00	993,513.81
8.11	Analysis	400 mm gate valve	Each	104,808.80	4.00	419,235.20	1.00	104,808.80	1.00	104,808.80	6.00	628,852.79
8.12	Analysis	450 mm gate valve	Each	115,072.10	1.00	115,072.10	-	-	-	-	1.00	115,072.10
8.13	Analysis	500 mm gate valve	Each	125,939.12	1.00	125,939.12	-	-	1.00	125,939.12	2.00	251,878.24
8.14	Analysis	560 mm gate valve	Each	140,790.71	1.00	140,790.71	1.00	140,790.71	-	-	2.00	281,581.43
9		Supplying, fitting and fixing of **G.I. Union** with sealant etc. complete in all respects approved and accepted by the Engineer- in- charge.										
9.1	26.46.4	32 mm dia GI Union	Each	246.00	30.00	7,380.00	15.00	3,690.00	20.00	4,920.00	65.00	15,990.00
9.2	26.46.5	40 mm dia GI Union	Each	356.00	20.00	7,120.00	15.00	5,340.00	11.00	3,916.00	46.00	16,376.00
9.3	26.46.7	63 mm dia GI Union	Each	598.00	11.00	6,578.00	5.00	2,990.00	9.00	5,382.00	25.00	14,950.00
9.4	26.46.8	75 mm dia GI Union	Each	691.00	10.00	6,910.00	2.00	1,382.00	8.00	5,528.00	20.00	13,820.00
9.5	26.46.9	100 mm dia GI Union	Each	902.00	8.00	7,216.00	8.00	7,216.00	12.00	10,824.00	28.00	25,256.00
9.6	Analysis	150 mm dia GI Union	Each	1,552.29	3.00	4,656.88	5.00	7,761.47	4.00	6,209.17	12.00	18,627.52
9.7	Analysis	200 mm dia GI Union	Each	2,058.46	5.00	10,292.28	2.00	4,116.91	1.00	2,058.46	8.00	16,467.64
9.8	Analysis	225 mm dia GI Union	Each	2,360.56	1.00	2,360.56	1.00	2,360.56	4.00	9,442.23	6.00	14,163.35
9.9	Analysis	250 mm dia GI Union	Each	2,791.13	4.00	11,164.54	6.00	16,746.80	6.00	16,746.80	16.00	44,658.15
9.10	Analysis	355 mm GI Union	Each	3,621.13	4.00	14,484.53	1.00	3,621.13	6.00	21,726.80	11.00	39,832.46
9.11	Analysis	400 mm GI Union	Each	4,345.60	4.00	17,382.40	1.00	4,345.60	1.00	4,345.60	6.00	26,073.61
9.12	Analysis	450 mm GI Union	Each	7,183.10	1.00	7,183.10	-	-	-	-	1.00	7,183.10
9.13	Analysis	500 mm GI Union	Each	10,805.44	1.00	10,805.44	-	-	1.00	10,805.44	2.00	21,610.88
9.14	Analysis	560 mm GI Union	Each	15,635.23	1.00	15,635.23	1.00	15,635.23	-	-	2.00	31,270.46

Item No.	pwd-2018	Description	Unit	Unit Rate (BDT)	Phase-01		Phase-02		Phase-03		Total Quantity	Grand Total
					Quantity	Amount	Quantity	Amount	Quantity	Amount		
10		**Construction of RCC inspection pits**: Construction of RCC inspection pit up to a avg. depth of 1500 mm. with 200mm thick RCC Vertical wall & bottom slab work (1:1.5:3) including 1.5% reinforcement, 600mm heavy type CI man-hole cover with locking /unlocking arrangement including necessary earth work, side filling and one brick flat soling. 75 mm thick (1:3:6) base concrete, formwork, Steel Lader, palisading for making invert channel and 12 mm thick (1:2) cement plaster with neat finishing etc. all complete approved and accepted by the Engineer.										
10.1		Clear Size (1000mmx1000mm)	Each	42,226.93	90.00	3,800,423.51	85.00	3,589,288.87	95.00	4,011,558.15	270.00	11,401,270.53
10.2		Mucking & pleasing of **Trust block** (1:2:4) as per drawing accept by the engineer	LS			300,000.00		300,000.00		300,000.00		900,000.00
Total						**138,635,587.31**		**61,921,884.69**		**89,314,975.25**		**289,872,447.25**

