



Gas Transmission Company Limited

Environmental Impact Assessment (EIA) for the Proposed offshore LNG Floating Storage and Re-Gasification Unit (FSRU) moored at STL (Submerged Turret Loading) Project at Maheshkhali under Cox's Bazar to Build up Summit LNG Terminal Co. (Pvt.) Ltd.

EIA Report



January 2018



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EIA Report

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EXECUTIVE SUMMARY

Introduction:

In Bangladesh, the demand of natural gas is rapidly increasing due to diversified use in industrial and electric power sector and fast depletion of existing reserves. As a result many of industries, gas fired power plants are experiencing gas shortages and running below their rated capacity.

LNG Project Initiative:

At this stage the Government of the People's Republic of Bangladesh (GOB) has adopted a strategy for the development of the gas sector which envisages private participation in this sector. As part of that strategy, the GOB decided that a new LNG terminal will be installed and operated by the private sector. As part of its response, private entrepreneur Summit LNG Terminal Co. (Pvt.) Ltd. has initiated to build up a Offshore LNG Floating Storage and Re-gasification Unit (FSRU) moored at STL (Submerged Turret Loading) Project, Maheshkhali, Cox's Bazar district at the same area and co-ordinate 21°33' 20.46" N; 91°48' 58.22" E.

Current Status of the Project:

As part of that strategy, the GOB decided that a new LNG terminal will be installed and operated by the private sector. As part of its response, private entrepreneur Summit LNG Terminal Co. (Pvt.) Ltd. has initiated to build up a Offshore LNG Floating Storage and Re-gasification Unit (FSRU) moored at STL (Submerged Turret Loading) Project, Maheshkhali, Cox's Bazar district at the same area and co-ordinate 21°33' 20.46" N; 91°48' 58.22" E has already fixed up. It can be added that in the mean time Summit LNG Terminal Co. (Pvt.) Ltd. has already signed Implementation Agreement (IA) with Power, Energy and Mineral Resource Division on 20th April, 2017 and Terminal Use Agreement (TUA) on same date with Petrobangla. The project site location of Summit's LNG FSRU terminal is in the South East of Bangladesh

Description of the Project:

The marine facilities of the project are planned to be set up in the Bay of Bengal of Moheshkhali island. Approximately 3-8 km subsea gas pipeline is planned to connect the FSRU with the onshore at moheshkhali onshore island. The LNG terminal is proposed with Floating Storage and Regasification unit (FSRU) project will consist of:

- ***Marine Component off Moheshkhali Island:***
 - LNG Floating Storage and Re-gasification Unit (FSRU) moored at STL (Submerged Turret Loading) of LNG storage capacity of 138,000m³ (if 100%) and if maximum filled volume is 98.58% it will be 135,930 m³
 - Regas Facility Configuration—Submerged Turret Loading (STL) Buoy compartment
 - Regasification onboard FSRU of Nominal NG Sendout—500 mmscf (Open Loop) and Peak NG Sendout—600 mmscf (Open Loop).
 - High pressure 24 inches (24") subsea re-gasified LNG (RLNG) pipeline of of 3-8 km
- ***Onshore Component Covering:***
 - Proposed Subsea/ sub surface gas spur pipeline around 7 Km from tie-in-point at Kalirdiar char to Dhalghata Custody Transfer Metering Station (CTMS) through the valve station where gas pipeline will be connected into the GTCL's national Gas grid pipeline of Moheshkhali-Anowara section.

Location of the Project: The project site location for this LNG FSRU terminal activities project is 3 to 8 km offshore from Moheshkhali island in the South East of Bangladesh, approximately 380 km from Dhaka, 90km south of the port city of Chittagong with approximate co-ordinate for FSRU terminal ; 21°33'20.46" N; 91°48' 58.22" E on the Bay of Bengal and for Tie-in-point 21°34'4.8" N; 91°51'24" E The area is relatively undeveloped consisting mostly of coastal area and the Island.

The 2 Union Council jurisdictions involve Boro-Moheshkhali and Kutubjom under Moheshkhali Upazila of the Cox's Bazar District for the people who live within 6 km of the Tie-in Point and engage themselves in fish and salt cultivation at Kalirdia Char. During local site inspection, it revealed that the proposed Tie-in location is about 3 km from village Boro-Dale of Boro-Moheshkhali Union.

Project Schedule: The proposed Offshore LNG Terminal is a high priority fast track project for Bangladesh. As a result, Petrobangla signed LNG terminal USE Agreement (TUA) and Implementation Agreement (IA) with Summit LNG terminal Co. Ltd. on 20th April 2017 and TUA and IA were delivered to company on 04th May-2017. As per Monthly progress report of Summit LNG Co. Ltd, dated 25th November-2017 the project current and proposed activities are given below:

Major Project Milestones

Description	Start Date	End Date	Remarks
Execution of TUA and IA Executed		20 th Apr' 17	
Geo-Physical Study	20 th May'17	Oct'17	Recent monsoon season has deferred the study. After expiration of monsoon period, study was completed. Awaiting to receipt the report.
Geo-Technical Study	15 Sep' 17	End of Nov' 17	Due to Monsoon thereafter cyclonic weather delayed the mobilization of vessel spread for performing this study. Even in month of November total approximately 10 hrs were lost for weather. Site investigation has been completed on 21 st Nov-2017
Expected Financial Close	21 st Apr' 17	Jan'18	
Expected date Execution of TCP	1 st Sep'16	31 st July '17	Signed
EPC of Fixed Infrastructure	1 st Mar'17	30 th Sep' 17	Signed Signing is expected to be consummated by Oct'17 as EPC brought number of issues related to import of Temporary Equipment.
Approved ECC from DoE	5 th Oct'17	04 th Jan18	GTCL engaged BETS to conduct EIA study for proposed project.
Site Work Begins	Dec'17		Depending upon weather
Expected CSD		Dec-Jan 2018-19	-do-

ABBREVIATION

ADB	Asian Development Bank
ADP	Annual Development Plan
ANSI	American National Safety Institute
API	American Petroleum Institute
AQM	Air Quality Management
ASA	Association for Social Advancement—an NGO
ASME	American Society of Mechanical Engineers
BAPEX	Bangladesh Petroleum Exploration and Production Company Limited
BBS	Bangladesh Bureau of Statistics
BCAS	Bangladesh Centre for Advance studies
BCG	Bangladesh Coast Guard
BDT	Bangladesh Taka
BERC	Bangladesh Energy Regulatory Commission
BETS	Bangladesh Engineering and Technological Services Limited
BGDCL	Bakhrabad Gas Distribution Company Limited
BMD	Bureau of Mineral Development
BMD	Bangladesh Meteorological Department
BOD	Biochemical Oxygen Demand
BOG	Boil off Gas
BOGMC	Bangladesh Oil, Gas and Mineral Corporation
BPC	Bangladesh Petroleum Corporation
BPDB	Bangladesh Power Development Board
BRDB	Bangladesh Rural Development Board
BS	British Standards
Btu	British Thermal Unit
BUET	Bangladesh University of Engineering and Technology
BWDB	Bangladesh Water Development Board
BWPA	Bangladesh Wildlife Preservation (Amendment) Act 1974
CARE	CARE International-Bangladesh
CBD	Convention on Biological Diversity
CEM	Commission on Ecosystem Management
CFP	Comprehensive Facilities Plan
CITES	Convention on International Trade in Endangered Species
CLO	Community Liaison Officer
cm	Centimeter
CMS	Convention on Migratory Species
CNG	Compressed Natural Gas
COD	Chemical Oxygen Demand
DAE	Department of Agricultural Extension
dB	Decibels
DC	Deputy Commissioner
DC	Disaster Controller
DCR	Disaster Control Room
DFO	District Fishery Officer
DFO	Divisional Forest Officer
DGM	Deputy General Manager
DGPS	Differential Global Positioning System
DLR	Department of Land Revenue
DMT	Disaster Management Team
DO	Dissolved Oxygen
DoE	Department of Environment

DOF	Department of Fisheries
DoF	Department of Forest
DPHE	Department of Public Health Engineering
DPP	Development Project Proposal
DSSTW	Deep Set Shallow Tube well
DTW	Deep Tube Well
EA	Environmental Assessment
EC	Electrical Conductivity
ECA	Environment Conservation Act 1995
ECA	Ecologically Critical Area
ECA	Environmental Conservation Act
ECC	Environmental Clearance Certificate
ECR	Environmental Conservation Rules
EEBL	Excelerate Energy Bangladesh Ltd
EEM	Environmental Effects Monitoring
EIA	Environmental Impact Assessment
EIM	Environmental Impact Monitoring
EMP	Environmental Management Plan
EMP	Environmental Monitoring Plan
EMR	Environmental Management Representative
EMRD	Energy and Mineral Resources Division
EMS	Environmental Management System
EMU	Environmental Management Unit
EPA	Environment Protection Agency
EQS	Environment Quality Standards
ERP	Emergency Response Plan
ESA's	Ecologically Sensitive Area
ESHIA	Environmental Social and health Impact Assessment
ESMP	Environmental and Social Management Plan
ESMS	Environment and Safety Management System
EZs	Economic Zones
FAO	Food & Agriculture Organization
FCDI	Flood Control, Drainage and Irrigation
FD	Forest Department
FGD	Focus Group Discussion
FS	Feasibility Study
FSRU	Floating Storage Re-gasification Unit
FY	Fiscal Year
GDP	Gross Domestic Product
GEF	Global Environment Facility (of the World Bank)
GHG	Greenhouse gasses
GIS	Geographic Information System
GM	General Manger
GOB	Government of Bangladesh
GPS	Global Positioning System
GRR	Gas Redelivery Rate
GSB	Geological Survey of Bangladesh
GSMP	Gas Sector Master Plan
GTCL	Gas Transmission Company Limited
GW	Ground Water
GWA	Government of Western Australia
ha	Hectares
HDD	Horizontal Directional Drilling
HES	Health Environment and Safety

HHS	Household Survey
HIA	Health Impact Assessment
IA	Implementation Agreement
ICTPs	International Conventions, Treaties and Protocols
IEC	Important Environmental Component
IEE	Initial Environmental Examination
IGRR	Increased Gas Redelivery Rate
IPAC	Integrated Protected Area Conservation
IPP	Independent Power Producer
IUCN	International Union for Conservation of Nature and Natural Resources or
KGDCL	Karnaphuli Gas Distribution Company Ltd
KI	Key Informant
KII	Key Informant Interviews
LD	Low Duty
LGED	Local Government Engineering Department
LLP	Low Lift Pump
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
m	Meters
MACH	Management of Aquatic Community Husbandry
MARPOL	Marine Pollution
MCF	Thousand Cubic Foot
MD	Managing Director
ME&F	Ministry of Environment & Forest
MEMR	Ministry of Energy & Mineral Resources
MFO	Marine Fauna Observer
MIS	Management Information System
MMscf/d	Million Standard Cubic Feet per Day
Mmbtu	Million british thermal unit
MOEF	Ministry of Environment & Forest
MoU	Memorandum of Understanding
MPEMR	Ministry of Power, Energy and Mineral Resources
mPWD	Meters Public Work Datum
MSDS	Material Safety Data Sheet
MSL	Mean Sea Level
MT	Metric Ton
MW	Megawatts
NA	Not Applicable
NACOM	Nature Conservation Management
NBR	National Board of Revenue
NBSAP	National Biodiversity Strategy and Action Plan
NCS	National Conservation Strategy
NEMAP	National Environmental Management Action Plan
NG	Natural Gas
NGO	Non-governmental Organization
NOC	No Objection Certificate
NORI	National Oceanography Research Institute
NWMP	National Water Management Plan
NYS	Not Yet Standardized
O&M	Operation and Maintenance
OERP	Offsite Emergency Response Plans
OMS	Operation Management System
OSC	On Scene Commander
PAP	Project Affected People

PCP	Pollution Control Plan
pH	Puissance of Hydrogen
PLEM	Pipeline End Manifold
PM	Particulate Matter
PM&E	Participatory Monitoring and Evaluation
PNG	Pipeline Natural Gas
PNGO	Partner Non-governmental Organization
ppm	Parts Per Million
PSC	Production Sharing Contract
PTS	Permanent Threshold Shift
RAB	Rapid Action Battalion
RBA	Rapid Biodiversity Assessment
RCC	Regional Communication Center
RDPP	Revised Development Project Proposal
RLNG	Re-gasified LNG
RMA	Resource Management Associates
RRA	Rapid Rural Appraisal
SARI	Sensitivity Assessment and Response Tool
SC	Site Clearance
SCBA	Self Contained Breathing Apparatus
SEA	Strategic Environmental Assessment
SEMP	Sustainable Environmental Management Programme
SIA	Social Impact assessment
SLR	Sea Level Rise
SPARRSO	Space Research and Remote Sensing Organization
SPM	Single Point Mooring
SRDI	Soil Resource Development Institute
SS	Suspended Solids
STL	Submerged Turret Loading
STP	Sewage Treatment Plant
STS	Ship To Ship
STW	Shallow-tube Well
SW	Surface Water
TCF	Trillion Cubic Foot
TDS	Total Dissolved Solids
TOR	Terms of Reference
TS	Total Solids
TSS	Total Suspended Solids
TTS	Temporary Threshold Shift
TUA	Terminal Use Agreement
UKC	Under Keel Clearance
UNCED	United Nations Conference on Environment and Development (1992)
UNO	Upazila Nirbahi Officer
UP	Union Parishad (Council)
USD	United States Dollar
VAT	Value Added Tax
WARPO	Water Resources Planning Organization
WL	Water Level
WQM	Water Quality Management

CHAPTER-1: INTRODUCTION

1.1 Background

In Bangladesh, the demand for natural gas is rapidly rising due to its diversified use in industrial and electric power sector. Bangladesh is experiencing an acute shortage of natural gas that threatens to place serious constraints on economic growth. As part of its response, the government of Bangladesh is initiating a project to Import Liquefied Natural Gas (LNG) at a floating receiving terminal and re-gasification facility to be constructed approximately 90 km south of Chittagong, the second largest city in Bangladesh.

Now GOB has adopted a strategy for the development of the gas sector which envisages private participation in this sector. As part of that strategy, the GOB decided that a new LNG terminal will be installed and operated by the private sector. As part of its response, private entrepreneur Summit LNG Terminal Co. (Pvt.) Ltd. has initiated to build up a Offshore LNG Floating Storage and Re-gasification Unit (FSRU) moored at STL (Submerged Turret Loading) Project, Maheshkhali, Cox's Bazar district at the same area and co-ordinate 21°33'20.46" N; 91°48.58'22" E has already fixed up and SUMMMIT LNG Co. (Pvt) Ltd. will operate the terminal for a period of fifteen (15) years from the commercial start sate. Petrobangla has signed a contract with Raslaffan Liquified Natural Gas Co. of Qatar to import LNG for SLNG and MLNG (operated by EEBL). SLNG will receive maximum 183,000m³ LNG in every shipment. Generally it will take 12 hrs to 24 hrs to transfer LNG from LNGC to FSRU.

"Consistent with the Government's Private Sector Power Generation Policy of Bangladesh, published in October 1996 and with the Power and Energy Speedy Supply Enhancement (Special Provision) Act, 2010 (Act No. LIV of 2010) in connection with the development, design, engineering, financing, construction, permitting, testing, completion, insurance, commissioning, operation and maintenance of, and ultimate transfer of title to, the Terminal, Terminal Co and Customer have initiated discussions for development of the Terminal. Terminal Co intends to construct, own and operate an LNG receiving terminal located off Maheshkhali Island, Bangladesh which is capable of performing certain LNG terminal services, including the berthing of LNG Carriers, the unloading, receiving and storing of LNG, the regasification of and the delivery of Natural Gas to the Deliver)' Point."

Under this Act in the mean time Summit LNG Terminal Co. (Pvt.) Ltd. Has already signed Implementation Agreement (IA) with Power, Energy and Mineral Resource Division on 20th April, 2017 under the companies act, 1994 (Act No XVIII of 1994) and Terminal Use Agreement (TUA) on same date with Petrobangla.

1.2 Brief Description of the Project

SUMMIT LNG Co. Ltd. Has proposed to construct, install, operate, and maintain, liquefied natural gas (LNG) FSRU moored at STL (Submerged/Directional Turret Loading) to import, storage, and regasification facility to be located in the offshore to be connected by a subsea pipeline to be tied-in at Kaladiar char, Moheshkhali with a new offshore natural gas pipeline from Moheshkhali to Anwara for connecting the existing natural gas transmission system in Chittagong.