4.2 COST ESTIMATE OF HYDRO PNEUMATIC PUMP

Item No.	pwd-2018	Description	Unit	Unit Rate (BDT)	Phase-01		Phase-02		Phase-03		Total Quantity	Grand Total
					Quantity	Amount	Quantity	Amount	Quantity	Amount		
1	2	3	4	5	6	7=5x6	8	9=5x8	10	11=5x10	12=6+8+10	13=5x12
1		Supply, Installation, Testing and Commissioning of Compact Self Contained **Hydro Pneumatic System Pump** as per specification including 1no Variable Frequency Drive & Pressure Vessel (Capacity to be mentioned by Vendor) , all complete and the direction of the Engineer.										
1.1	Analysis	Vertical Multistage Pump 1set= 6 nos pump	sets	10,203,329	2	20,406,658					2	20,406,658
1.2		Vertical Multistage Pump 1set= 4 nos pump	sets				1	6,932,572.84	1	6,932,573	2	13,865,146
1.3		Vertical Multistage Pump 1set= 3 nos pump	sets				1	5,672,785.25	1	5,672,785	2	11,345,570
		Total				**20,406,658**		**12,605,358**		**12,605,358**		**45,617,375**

5 COST ESTIMATE OF DRAINAGE NETWORK

Item no.	Description	No.	Length (m)	Width (m)	Depth (m)	Sub-Total	Total	Unit	Quantity	Unit Rate (BDT)	Amount (BDT)	Unit Rate Reference
Civil Works:												
DIVISION: 1 RCC Pipe Line Drainage												
1.01	Supplying and laying machine made pre-cast RCC pipes with collars of different diameter, length & thickness including screening, grading and washing aggregates with clear water, mixing, laying in steel forms, placing re-bars in position, consolidating, curing for at least 14 days including the cost of formwork, lifting, loading and unloading from factory/ yard, laying in position etc. including tools, plants, testing etc. all complete as per direction of the E-I-C. The collars shall be of 200mm wide made by RCC and having the same strength as the pipes to be jointed. The spirals shall end in a complete ring/ turn at both the ends of pipes and collars. The cost of reinforcement and it's fabrication, welding, coupling, placing, binding etc. is included in this unit rate.											
1.02	**For Heavy Traffic: Cross drains/ culverts/ outlet and any other works carrying heavy traffic in leanest mix 1:1.25:2.5 with cement conforming to BDS EN 197-1: 2003 BDS EN 197-1: 2003 CEM-I 52.5N/ASTM C150 Type-1, 20mm down well graded stone chips broken from boulder (LAA not exceeding 30), sand of minimum FM 2.5 and water**											