The marine facilities of the project are planned to be set up in the Bay of Bengal of Moheshkhali Island. Approximately 3-8 km subsea gas pipeline is planned to connect the FSRU with the onshore at moheshkhali onshore island. Overall project will consist of:

a) Marine Component off Moheshkhali Island:

- 01) LNG Floating Storage and Re-gasification Unit (FSRU) moored at DTL (Directional Turret Loading) of storage capacity of **LNG Capacity, cbm (100%)—138,000m³**
- 02) Regasification onboard FSRU of **Nominal NG Sendout—500 mmscfd** (Open Loop) and **Peak NG Sendout—600 mmscfd** (Open Loop).
- 03) High pressure class 600 24" (inches) regasified sub-sea pipeline of 3-8 KM.

b) Onshore Component Covering:

- 04) Subsea/ sub surface gas spur pipeline of 7 Km from tie-in-point at Kalirdia char to Maheshkhali Custody Transfer Metering Station CTMS from where gas pipeline will be connected into the GTCL's national Gas grid pipeline of Moheshkhali-Anowara section.

Gas Transmission Co Ltd (GTCL)—the Company of Petrobangla as assigned to execute this Project has engaged BETS Consulting Services Ltd to perform the EIA for the proposed LNG Floating Storage Regasification Unit (FSRU) terminal activities project at Moheshkhali island under Cox's Bazar district. Both TOR of GTCL and letter of DOE cited above are placed at Annexure-1.

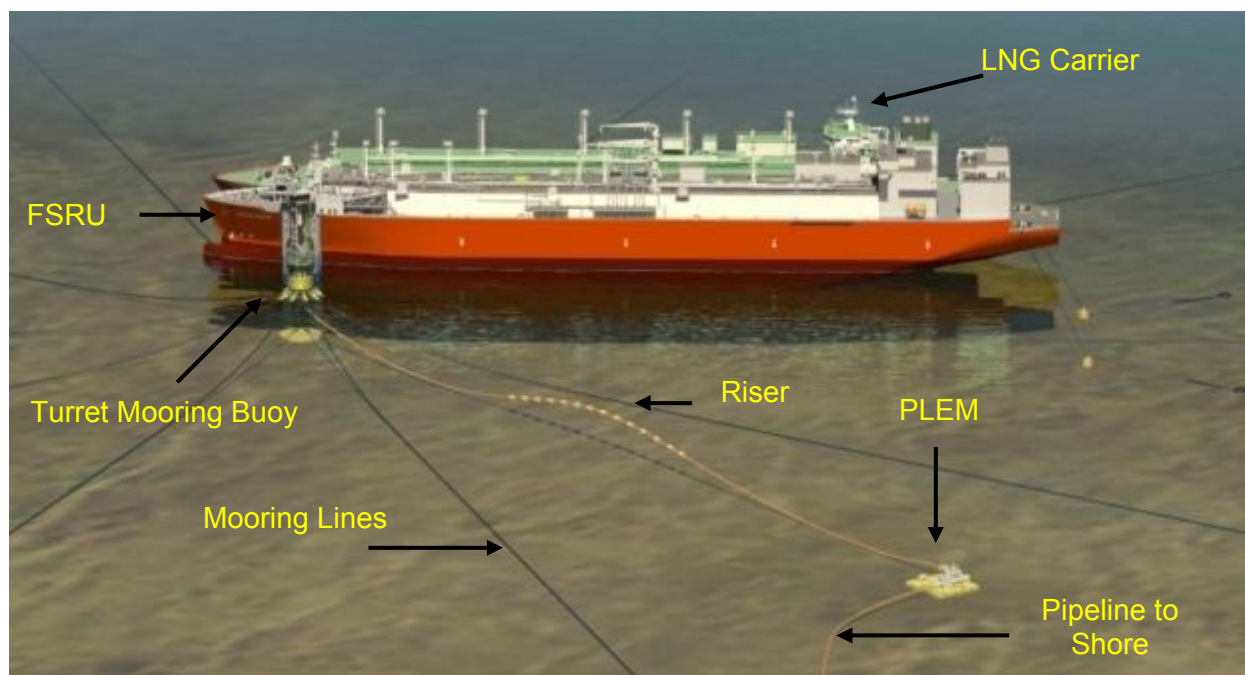


Figure-1.1: Main Project Components of FSRU

Source: Adapted from National Oilwell Varco, 2016. www.nov.com

1.3 Purpose of the Project

The purpose of the EIA study is to provide the public and the permitting agencies with information about the potential environmental impacts of the proposed Project and its alternatives, and to recommend mitigation measures that would avoid or minimize adverse impacts to the maximum extent practical.

Applicable regulatory regime in Bangladesh in this regards is principally driven through the Environmental Conservation Act (ECA) 1995 (as amended in 2000, 2002 and 2010), Bangladesh Gas Safety Rules 1991 (Amended in 2003), Land Acquisition and Requisition of Immovable property Ordinance 1982 and Environmental Conservation Rules (ECR), 1997 and ensures that *"no industrial unit or project shall be established or undertaken without obtaining, in the*

manner prescribed by rules, an environmental Clearance Certificate from Director General". Ensuring compliance with the provision of this Act and Rules is the responsibility of the Department of Environment (DoE). As per the ECR 1997, the proposed LNG terminal project falls under Red category due to

- Item 65: Exploration/ extraction/ distribution of mineral resources
- Item 64: water, power and gas distribution line laying/relaying/ extension.

The overall objective of the study is to obtain Environmental Clearance Certificate (ECC) in favor of Summit Offshore LNG Floating Storage and Re-gasification Unit (FSRU) moored at STL (Submerged Turret Loading) Project, Maheshkhali, Cox's Bazar district from DOE.

1.4 Need of the Project

Energy consumption projections indicate that there will be an increasing need for natural gas in the region. Due to fast depletion of existing reserves as part of its response GOB already signed a contract with Excelerate Energy Bangladesh Limited (EEBL) to construct a LNG FSRU Terminal, capacity 500mmcf/d at Maheshkhali under Cox's Bazar district and which is going to add in national grid within December-2018. The Chittagong market is currently delivered by pipeline from the Sangu Field & the National Grid. Production from Sangu Field has declined over the last decade and new discovery are being inadequate to cover these areas..This is because, electric power generating facilities in the region have remarkably increased the output capacity and the annual consumption of natural gas by those facilities and different industries has been substantially increased over the past 10 years.

1.5 Scope of the Present Study

The detailed scope of the EIA study is outlined as following:

- 01) Screening of the project based on applicable reference framework based on reconnaissance survey and desk based review of project documents
- 02) Scoping of the EIA study.
- 03) Development of an integrated description of the project components including ois sub-components.
- 04) Assessment of the environmental impacts of the project in the study area based on field level data collection and sampling analysis of environmental parameter (Soil, Ambient air, Noise Water etc.), professionals judgment along with the stakeholders consultation and feedback.
- 05) Assessment of the social scenario of the local community as well as project affected people (If any) and any other stakeholders, which have been identified during the social consultation process.
- 06) Risk assessment and consequence analysis of the project.
- 07) Development of a policy, regulatory and administrative framework relevant to the project.
- 08) Monitoring, analysis and reporting of the environmental and social baseline data of the study area including consultation with local communities and stakeholders

1.6 Methodology

As the first step of project screening and scoping exercise BETS' Multidisciplinary Team of Consultants has identified the parameters needed to be considered for the study and outline the activities for collecting data on each parameter. All relevant data of the environment like physical, ecological and socioeconomic environment were collected from study area through both primary and secondary sources. The stepwise activities are detailed in the following subsections:

1) **Discussions with Project Proponent:** Discussions were held with GTCL, RPGCL and Summit LNG Co. Ltd to understand the project, current status of agreements (i.e implementation, land, water, power supply etc.) project milestones, legal requirements and scope and collection of relevant project documents such as site and configuration selection report, reconnaissance survey report for LNG terminal and associated pipeline, onshore facility layout. They prepared this EIA with the assistance of the different cooperating agencies including but not limited to DOE, Department of Forest, Department of Fisheries, Divisional & District Administration of Chittagong, District Administration and Police Administration of Chittagong and Cox's Bazar, Directorate General of Shipping, Bangladesh Navy, Bangladesh Coast Guard, Karnaphuli Gas Distribution Company Ltd (KGDCL), National Oceanography Research Institute (NORI) and so on apart from Petrobangla & GTCL itself.