Item no.	Description	No.	Length (m)	Width (m)	Depth (m)	Sub-Total	Total	Unit	Quantity	Unit Rate (BDT)	Amount (BDT)	Unit Rate Reference
	reducing admixture conforming to ASTM C 494 Type -A @ 1.75 liter per cubic meter of concrete to attain a minimum 28 days cylinder strength of 30 MPa.											
1.02.1	375 mm internal dia, wall thickness not less than 50mm, Re-bar for pipe: - circumferential: 14 turns - 6mmΦ and longitudinal: 8 nos. - 6mmΦ, Re-bar for Collar: - circumferential: 3 turns - 6mmΦ and longitudinal: 8 nos. - 6mmΦ	1	271.70			**271.70**	**271.70**	**Rm**	**271.70**	**2,630.00**	**714,571.00**	**Lged-2020 IT-4.17.01.02.01**
1.02.2	450 mm internal dia, wall thickness not less than 75mm, Re-bar for pipe: - circumferential: 14 turns - 6mmΦ and longitudinal: 8 nos. - 6mmΦ, Re-bar for Collar: - circumferential: 3 turns - 6mmΦ and longitudinal: 8 nos. - 6mmΦ					**3,715.41**	**3,715.41**	**Rm**	**3,715.41**	**3,882.00**	**14,423,222.00**	**Lged-2020 It-4.17.01.01.03**
	450 mm Pipe line drain (1st Phase)	1	405.10			405.10	405.10					
	450 mm Pipe line drain (1st Phase)	1	114.70			114.70	114.70					
	450 mm Pipe line drain (1st Phase)	1	147.50			147.50	147.50					
	450 mm Pipe line drain (1st Phase)	1	407.50			407.50	407.50					
	450 mm Pipe line drain (1st Phase)	1	379.00			379.00	379.00					
	450 mm Pipe line drain (1st Phase)	1	112.80			112.80	112.80					
	450 mm Pipe line drain (1st Phase)	1	459.90			459.90	459.90					
	450 mm Pipe line drain (1st Phase)	1	134.50			134.50	134.50					
	450 mm Pipe line drain (1st Phase)	1	128.20			128.20	128.20					
	450 mm Pipe line drain (1st Phase)	1	132.70			132.70	132.70					
	450 mm Pipe line drain (1st Phase)	1	316.10			316.10	316.10					
	450 mm Pipe line drain (2nd Phase)	1	117.30			117.30	117.30					
	450 mm Pipe line drain (2nd Phase)	1	74.66			74.66	74.66					
	450 mm Pipe line drain (2nd Phase)	1	112.70			112.70	112.70					

Item no.	Description	No.	Length (m)	Width (m)	Depth (m)	Sub-Total	Total	Unit	Quantity	Unit Rate (BDT)	Amount (BDT)	Unit Rate Reference
	450 mm Pipe line drain (2nd Phase)	1	249.50			249.50	249.50					
	450 mm Pipe line drain (2nd Phase)	1	226.70			226.70	226.70					
	450 mm Pipe line drain (2nd Phase)	1	85.55			85.55	85.55					
	450 mm Pipe line drain (2nd Phase)	1	111.00			111.00	111.00					
1.02.3	525 mm internal dia, wall thickness not less than 75mm, Re-bar for pipe: - circumferential: 19 turns - 6mmΦ and longitudinal: 8 nos. - 6mmΦ, Re-bar for Collar: - circumferential: 3 turns - 6mmΦ and longitudinal: 8 nos. - 6mmΦ					**909.40**	**909.40**	**Rm**	**909.40**	**4,467.00**	**4,062,290.00**	**Lged-2020 It-4.17.01.01.03**
	525 mm Pipe line drain (1st Phase)	1	568.60			568.60	568.60					
	525 mm Pipe line drain (2nd Phase)	1	340.80			340.80	340.80					
1.02.4	600 mm internal dia, wall thickness not less than 85mm, Re-bar for pipe: - circumferential: 19 turns - 6mmΦ for inner cage & 14 turns - 6mmΦ for outer cage and longitudinal: 6 nos. - 6mmΦ for inner cage & 6 nos. - 6mmΦ for outer cage, Re-bar for Collar: - circumferential: 3 turns - 6mmΦ and longitudinal: 8 nos. - 6mmΦ					**3,273.00**	**3,273.00**	**Rm**	**3,273.00**	**5,950.01**	**19,474,383.00**	**Lged-2020 It-4.17.01.01.03**
	600 mm Pipe line drain (1st Phase)	1	263.80			263.80	263.80					
	600 mm Pipe line drain (1st Phase)	1	127.60			127.60	127.60					
	600 mm Pipe line drain (1st Phase)	1	480.70			480.70	480.70					
	600 mm Pipe line drain (1st Phase)	1	102.50			102.50	102.50					
	600 mm Pipe line drain (1st Phase)	1	136.30			136.30	136.30					
	600 mm Pipe line drain (1st Phase)	1	226.20			226.20	226.20					
	600 mm Pipe line drain (1st Phase)	1	358.30			358.30	358.30					
	600 mm Pipe line drain (2nd Phase)	1	279.60			279.60	279.60					
	600 mm Pipe line drain (2nd Phase)	1	413.80			413.80	413.80					
	600 mm Pipe line drain (2nd Phase)	1	83.10			83.10	83.10					

Item no.	Description	No.	Length (m)	Width (m)	Depth (m)	Sub-Total	Total	Unit	Quantity	Unit Rate (BDT)	Amount (BDT)	Unit Rate Reference
	600 mm Pipe line drain (3rd Phase)	1	460.50			460.50	460.50					
	600 mm Pipe line drain (3rd Phase)	1	340.60			340.60	340.60					
1.02.5	750 mm internal dia, wall thickness not less than 95mm, Re-bar for pipe: - circumferential: 22 turns - 6mmΦ for inner cage & 17 turns - 6mmΦ for outer cage and longitudinal: 8 nos. - 6mmΦ for inner cage & 8 nos. - 6mmΦ for outer cage, Re-bar for Collar: - circumferential: 3 turns - 6mmΦ and longitudinal: 8 nos. - 6mmΦ					**3,367.70**	**3,367.70**	**Rm**	**3,367.70**	**8,080.00**	**27,211,016.00**	**Lged-2020 It-4.17.01.01.03**
	750 mm Pipe line drain (1st Phase)	1	528.10			528.10	528.10					
	750 mm Pipe line drain (1st Phase)	1	1031.00			1,031.00	1,031.00					
	750 mm Pipe line drain (1st Phase)	1	584.60			584.60	584.60					
	750 mm Pipe line drain (1st Phase)	1	170.70			170.70	170.70					
	750 mm Pipe line drain (1st Phase)	1	120.70			120.70	120.70					
	750 mm Pipe line drain (3rd Phase)	1	671.30			671.30	671.30					
	750 mm Pipe line drain (3rd Phase)	1	261.30			261.30	261.30					
1.02.6	900 mm internal dia, wall thickness not less than 100mm, Re-bar for pipe: - circumferential: 14 turns - 8mmΦ for inner cage & 11 turns - 8mmΦ for outer cage and longitudinal: 8 nos. - 6mmΦ for inner cage & 8 nos. - 6mmΦ for outer cage, Re-bar for Collar: - circumferential: 3 turns - 6mmΦ and longitudinal: 12 nos. - 6mmΦ					**1,956.01**	**1,956.01**	**Rm**	**1,956.01**	**10,301.49**	**20,149,817.00**	**Lged-2020 It-4.17.01.01.03**
	900 mm Pipe line drain (1st Phase)	1	318.00			318.00	318.00					
	900 mm Pipe line drain (1st Phase)	1	74.41			74.41	74.41					
	900 mm Pipe line drain (1st Phase)	1	102.80			102.80	102.80					
	900 mm Pipe line drain (1st Phase)	1	125.40			125.40	125.40					
	900 mm Pipe line drain (1st Phase)	1	333.10			333.10	333.10					