2) **Screening and Scoping exercise:**

The screening and scoping exercise involves the following:

- a) Before field /survey work consultant team reviewed the relevant data, documents and available imagery of the project site and its surroundings.
- b) Reconnaissance survey of the site and surroundings areas and preliminary discussions with local people, local government officials and other stakeholders.

3) **Baseline Data collection:**

Baseline data collection involved the following

- a) Identification of monitoring locations for air, water soil, sediments and noise as per sensitive receptors, key locations for the project facilities and their surrounding areas.
- b) The baseline data collection, monitoring and analysis for environmental parameters was completed during the period from October-November-2017
- c) Socio-economic data collection and public consultation was under process.
- d) Secondary data was also collected from different government departments, local bodies and through literate surveyors.

4) **Stakeholder's Consultation:**

The following activities were undertaken:

- e) Extensive consultation was conducted with key stakeholders including the local population, different government agencies, fishing association, union parishad chairman etc.
- f) Stakeholder's consultation was completed with the intent of collecting baseline information on the social and environmental sensitivities, developing a better understanding of the potential impacts, informing the public for the proposed project.
- g) BETS have taken necessary steps for obtaining NOC (no objection certificate) from local authority and would be assisting GTCL in obtaining clearance from DOE.

5) **Impact Assessment & Mitigation Measures:**

Analysis of the baseline results and the impacts of the Project were assessed in accordance with the Bangladesh national guidelines for air, water and noise emissions; standards stipulated in the Environment Conservation Rules (ECR), 1997 and Environmental, Health and Safety (EHS) Guidelines. Impact prediction covered residual impacts (impacts remaining after all possible mitigation has been incorporated) and took into account control measures that are part of the Project design. Additional measures aimed at further avoiding, minimizing and mitigating predicted impacts were suggested where necessary or appropriate.

6) **Management Plans & Grievance Redress Mechanism**

Environmental and Social Management Plan (ESMP) were developed for the mitigation measures suggested and included defined roles and responsibilities for implementation

1.7 EIA Team

The composition of the Multidisciplinary Team of BETS Consulting Services Ltd is placed in the Table-1.1 below:

Table-1.1: Composition of the EIA Team

Sl. No.	Professionals
01	Delawar Bakht B. Sc. Eng, M. Eng.(BUET), FIE(B), FBSNDT, P.Eng Team Leader
02	Md. Mukhlesur Rahman Gas Pipe line Engineer, Post Graduate Diploma in Energy, Leeds University, U.K(1990) B.Sc. Engineering (Chem.), BUET,1974
03	Md. Shahidur Rahman Khan B.Sc. Eng. PEng Hydrologist
04	Dr. Shaker Ahmed Financial/Economic Analyst PhD in Economics, I M. Sc in Economics with Honors
U05	A.K.M. Fazlul Hoque Majumdar Sociologist
06	Mir Towfiq Hussain, Bsc. Engg, MSc. Engg (Environment, Enrolling), Environmental Engineer
06	Md. Azizul Haque Field Surveyor cum Data Analyst
07	Md. Shahin Khan Field Surveyor cum Data Analyst

1.7.1 Format of the Report

The format of this report has been prepared with inclusion of the new sections /subsections of certain chapters as per requirement of the TOR of GTCL and further directives of the DOE. Accordingly, the content of this report now stands as follows:

Chapter-1: Introduction-This chapter of the report has provided the background information and scope of this EIA study

Chapter-2: Legislative Requirements and Policy Considerations-This chapter has include description and requirements of the pertinent policies, local and regulatory framework, international standards and guidelines, international treaties and conventions related to protection of ecosystems.

Chapter-3: Project Data Sheet-This chapter has incorporated by the guidelines of DoE. Some brief description of project proponent, project component, activities nad schedule been incorporated here.

Chapter-4: Project Description-This chapter has provided a full description of the project incorporating the actual location; general layout, activity flow diagram, start up of operation; schedule of staffing and support facilities and services

Chapter-5: Environmental Description-This chapter has reflected collection of baseline information on the physical environment including environmental quality, biological environment, and socio-economic profile and health conditions of the project area:

Chapter-6: Identification and Evaluation of Potential Impacts--This Chapter deals with the environmental impacts of the proposed project under different phases of its execution & operation.

Chapter-7: Mitigation Measures: This chapter has incorporated prediction and Mitigation measures of the potential impacts.

Chapter-8:-Environmental Management Plan: The EMP will describe the impacts to be mitigated and activities to implement the mitigation measures including how,when andwhere will be implemented.

Chapter-9: Risk Management-This chapter has delineated the possible risks and hazards of the projects with management concepts and mechanisms in practice

Chapter-10: Environmental Monitoring Programme Performance Evaluation-This chapter mainly deals with impacts to be monitored during operation and when and where monitoring will be carried out and who will carry out.

Chapter-11: Work Schedule.

Chapter-12: Beneficial Impacts-This chapter has delineated all positive impacts on environment and social life.

Chapter-13: Institutional Capacity–It has been intended to incorporate the organizational set up of both GTCL and RPGCL, the executing and Operating agencies including that of Summit, the Implementing Agency in this Chapter. All these together would build up the total institutional capacity in developing the project and operating it thereafter.

Chapter-14: Public Consultation-This chapter presents the results of the Public Consultations including comments, suggestions and concerns as recorded during FGD meetings; key informant interviews and one to one discussions etc at project sites and offices of the concerned agencies.

Chapter-15: Conclusion and Recommendations-This chapter presents the highlights & conclusive statements on the EIA with recommendations for the project.

1.8 Limitations

The extent of time frame required to be allowed for and the provision of technological and logistic supports essential in conducting the study to its fullest context has been rather limited. In view of this, it is expected that the studies conducted in respect of identification of potential impacts and responsive mitigation measures to be covered under the environmental monitoring plan would be worked out in further details during the implementation period of the project.

1.9 Acknowledgement

The invaluable information and clarifications received from different officials of Petrobangla and its LNG Cell, as well as its Companies like GTCL and RPGCL, Bangladesh Petroleum Corporation, Bangladesh Energy Regulatory Commission, SUMMIT LNG Co. (Pvt.) Ltd. Bangladesh Economic Zones Authority and the Power & Energy Magazine have been very helpful in preparing the report and are gratefully acknowledged.

Contributions in the form of assistance in collecting data and information as well as holding meetings with different organizations like Department of Environment, IUCN,, Department of Fisheries, Department of Forest, Chittagong Port Authority, District Commissioner's Office of Cox's bazar, UNO office of Moheshkhali, Union parisad chairman office of Boro Moheshkhali, Hoyanok and Kutubjom are also thankfully acknowledged.

CHAPTER-2: LEGISLATIVE REQUIREMENTS & POLICY CONSIDERATIONS

2.0 Introduction

This chapter has included description and requirements of the pertinent policies, local and regulatory framework, international standards and guidelines, international treaties and conventions related to protection of the ecosystems.

Efforts have been maintained to depict information on the following:

- Description of the relevant regulations and standards governing environmental quality, health and safety, protection of sensitive areas, protection of Marine flora and fauna and endangered species, siting, and use control, land acquisition, compensation, etc. at the local, regional, national, and international levels.
- Review of GOB's current policies, operational procedure and practices to address and mitigate social issues

It has been ensured that the following Regulations and Guidelines are adhered to in conducting the Environmental Impact Assessment (EIA) and preparing the report:

- The descriptions and requirements of the pertinent policies, the regulations and guidelines of the Government of Bangladesh as well as international standards and guidelines, International treaties and conventions shall govern the conduct of this assessment. Among others, they have included:
 - The laws and regulations of the Government of Bangladesh relevant to route selection, environment and social issues related to the project;
 - Regional provincial or communal environmental assessment regulations;
 - Environmental assessment regulators of another organization Involved in the project.,
 - Bangladesh Natural Gas Safety Rule 1991 amendment in 2003).
 - Rio Declaration
 - Convention on Biological Diversity, Rio-de-Janeiro (1992).
 - United Nation Convention on the law of the Sea, Montero Bay, (1982)
 - Other applicable laws and regulations specifically applicable to this floating LNG terminal and FSRU project and thus relating to the flowing as well:
 - Rivers, Coastal and Port Management
 - Inland & offshore Shipping
 - Environmental Quality Standards for Clean Air, Water, Noise etc
 - Fishery and Marine Mammal Protection Conservation and Management etc

In brief, this chapter has been so intended to cover the Legislative Requirements And Policy consideration to cover the Potential Legal, Administrative and Policy framework aspects of the project as desired by DOE.