Item no.	Description	No.	Length (m)	Width (m)	Depth (m)	Sub-Total	Total	Unit	Quantity	Unit Rate (BDT)	Amount (BDT)	Unit Rate Reference
	900 mm Pipe line drain (1st Phase)	1	469.70			469.70	469.70					
	900 mm Pipe line drain (1st Phase)	1	326.90			326.90	326.90					
	900 mm Pipe line drain (3rd Phase)	1	28.40			28.40	28.40					
	900 mm Pipe line drain (3rd Phase)	1	177.30			177.30	177.30					
1.02.7	1050 mm internal dia, wall thickness not less than 115mm, Re-bar for pipe: - circumferential: 19 turns - 8mmΦ for inner cage & 14 turns - 8mmΦ for outer cage and longitudinal: 8 nos. - 8mmΦ for inner cage & 8 nos. - 8mmΦ for outer cage, Re-bar for Collar: - circumferential: 3 turns - 8mmΦ and longitudinal: 12 nos. - 6mmΦ					**1,639.82**	**1,639.82**	**Rm**	**1,639.82**	**14,000.00**	**22,957,480.00**	**Lged-2020 It-4.17.01.01.03**
	1050 mm Pipe line drain (1st Phase)	1	128.50			128.50	128.50					
	1050 mm Pipe line drain (1st Phase)	1	508.00			508.00	508.00					
	1050 mm Pipe line drain (1st Phase)	1	162.50			162.50	162.50					
	1050 mm Pipe line drain (2nd Phase)	1	361.10			361.10	361.10					
	1050 mm Pipe line drain (2nd Phase)	1	97.32			97.32	97.32					
	1050 mm Pipe line drain (2nd Phase)	1	287.10			287.10	287.10					
	1050 mm Pipe line drain (2nd Phase)	1	95.30			95.30	95.30					
1.02.8	1200 mm internal dia, wall thickness not less than 120mm, Re-bar for pipe: - circumferential: 21 turns - 8mmΦ for inner cage & 16 turns - 8mmΦ for outer cage and longitudinal: 8 nos. - 8mmΦ for inner cage & 8 nos. - 8mmΦ for outer cage, Re-bar for Collar: - circumferential: 3 turns - 8mmΦ and longitudinal: 12 nos. - 8mmΦ					**1,348.93**	**1,348.93**	**Rm**	**1,348.93**	**17,045.00**	**22,992,512.00**	**Lged-2020 It-4.17.01.01.03**
	1200 mm Pipe line drain (1st Phase)	1	343.30			343.30	343.30					
	1200 mm Pipe line drain (1st Phase)	1	26.23			26.23	26.23					
	1200 mm Pipe line drain (1st Phase)	1	105.20			105.20	105.20					

Item no.	Description	No.	Length (m)	Width (m)	Depth (m)	Sub-Total	Total	Unit	Quantity	Unit Rate (BDT)	Amount (BDT)	Unit Rate Reference
	1200 mm Pipe line drain (1st Phase)	1	233.40			233.40	233.40					
	1200 mm Pipe line drain (2nd Phase)	1	126.30			126.30	126.30					
	1200 mm Pipe line drainage (3rd Phase)	1	514.50			514.50	514.50					
1.02.9	1350 mm internal dia, wall thickness not less than 135mm, Re-bar for pipe: - circumferential: 17 turns - 10mmΦ for inner cage & 13 turns - 10mmΦ for outer cage and longitudinal: 12 nos. - 8mmΦ for inner cage & 12 nos. - 8mmΦ for outer cage, Re-bar for Collar: - circumferential: 3 turns - 8mmΦ for inner cage & 3 turns - 8mmΦ for outer cage and longitudinal: 8 nos. - 8mmΦ for inner cage & 8 nos. - 8mmΦ for outer cage					**200.50**	**200.50**	**Rm**	**200.50**	**23,000.00**	**4,611,500.00**	**Lged-2020 It-4.17.01.01.03**
	1350 mm Pipe line drain (2nd Phase)	1	200.50			200.50	200.50					
1.02.10	1650 mm internal dia, wall thickness not less than 140mm, Re-bar for pipe: - circumferential: 21 turns - 10mmΦ for inner cage & 16 turns - 10mmΦ for outer cage and longitudinal: 12 nos. - 8mmΦ for inner cage & 12 nos. - 8mmΦ for outer cage, Re-bar for Collar: - circumferential: 3 turns - 8mmΦ for inner cage & 3 turns - 8mmΦ for outer cage and longitudinal: 8 nos. - 8mmΦ for inner cage & 8 nos. - 8mmΦ for outer cage					**181.30**	**181.30**	**Rm**	**181.30**	**30,000.00**	**5,439,000.00**	**Lged-2020 It-4.17.01.01.03**
	1650 mm Pipe line drain (1st Phase)	1	181.30			181.30	181.30					
Total:											**142,035,791.00**	

6 COST ESTIMATE OF SEWERAGE PLAN

6.1 WASTE & SOIL WATER PIPE LINE

Item No.	pwd-2018	Description	Unit	Unit Rate (BDT)	Phase-1		Phase-2		Phase-3		Total Quantity	Grand Total (phase-1, 2 &3)
					Quantity	Amount	Quantity	Amount	Quantity	Amount		
1	2	3	4	5	6	7=5X6	8	9=5X8	10	11=5X10	12=6+8+10	13=5X12
1	02.1	Earth work in excavation in all kinds of soil for foundation trenches including layout, providing center lines, local bench-mark pillars, levelling, ramming and preparing the base, fixing bamboo spikes and marking layout with chalk powder, providing necessary tools and plants, protecting and maintaining the trench dry etc., stacking, cleaning the excavated earth at a										