2.1 Environment-Related Policies in Bangladesh

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

2.2.1 National Environmental Policy, 1992

The Bangladesh National Environmental Policy, approved in May 1992, sets out the

basic framework for environmental action together with a set of broad sectoral action guidelines.

The Policy requires specifications with respect to the industrial sector which are as follows:

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

The policy also states that EIAs should be conducted before projects are undertaken and the Department of Environment (DOE) is directed to review and approve all Environmental Impact Assessments.

2.2.2 Other Relevant Policies

Other relevant policies in Bangladesh and their key features and applicability to the subject Project are detailed in Table-2.1.

Table-2.1 Policies relevant to the Environment

Policy	Key Features	Applicability
National Conservation Strategy, 1992	<ul style="list-style-type: none"> ▪ All industries shall be subject to an EIA; ▪ Adoption of pollution prevention/control technologies shall be enforced; ▪ Hazardous or toxic materials/waste shall not be imported as raw materials; ▪ Import of appropriate and environmentally-sound technology; ▪ Dependence on imported technology and machinery gradually be reduced in favour of sustainable local skills and resources. 	Applicable as the project is an industrial sector project
The National Forest Policy, 1994	<ul style="list-style-type: none"> ▪ Afforestation of 20% project land ▪ Bio-diversity of the existing degraded forests ▪ Strengthening of the agricultural sector ▪ Control of Global warming, desertification ▪ Control of trade in wild birds and animals ▪ Prevention of illegal occupation of the forested land, tree felling and hunting of wild animals 	Applicable when considering global warming and the protection of forests
National Land Transport Policy, 2004	<ul style="list-style-type: none"> ▪ All new roads and major improvements will be subjected to an EIA ▪ Funding will be provided for mitigation measures ▪ The Government will publish environmental standards for new roads and new design standards addressing environmental issues 	Not directly applicable, however, the standards may apply for the project approach road (that will be refurbished and strengthened)
The National Water Policy, 1999	<ul style="list-style-type: none"> ▪ Protection, restoration and enhancement of water resources ▪ Protection of water quality, including strengthening regulations concerning agrochemicals and industrial effluent ▪ Sanitation and potable water ▪ Fish and fisheries ▪ Participation of local communities in all water sector development 	<p>Applicable for the Preservation of water quality.</p> <p>Applicable, the bay and the <i>Moheshkhali</i> Channel may also be used for transport of construction materials and laying of subsea pipeline.</p>
National Land Use Policy, 2001	<ul style="list-style-type: none"> ▪ Deals with several land uses including: agriculture (crop production, fishery and livestock), housing, forestry, industrialization, railways and roads, tea and rubber ▪ Identifies land use constraints in all these sectors 	Applicable as land use changes from sandy beach/agricultural to industrial
Draft Wetland Policy, 1998	<ul style="list-style-type: none"> ▪ Establishment of principles for the sustainable use of wetland resources ▪ Maintenance of the existing level of biological 	Not directly applicable, however maybe applicable once the draft policy is finalised

Policy	Key Features	Applicability
	diversity <ul style="list-style-type: none"> ▪ Maintenance of the functions and values of wetlands ▪ Promotion and recognition of the value of wetland functions in resource management and economic development 	
National Fisheries Policy, 1998	<ul style="list-style-type: none"> ▪ Preservation, management and exploitation of fisheries resources in inland open water ▪ Fish cultivation and management in inland closed water. ▪ Prawn and fish cultivation in coastal areas ▪ Preservation, management and exploitation of sea fishery resources 	Applicable as fishing is the Prime occupation of the community in <i>Moheshkhali</i> .
National Agriculture Policy, 1999	<ul style="list-style-type: none"> ▪ The Policy deals with the programs related to make the nation self-sufficient in food through increasing production of all crops, including cereals, and ensure a dependable food security system for all 	Not applicable
The Energy Policy, 1996	<ul style="list-style-type: none"> ▪ Provides for utilization of energy for sustainable economic growth, supply to different zones of the country, development of the indigenous energy source and environmentally sound sustainable energy development programmes ▪ Highlights the importance of EIA for any new energy development project 	Not directly applicable
The Power Policy, 1995	<ul style="list-style-type: none"> ▪ The Power Policy is an integral part of the Energy Policy and deals with policy statement on demand forecast, long term planning and project implementation, investment terms, fuels and technologies, load management, institutional issues, private sector participation, technology transfer and research programme, environmental policy and legal issues 	Applicable, if any power generation activities will be required at a tie-in point at Kaladiar Char..
Industrial Policy, 1999	<ul style="list-style-type: none"> ▪ Deals with industrial development, direct foreign investments, investment by public and private sector, introduction of new appropriate technology, women's participation, infrastructure development and environmentally sound industrial development 	Applicable as the Project is in the private sector, industrial development

2.2 Applicable Existing Legal and Regulatory Framework in Bangladesh

2.2.1 The Environment Conservation Act, 1995 (as amended in 2000, 2002 & 2010)

The Bangladesh Environment Conservation Act, 1995 (ECA) is currently the main legislation in relation to environment protection in Bangladesh. This Act is promulgated for environment conservation, environmental standards development and environment pollution control and abatement. It has replaced the Environment Pollution Control Ordinance of 1977. The Act is aided by the Bangladesh Environment Conservation Rules, 1997 (ECR).

The main objectives of ECA are:

- Conservation and improvement of the environment; and
- Control and mitigation of pollution of the environment.

The main strategies of the Act can be summarized as:

- Declaration of ecologically critical areas and restriction on the operations and processes Section 5 (ECA) read with rule 3 (ECR);
- projects can or cannot be carried out/initiated in the ecologically critical areas, rule 7(2) & Schedule 1 (ECR);
- Regulations in respect of vehicles emitting smoke harmful for the environment section 6 (ECA) read with Schedule 6 (ECR);
- Environmental clearance section 12 (ECA) read with rule 7 & Form 3 (ECR);
- Regulation of the industries and other development activities' discharge permits;

- Promulgation of standards for quality of air, water, noise and soil for different areas for areas as guideline section 12 (ECA);
- Rule making power section 20 (ECA);
- Promulgation of a standard limit for discharging and emitting waste; and
- Formulation and declaration of environmental guidelines.

Before any new project can go ahead, as stipulated under the rules, the project proponent must obtain an Environmental Clearance Certificate from the Director General, DOE. An appeal procedure does exist for those promoters who fail to obtain clearance. Failure to comply with any part of this Act may result in punishment to a maximum of 10 years imprisonment or a maximum fine of 1.0 million taka, or both. The Department of Environment executes the Act under the leadership of the Director General (DG).

Section 12 of the ECA entails provision for an Environmental Clearance Certificate as follows:

- Environmental Clearance Certificate -No industrial unit or project shall be established or undertaken without obtaining, in the manner prescribed by rules an Environmental Clearance Certificate from the Director General.
- Rule 7 (ECR).
- Form 3 (ECR) Application form for Environmental Clearance Certificate
- Schedule 13, Fees for Environmental Clearance Certificate
- Bangladesh Environmental Conservation Act (Amendment 2000)-This amendment of the Act focuses on: (1) ascertaining responsibility for Compensation in cases of damage to ecosystems, (2) increased provision of punitive measures both for fines and imprisonment and (3) fixing authority on cognizance of offences.
- Bangladesh Environmental Conservation Act (Amendment 2002)-This amendment of the Act elaborates on: (1) restriction on polluting automobiles, (2) restriction on the sale and production of environmentally harmful items like polythene bags, (3) assistance from law enforcement agencies for environmental actions, (4) break up of punitive measures and (5) authority to try environmental cases.

2.1.2 Environment Conservation Rules (ECR), 1997 (as amended in 2002 & 2003)

These are the first set of rules, promulgated under the Environmental Conservation Act of 1995 (so far there have been three amendments to this set of rules -February and August 2002 and April 2003). The Environment Conservation Rules of 1997 have provided categorization of industries and projects and identified types of environmental assessments needed against respective categories of industries or projects.

Among other things, these rules set out (i) the National Environmental Quality Standards for ambient air various types of water, industrial effluent, emission, noise, vehicular exhaust etc., (ii) the requirement for and procedures to obtain environmental clearance, and (iii) the requirement for Initial Environmental Examination (IEE)/Environmental Impact Assessment (EIA) according to categories of industrial and other development interventions. Rule 7 of the ECR has for the purpose of issuance of Environmental Clearance Certificate has divided industrial units and projects in four categories: (a) Green; (b) Orange– A; (c) Orange– B; and (c) Red.

The Rules are not explicit for various oil and gas exploitation and exploration activities. Rather, this is covered under the broader heading of "exploration, extraction and distribution of mineral resources", classified as Red Category Projects.

The proposed project, according to the DOE is considered under the Red category of the Environmental Conservation Rules, 1997 (Item 65: Exploration, extraction and distribution of mineral resources) [Page 3122 of the Bangladesh Gazette of 28 August 1997].

2.2.3 Compliance with Other Legal Requirements

The Environment and Forest Ministry in its Notification No PaBaMa, dated 19.4.1999 has declared some areas of the country as Ecologically Critical Areas; however, no such areas are currently identified in the proposed project areas.

There are two kinds of legislation that the Proponent is required to comply for conducting the proposed project activities. The first kind requires specific compliance through obtaining permission from certain authorities of the GOB, i.e. DOE, Department of Explosives, Department of Forests, Department of Shipping As part of the DOE requirement permission of the local authority is also required. The second kind of legislation does not require specific permission from any authority; however, they require specific compliance. These include:

- Forest Act, 1927;
- Mines and Mineral (Development and Control) Act, 1992 & Mines and Mineral Rules, 1968;
- Explosives Act, 1884;
- Explosives Substances Act, 1908; and
- The Maritime Fisheries Ordinance, 1983

i) The Forest Act, 1927

The Forestry Act, 1927 provides for reserving forests over which the government has an acquired proprietary right. Section 3 of this Act entails that–

“3. Power to reserve forests -The Government may constitute any forest land or waste-land or any land suitable for forestation which is the property of the Government, or over which the Government has proprietary rights, or the whole or any part of the forest-produce of which the Government is entitled, a reserved forest in the manner hereinafter provided.”

Section 26 of the Act has provided inter alia that -

26. Acts prohibited in such forests -(1) any person who, in a reserved forest–

- (a) Kindles, keeps or carries any fire except at such seasons as the Forest Officer may notify in this behalf;
 - (b) causes any damage by negligence in felling any tree or cutting or damaging any timber; or who enters a reserved forest with fire-arms without prior permission from the Divisional Forest Officer concerned, shall be punishable with imprisonment for a term which may extend to six months and shall be liable to fine which may extend to two thousand taka, in addition to such compensation for damages done to the forest as the convicting court may direct to be paid.
1A. any person who–
 - (c) Removes any timber from a reserved forest or who in a reserved forest–
 - (d) Fells, girdles, lops, taps or burns any tree or strips off the bark or leaves from, or otherwise damages, the same;
 - (e) Clears or breaks up any land for cultivation or for any other purpose or cultivates or attempts to cultivate any land in any other manner; shall be punishable with imprisonment for a term which may extend to five years and shall not be less than six months, and shall also be liable to fine which may extend to fifty thousand taka and shall not be less than five thousand taka, in addition to such compensation for damage done to the forest as the conviction Court may direct to be paid.
- (2) Nothing in this section shall be deemed to prohibit–
- (a) Any act carried out by permission in writing of the Forest Officer or under any rule made by the Government; or . . .
 - (b) of sub-section (2) of section 15, or created by grant or contract in writing made by or

on behalf of the government under section 23; . . .”

The statute in section 26 has provided for penalties for contravening the provisions of the statute, however, the project activities may be conducted with permission of the government, i.e. forest officer, as provided in sub-section 2 of the same section (stated above).

Similarly, the government may also declare certain forests as Protected Forests (Chapter IV of the Forests Act, 1927). And similar prohibitions as contained in section 26 are also entailed in section 33; however, the permission as contained in section 26(2) is also available in section 34.

Other Forest Acts:

The Supplementary Rules of 1959 empower the concerned governmental bodies to restrict totally and for a specified period, the shooting, hunting or catching of various birds, animals and reptiles in the controlled and vested forests. The Bangladesh Private Forests Ordinance, 1959 provides for the conservation of private forests and for the forestation, in certain cases, of wastelands in Bangladesh.

(ii) Mines and Minerals (Control and Development) Act, 1992; and Mines and Minerals Rules, 1968

The Constitution of Bangladesh in Part XI (Miscellaneous), Article 143 has provided that “all minerals and other things of value underlying any land of Bangladesh” are lawfully vested in the People’s Republic of Bangladesh. Thus, the right to extract minerals is owned by the GOB. The power to grant mining leases and licenses is vested in the Bureau of Mineral Development (BMD), Bangladesh. The Constitution has further provided in Article 47-“47. Saving for certain laws.

- (a) No law providing for any of the following matters shall be deemed to be void on the ground that it is inconsistent with, or takes away or abridge, any of the rights guaranteed by this Part- (a) the compulsory acquisition, nationalization or requisition of any property, or the control or management thereof whether temporarily or permanently;
- (b) The extinction, modification, restriction or regulation of rights of search for or win minerals or mineral oil;”

In the Mines and Minerals (Control and Development) Act, 1992, section 3 indicates that no survey or exploration with regard to any mines or mineral should be carried out except with a license from the government, i.e. Bureau of Mineral Development (BMD). The necessary procedure for acquiring license is provided in Rule 9 of the Mines and Minerals Rules, 1968. BMD will issue the necessary permit and conversely Project Proponent is required to ensure that appropriate exploration license is obtained, though it seems that no such activity is involved in this project and thus no license is required too. .

(iii) Explosives Act, 1884

As per section 4 of the legislation, “(1) “explosive” includes-

- (a) means, gun powder, nitro-glycerin, dynamite, gun-cotton, blasting powders, fulminate of mercury or of other metals, colored fires and every other substance, whether similar to those above-mentioned or not, used or manufactured with a view to produce a practical effect by explosion, or a pyrotechnic effect; and
- (b) Includes fog-signals, fireworks, fuses, rockets, percussion-caps, detonators, cartridges, ammunitions of all descriptions, and every adaptation or preparation of an explosive as above defined;
- (3) “Vessel” includes every ship, boat and other vessel used in navigation, whether propelled by oars or otherwise;
- (4) “carriage” includes any carriage, wagon, cart, truck, vehicle or other means of

conveying goods, or passengers by land, in whatever manner the same may be propelled: . . .

(5) "import" means to bring into (Bangladesh) by sea or land"

Section 6 of the Act provides punishment for contravening notifications issued under the provisions of this law, which may extend to imprisonment of ten years with or without fine amounting to fifty thousand taka. Section 8 provides for punishment for failing to notify the Chief Inspector of Explosives in Bangladesh and also to the Officer-in-Charge of the nearest Police Station in case of an accident due to explosion of any explosives either during manufacturing, possession, usage or carriage. The punishment extends to three months of imprisonment and to a fine of up to five thousand taka.

Under the provisions of Explosives Rules, 2003 (rules made under the provision of section 5 of the Explosives Act, 1884), Project Proponent will be required to obtain licenses for explosive related activities, if any, viz: import, transport and possession and for such the Project Proponent will apply for a license to import explosives from the Chief Controller of Imports and Exports with the clearance from the Chief Inspector of Department Explosives. Application for transport and possession must be sought from the Chief Inspector of Department Explosives.

(iv) Explosives Substances Act, 1908

In this statute in section 2 an "explosive substance" has been defined as follows–

2. In this Act the expression "explosive substance" shall be deemed to include any materials for making any explosive substance; also any apparatus, machine implement or material used, or intended to be used, or adapted for causing, or aiding in causing, any explosion in or with any explosive substance; also any part of any such apparatus, machine or implement."

Section 3 provides for maximum punishment of a life jail term for causing any explosion "...unlawfully and maliciously to endanger life to cause serious injury to property...", however, this statute does not come within the purview of this project as there will be no unlawful or malicious intention whatsoever.

Apart from the above, DOE also requires specific compliance through obtaining permission and those are discussed below.