Item No.	pwd-2018	Description	Unit	Unit Rate (BDT)	Phase-1		Phase-2		Phase-3		Total Quantity	Grand Total (phase-1, 2 &3)
					Quantity	Amount	Quantity	Amount	Quantity	Amount		
		safe distance out of the area enclosed by the layout etc. all complete and accepted by the Engineer-in-charge, subject to submit method statement of carrying out excavation work to the Engineer-in-charge for approval. However, engineer's approval shall not relieve the contractor of his responsibilities and obligations under the contract.										
1.1	**02.1.3**	**Earthwork in excavation** in foundation trenches up to 1.5 m depth and maximum 10 m lead: in medium stiff clayey soil.	Cum	126.00	14,868.00	1,873,368.00	19,322.10	2,434,584.60	9,579.15	1,206,972.90	43,769.25	5,514,925.50
2	02.13	Earth filling in foundation trenches and plinth in 150 mm layer with earth available within 90 m of the building site to achive minimum dry density of 95% with optimum moisture content (Modified proctor test) including carrying watering, leveling, dressing and compacting to a specified percentage each layer up to finished level etc. all complete and	Cum	149.00	5,947.20	886,132.80	7,728.84	1,151,597.16	3,831.66	570,917.34	17,507.70	2,608,647.30

Item No.	pwd-2018	Description	Unit	Unit Rate (BDT)	Phase-1		Phase-2		Phase-3		Total Quantity	Grand Total (phase-1, 2 &3)
					Quantity	Amount	Quantity	Amount	Quantity	Amount		
		accepted by Engineer-in-charge.										
3	03.1	**One layer brick flat soling** in foundation or in floor with first class/picked jhama bricks including preparation of bed and filling the interstices with local sand, leveling etc. complete and accepted by the Engineer-in-charge	Sqm	420.00	7,080.00	2,973,600.00	9,201.00	3,864,420.00	4,561.50	1,915,830.00	20,842.50	8,753,850.00
4	03.4	**Mass concrete (1:3:6) in foundation or in floor** with cement, sand (F.M. 1.2) and picked jhama brick chips including breaking of chips, screening, mixing, laying, compacting to required level and curing for at least 7 days including the supply of water, electricity, costs of tools & plants and other charges etc. all complete and accepted by the Engineer-in-charge. (Cement: CEM-II/A-M)										
4.1	03.4.1	Mass concrete in foundation (1:3:6) with cement, brick chips	Cum	6,647.00	531.00	3,529,557.00	690.08	4,586,928.53	342.11	2,274,021.79	1,563.19	10,390,507.31

Item No.	pwd-2018	Description	Unit	Unit Rate (BDT)	Phase-1		Phase-2		Phase-3		Total Quantity	Grand Total (phase-1, 2 &3)
					Quantity	Amount	Quantity	Amount	Quantity	Amount		
		and sand of F.M. 1.2										
5		Supplying, laying, fitting and fixing of best quality **HDPE soil, waste and ventilation pipe** having PE-100 (Hydrostatic Strength for PE-100 is 5.0 MPa & 12.4 Mpa at 80°c & 20°c respectively according to ISO 4427:2007(E)), PN-10 (nominal pressure for PN-10is 0.6 MPa according to ISO 4427:2007(E)) & SDR 26 for soil, waste and ventilation pressure pipe having density 0.940 – 0.970 gm/cm^3 and other physical, chemical, thermal, fire resistivity properties etc. as per BSTI approved manufacturer standards or ASTM/BS/ISO/IS standards ,fitted and fixed in position with necessary joints and fittings with all accessories, bedding sand, (compacted granular materials etc.)complete approved and accepted by the Engineer- in- charge.										
5.1	**Analysis**	140 mm dia (HDPE Pipe)	Rm	2,892.41	598.00	1,729,661.19	-	-	230.00	665,254.30	828.00	2,394,915.49
5.2	**Analysis**	160 mm dia (HDPE Pipe)	Rm	3,588.11	-	-	332.00	1,191,252.99	190.00	681,741.17	522.00	1,872,994.16