(v) The Marine Fisheries Ordinance, 1983

Section 26 of the Ordinance has provided provisions prohibiting use of explosives with intent and means to catch fish by the use of explosives, as air pulses will be used this provision does not directly relate to this project, which does not use explosives for the proposed marine activities; however, if explosives are used, prior permission from the Director of Fisheries must be obtained to remain in the safe side.

Section 28 of the Ordinance further provides that–

The Government may, by notification in the official Gazette declare any area of the Bangladesh fisheries waters and as appropriate, any adjacent or surrounding land, to be a marine reserve where it considers that special measures are necessary–

- to afford special protection to aquatic flora and fauna of such areas and to protect and preserve the natural breeding grounds and habitats of aquatic life with particular regard to flora and fauna in danger of extinction; or
- to allow for the natural regeneration of aquatic life in areas where such life has been depleted; or
- to promote scientific study and research in respect of such areas; or
- to preserve and enhance the natural beauty of such areas.

- Section 29 of the Ordinance also provides that–
 - (1) Any person who, in any marine reserve declared under section 28, without permission granted under this section or dredges, extracts sand or gravel, discharges or deposits waste or any polluting matter, or in any other way disturbs, alters or destroys fish or other natural breeding ground of habitats; or Shall be guilty of an offence and shall be liable to a fine not exceeding taka one lac.
 - (2) The Director may give permission to do any of the things prohibited under this section where the doing of such thing may be required for the proper management of the reserve or for any of the purposes referred to in section 28.

Section 30 dealing with granting permission for scientific research provided that–

The Government may, in writing and subject to such terms and conditions, if any as may be specified therein, exempt from all or any of the provisions of this Ordinance or the rules made there under any vessel or person undertaking research into marine fisheries or other marine living resources in the Bangladesh fisheries waters.

There are some marine fisheries around FSRU Complex area in Barguna, Patuakhali, Kuakata, Maheshpur, Bhola and Khepupara. It is suggested that a prior permission is obtained for the offshore project area.

2.3 The Regulation and Guideline To Conduct The Assessment

2.3.1 Relevant Strategies, Plans and Policies of the Government of the Peoples' Republic of Bangladesh

There are certain policies that are followed by the government and its agencies with regard to any development activities and those are discussed as follows:

- (i) National Conservation Strategy, 1992;
- (ii) National Environmental Management Action Plan (NEMAP), 1995;
- (iii) Fifth Five-Year Plan (1997-02);
- (iv) National Forest Policy, 1994;
- (v) National Industrial Policy, 1999;
- (vi) National Water Policy, 1999;
- (vii) National Tourism Policy, 1992;
- (viii) National Energy Policy, 1995;
- (ix) Petroleum Policy, 1993; and
- (x) Bangladesh National Environmental Policy, 1992.

(i) National Conservation Strategy (NCS), 1992

The National Conservation Strategy was drafted in late 1991 and submitted to the Government in early 1992. This was approved in principle; however the final approval of the document is yet to be made by the cabinet.

For sustainable development in the energy sector, the strategy document offered various recommendations for 'Energy and Minerals' sector, the relevant strategy recommendations were:

- To use the minimum possible area of land in exploration sites;
- To take precautionary measures against Environmental Pollution from liquid effluent, condensate recovery and dehydration plants; and
- Technology assessment for selection of appropriate technology

ii) National Environmental Management Plan (NEMAP), 1995

The National Environmental Management Action Plan (NEMAP) is a wide ranging and multi-

faceted plan, which builds on and extends the statements set out in the National Environmental Policy. NEMAP was developed to address issues and management requirements for a period in between 1995 to 2005 and set out the framework within which the recommendations of the National Conservation Strategy are to be implemented.

NEMAP has the broad objectives of:

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

One of the key issues in NEMAP regarding the energy sector has been that "energy conservation awareness is generally low throughout the country". NEMAP did not recognize mineral resources as an important sector and there is no separate discussion on this aspect.

iii) Environmental Policy, 1992

The Bangladesh National Environmental Policy of 1992 sets out the basic framework for environmental action, together with a set of broad sectoral action guidelines. The Environment Policy provides the broader framework of sustainable development in the country. It also states that all major undertakings, which will have a bearing on the environment, (including setting up of an industrial establishment) must undertake a IEE/EIA before any project is initiated.

The Environment Policy delineates the Department of Environment as the approving agency for all such IEE/EIA s to be undertaken in the country.

Policies of fifteen sectors are described in the Policy. Under the Energy and Fuel sector, the use of fuel that has the least environmental impact is encouraged in Section 3.4.1. Conservation of fossil fuel is stressed in Section 3.4.5 and the need for conducting EIA before implementation of projects for fuel and mineral resources is stressed in Section 3.4.6.

Under the Environmental Action Plan in the section on Policy and in its sub-section for 'Fuel and Energy', it is suggested that:

- The use of gas, coal, kerosene and petrol as fuel will be expanded in the rural areas, so that fuel wood, agricultural residues, and cow dung is conserved. This will help the use of agricultural residues, and cow dung etc. as manure; and
- Appropriate measures will be taken to ensure that extraction; distribution and use of natural resources such as oil, gas, coal, peat etc. do not adversely affect air, water, land [and/or] the hydrological balance and the ecosystem.

Section 3.7 "Forest, Wildlife and Biodiversity" requires:

- Conserve Wildlife and Biodiversity, strengthen related research and help dissemination and exchange of knowledge in these areas; and
- Conserve and develop wetlands and protection of migratory birds.

iv) Seventh Five-Year Plan (2016-2020)

The present Seventh Plan's articulation of a sustainable development strategy involves a large array of actions under three key themes: (i) Climate Change Management and Resilience (comprised of adaptation and mitigation) (ii) Environmental Management; and (iii) Disaster Management. These actions are aligned with the overall framework and strategies of National Sustainable Development Strategy (NSDS), and are broadly consistent with the scope of the post-2015 Sustainable Development Goals (SDGs). Some of the objectives and activities that were considered under the Sixth Plan but were not addressed or implemented have also found

consideration under Seventh Plan, provided they have an instrumental role in aiding the key objectives of the Plan. This chapter is focused on Climate Change Management and Resilience and Environmental Management mostly. The detail of Disaster Management is discussed in Chapter 14 of Part 2 as the Ministry of Disaster Management and Relief is within the purview of Social Welfare and Security sector.

Activities proposed under 7th Five Year Plan for Environment Management

Issue 3: Strengthening EIA system as environment management tool Under ECA'95, EIA has been accepted as a mandatory tool to identify and predict impacts and undertake proper mitigation measures in a project scale. There is another concern that, most of the developing Ministries and agencies escape the process. There is also a need for introducing strategic EIA as a planning tool for sectoral level planning.

Programme:

- Strengthening the EIA processing & implementation through institutional capacity building.
- Issuance of location clearance after approval of EIA report for Red category projects.
- No land development activity to take place prior to environment clearance.
- Gazetting and publicizing EIA guidance manual & sectoral EIA guideline prepared.
- Enlistment of competent EIA consulting firms by the DoE for conducting EIA.
- Immediate framing of detailed rules on EIA as mandated in section 12 of BECA
- Strategic EIA/SEA for all sectoral planning including for exclusive economic zones.
- Achieving compliance to EIA practices by all development Ministries & agencies.
- Public consultation on EIA report of Red category projects

v) Forest Policy, 1994

The National Forest Policy of 1994 is the amended and revised version of the National Forest Policy of 1977 in the light of the National Forestry Master Plan. The major target of the policy is to conserve existing forest areas, bring about 20% of the country's land area under the Forestation Program and increase the reserve forest land by 10% per year to 2015 through coordinated efforts of GOB-NGOs and through active participation of the people.

Amendments of the existing laws (acts, rules and regulations) relating to the forestry sector and creation of new laws for sectoral activities have been recognized as important conditions for achieving the policy goals and objectives. The Forestry Policy also recognizes the importance of fulfilling the responsibilities and commitments under International Conventions, Treaties and Protocols (ICTPs). However, the Forest Act, 1927 is still in force.

vi) Industrial Policy, 1999

The National Industrial Policy, 1999 aims to ensure a high rate of investment by the public and private sectors, a strong productive sector, direct foreign investment, development of labor intensive industries, introduction of new appropriate technology, women's participation, development of small and cottage industries, entrepreneurship development, high growth of export, infrastructure development and environmentally sound industrial development.