Item No.	pwd-2018	Description	Unit	Unit Rate (BDT)	Phase-1		Phase-2		Phase-3		Total Quantity	Grand Total (phase-1, 2 &3)
					Quantity	Amount	Quantity	Amount	Quantity	Amount		
5.3	**Analysis**	180 mm dia (HDPE Pipe)	Rm	4,446.25	210.00	933,712.38	-	-	-	-	210.00	933,712.38
5.4	**Analysis**	225 mm dia (HDPE Pipe)	Rm	6,573.18	-	-	675.00	4,436,893.35	-	-	675.00	4,436,893.35
5.5	**Analysis**	280 mm dia (HDPE Pipe)	Rm	10,023.88	1,681.00	16,850,139.73	1,697.00	17,010,521.79	455.00	4,560,864.71	3,833.00	38,421,526.23
5.6	**Analysis**	315 mm dia (HDPE Pipe)	Rm	12,655.91	-	-	415.00	5,252,204.72	-	-	415.00	5,252,204.72
5.7	**Analysis**	400 mm dia (HDPE Pipe)	Rm	19,534.29	1,425.00	27,836,357.33	898.00	17,541,788.69	1,165.00	22,757,443.01	3,488.00	68,135,589.03
5.8	**Analysis**	450 mm dia (HDPE Pipe)	Rm	25,429.33	806.00	20,496,041.81	511.00	12,994,388.79	50.00	1,271,466.61	1,367.00	34,761,897.21
5.9	**Analysis**	500 mm dia (HDPE Pipe)	Rm	35,309.97	-	-	750.00	26,482,480.17	401.00	14,159,299.40	1,151.00	40,641,779.57
5.10	**Analysis**	560 mm dia (HDPE Pipe)	Rm	43,632.64	-	-	856.00	37,349,543.86	380.00	16,580,404.98	1,236.00	53,929,948.84
5.11	**Analysis**	630 mm dia (HDPE Pipe)	Rm	55,899.04	-	-	-	-	170.00	9,502,837.51	170.00	9,502,837.51
Sub- total of Pipe line Quantity					**4,720.00**		**6,134.00**		**3,041.00**		**13,895.00**	
6	**2.7.1**	Supplying and fitting-fixing **horizontal bracing in palisading with half split wooden ballah** having an average diameter not less than 150 mm with a minimum end diameter of 100 mm @ 450 mm including supply of iron nails, gazals etc. complete approved and accepted by the Engineer-in-charge.	Rm	180.00	9,440.00	1,699,200.00	12,268.00	2,208,240.00	6,082.00	1,094,760.00	27,790.00	5,002,200.00
7		Mucking & pleasing of **Trust block** (1:2:4) as per drawing accept by the engineer	Ls			700,000.00		400,000.00		500,000.00		1,600,000.00
8		**Construction of RCC inspection pits**: Construction of RCC inspection pit up to a avg. depth										

Item No.	pwd-2018	Description	Unit	Unit Rate (BDT)	Phase-1		Phase-2		Phase-3		Total Quantity	Grand Total (phase-1, 2 &3)
					Quantity	Amount	Quantity	Amount	Quantity	Amount		
		of 1500 mm with 200mm thick RCC Vertical wall & bottom slab work (1:1.5:3) including 1.5% reinforcement, 600mm heavy type CI man-hole cover with locking /unlocking arrangement including necessary earth work, side filling and one brick flat soling. 75 mm thick (1:3:6) base concrete, formwork, Steel Lader, palisading for making invert channel and 12 mm thick (1:2) cement plaster with neat finishing etc. all complete approved and accepted by the Engineer.										
8.1	**Analysis**	Inspection pit size clear (1m x 1m) avg. depth-1.50m	Each	42,226.93	520.00	21,958,002.49	610.00	25,758,426.00	525.00	22,169,137.13	1,655.00	69,885,565.63
		Total				**101,465,772.74**		**162,663,270.65**		**99,910,950.86**		**364,039,994.25**

6.2 COSTING OF SEWERAGE TREATMENT PLANT

Phase No	Item	Plant + Equipment +Testing & commissioning in BDT	Civil works in BDT	Total in BDT
Phase-01	STP-1	145,496,185	525,889,826	671,386,011
Phase-02	STP-2	88,641,581	320,391,256	409,032,837
Phase-03	STP-3	93,823,862	339,122,393	432,946,255
Total		**327,961,628**	**1,185,403,475**	**1,513,365,103**

7 COST ESTIMATION OF LAND DEVELOPMENT

Item No	Description	No.	Length (m)	Width (m)	Depth (m)	Sub-Total	Total	Unit	Quantity	Unit Rate (BDT)	Amount (BDT)	Unit Rate Reference
Civil Works:												
DIVISION 1: Sand Filling												
1.01	**Sand filling:** Site development/Improvement by carted earth or dredged sand, sandy silt (free from any organic, foreign, environmental hazardous substances) carried by head or truck or any other means including cost of cutting or by dredging of sand, sandy silt, all; including local carrying, placing the earth/sand, sandy silt in the designated area, maintaining slopes, breaking lumps, levelling and dressing in layers up to finished level etc. all complete as per direction and accepted by the engineer in charge. For Chittagong / Sylhet metropolitan area and Narayanganj district. By dredging including necessary systems thereof.						**4,284,983**	**cum**	**4,284,983.00**	**247.00**	**1,058,390,801.00**	**Pwd-'02.16.2.2**
	Total Sand filling	1				4,284,983	4,284,983.00					
										Total =	**1,058,390,801.00**	

8 COST ESTIMATE OF TELECOMMUNICATION AND INTERNET

8.1 INTERNET EQUIPMENT

Sl. No.	Items Name	Description of Items	Quantity	Unit	Rate (Taka)	Amount (Taka)
1	Router	Core Router equivalent to Cisco 7206VXR/NPE-G2 7206 VXR Router with NPEG2	1	No.	2,050,000	2,050,000
2	Firewall	ASA Next Generation Firewall	1	No.	850,000	850,000
3	Bandwidth Manager	Bandwidth Manager	1	No.	100,000	100,000
4	Network Switch	48 port Catalyst network switch equivalents to CISCO WS-C3550-48-EMI CATALYST 3500 48 -FAST ETHERNET & 2- GIGAB	12	No.	850,000	10,200,000
5	Access point	AirNet 3600 Series Access Point	2	No.	60,000	120,000
6	Wireless LAN Controller	Wireless LAN Controller with LAN management SW	1	No.	1,000,000	1,000,000
7	Media Converter	10/100/1000M Media Converter	45	Pair	8,250	371,250
8	Fibre Optic Cable	Armored 24 Core Fibre Optic Cable	100	Meter	180	18,000
9	Fibre Optic Cable	12 Core Fibre Optic Cable	22500	Meter	139	3,127,500
10	Fibre Optic Cable	4 Core Fibre Optic Cable	45000	Meter	74	3,330,000
11	Network Rack	42U Rack	10	No.	70,000	700,000
12	UPS	5KVA Online UPS	4	No.	170,000	680,000
13	Network Accessories	Other Network Accessories	1	Lot	225,000	225,000
					Total:	**22,771,750**

8.2 TELECOMMUNICATION

Sl. No.	Items Name	Description of Items	Quantity	Unit	Rate (Taka)	Amount (Taka)
1	IDF	250+750 pair Outdoor type fiber optic incoming and Intermediate Distribution Frame (IDF) complete with 1 set of insertion /disconnection tool & test cords.	25	No.	350,000	8,750,000
2	Fiber Optic Cable	12 Core Armored Fiber Optic Cable	8500	Meter	139	1,181,500
3	Telecommunication cable	50 pair armored telephone cable	6800	Meter	950	6,460,000
					Total:	**16,391,500**