WTO guidelines have been proposed to be followed in the Industry Policy. Following the guidelines may result in conflicts with intellectual property rights. Guidelines for mitigating such possible conflicts are absent in the policy document. No specific guidelines are given for sustainable extraction and utilization of raw materials for different industries.

One of the 17 objectives of the policy (Section 2.12; Chapter II) is

"To ensure a process of industrialization which is environmentally sound and consistent with the resource endowment of the country"

However, none of the 24 strategies of the policy relates to the environment.

vii) National Water Policy, 1999

The National Water Policy of 1999 was passed to ensure efficient and equitable management of water resources, proper harnessing and development of surface and ground water, availability of water to all concerned and institutional capacity building for water resource management. It has also addressed issues like river basin management, water rights and allocation, public and private investment, water supply and sanitation and water needs for agriculture, industry, fisheries, wildlife, navigation, recreation, environment, preservation of wetlands, etc.

The water policy, however, fails to address issues like consequences of trans-boundary water disputes and watershed management.

viii) National Tourism Policy, 1992

One of the aims of the policy statement is "Development of tourism resources of the country and their maintenance". Two special sections of the policy focus on 'archaeological and historical sites' and 'conservation of wildlife'.

ix) Energy Policy, 1995

The National Energy Policy provides for utilization of energy for sustainable economic growth, supply to different zones of the country, development of the indigenous energy sources and environmentally sound sustainable energy development programs. The Policy highlights the importance of protecting the environment by requiring an EIA for any new energy development project, as well as the introduction of economically viable and environment friendly technology.

One of the seven objectives (Section 1.2) addresses the environment and states, "(vi) to ensure environmentally sound sustainable energy development Programs causing minimum damage to the environment".

Seven specific policy recommendations are listed under Chapter 1.9. Of those, the following three are relevant to the present project:

- Environmental impact assessment should be made mandatory and should constitute an integral part of any new energy development project;
- Use of economically viable environment friendly technology is to be promoted; and
- Public awareness is to be promoted regarding environmental conservation.

x) Petroleum Policy, 1993

The Petroleum Policy has the primary objective of promoting, monitoring, and regulating all activities in the oil and gas sector in relation to exploration, development, refining, marketing and export. The Petroleum Policy indicates the need to "promote Environmental Impact Assessment" in the oil and gas sector and to formulate various laws, rules and policies for fostering safety and environmental protection. The Petroleum Policy further states that private companies, in consultation with the Ministry of Power, Energy and Mineral Resources and Petrobangla, are to contribute towards improving the state of the environment in their area(s) of operation. The Petroleum Policy is now an integral part of the Energy Policy.

xi) Bangladesh National Environmental Policy (2017) (Upcoming)

National Environmental Policy-2017 has been placed to the Honorable Prime Minister for Approval. This policy has stated the following points regarding the SEA.

- All the fields required confirmation of the execution of Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA)
- Environmental Policy

- Land Resources Management
 - Ecosystem and Regional-Ecosystem based land zoning have to be planned and Regional-Ecosystem based SEA execution should be ensured.
- Organizational Set-up
 - Relevant all ministries and offices shall formulate SEA on their sectoral policy, plan and program.
- National Environment Policy Compliance
 - Accommodation, Housing and Urbanization
 - EIA and SEA should be carried out before formulation of all National Regional Projects and Master Plan proposed for housing and urbanization
 - For the separation of residential, commercial and industrial areas, the zoning should be made through SEA. Preparation and implementation of environmentally-friendly and regional urban planning.
 - In order to set up industrial establishments in a planned manner, SEA guided land zoning would be required for building the subject based industrial Area. Restricted establishment of industrial factories in residential areas and Transfer existing industrial factories of the residential areas to the scheduled areas.

2.4 Relevant Bangladesh Legislation

Legislation discussed above requires strict compliance. The following legislation does not require any permission, but violation is penalized.

- (i) Bangladesh Petroleum Act, 1974;
- (ii) Bangladesh Wildlife (Preservation) Order, 1973;
- (iii) Mineral Gas Safety Rules, 1991;
- (iv) The Protection and Conservation of Fish Act, 1950;
- (v) The Protection and Conservation of Fish Rules, 1985;
- (vi) The Marine Fisheries Ordinance, 1983;
- (vii) The Territorial Waters and Maritime Zone Act, 1974;
- (viii) Coast Guard Act, 1994;
- (ix) The Penal Code, 1860;
- (x) Acquisition and Requisition of Immovable Property Ordinance, 1982;
- (xi) The Contract Act, 1872; and
- (xii) Bangladesh Labour Act, 2006.

i) Petroleum act, 1974

The Bangladesh Petroleum Act is enabling legislation which allows the Bangladesh Government to enter into all aspects of petroleum exploration, development, exploitation, processing, refining and marketing. In addition, the Government is authorized to enter into Petroleum Agreement(s) with any person(s) for the purpose of petroleum operations. Bangladesh Petroleum Act, 1974, in section 2 has defined that-

- (c) "Petroleum" means-
 - (i) Any naturally occurring hydrocarbon, whether in a gaseous, liquid or solid state; and
- (e) "petroleum operation" means any activity related to exploration, development, exploitation, production, processing, refining or marketing of petroleum.

The Act has bestowed the responsibility upon project officials to:

- To ensure that petroleum operation is carried out in a proper and workman like manner and in accordance with good oil field practice;
- To carry out petroleum operations in any area in a manner that does not interfere with navigation, fishing and conservation of resources;
- To consider the factors connected with the ecology and environment.

Clause 6(2) of the Act sets out certain details related to environment and safety: "In particular,

and without prejudice to the generality of the foregoing provision, a person engaged in any petroleum operations shall, in carrying out such operations in any area:

- Control the flow and prevent the waste or escape' in the area, of petroleum or water;
- Prevent the escape in that area of any mixture of water or drilling fluid with petroleum or any other matter;
- Prevent damage to petroleum-bearing strata in any area, whether adjacent to that area or not; and
- Keep separate any petroleum pool discovered in the area.

It is provided in section 7 of the Act that–

“Any land required for carrying on any petroleum operation shall be deemed to be required for a public purpose.”

ii) Bangladesh Wildlife (Preservation) Order, 1973 (Amended in 1994)

The Bangladesh Wildlife (Preservation) Order, 1973, has made provisions for the safety of wildlife and their protection and to save some species from extinction. It has provision for 'wild life sanctuaries', banning hunting of certain species, banning 'game reserves' and provision for special permits to keep and care for certain types of animals. Section 31 has provisions for arrest of any offender to be carried out without warrant by an officer, i.e. Forester or Senior Wild Life Scout. Any offence committed under this statute may be tried by a Magistrate under the provisions of summary trial of the Code of Criminal Procedure, 1898. Schedule III to the statute includes a list of animals that are declared as protected animals, which shall not be hunted, killed or captured. The maximum penalty for any offence committed under this statute is two (2) years imprisonment and a maximum fine of Taka ten thousand.

The Government of Bangladesh under the provisions of the Bangladesh Wildlife Preservation Act, 1974 (amendment act 1974), has established three categories of protected areas, namely National Parks, Wildlife Sanctuaries and Game Reserves. These in addition, the Government of Bangladesh has declared 14 protected areas and is considering declaring more. Moreover, the Government of Bangladesh has recently declared 6 areas as Ecologically Critical Area (ECA) under the Environmental Conservation Act, 1995.

One World Heritage Site, Sunderban East extends to the West of the Project Area but is no closer than 100s of km from the offshore area.

The nearest Wildlife Sanctuary is the Char Kukri-Mukri, which is also not close to the project area. A recent map prepared by Integrated Protected Area Conservation (IPAC) (a follow up program of the Management of Aquatic Community Husbandry (MACH), a US Aid funded project (1998– June 2008)), shows that apart from Char Kukri-Mukri National Park there is no Ecologically Critical Area (ECA), Reserve Forest, Protected Areas, Game Reserve, Wildlife Sanctuary, or Wetland Protected Area located nearby. No turtle nesting sites are also listed as protected areas by any authority of the Government.

iii) Mineral Gas Safety Rules, 1991 (Amendment 2003)

This document is derived mainly from the American Petroleum Institute (API), American Society of Mechanical Engineers (ASME), American National Standard Institute (ANSI), British Standards (BS), codes and practices etc. and Petroleum Act, 1934. These rules deal with the materials, design and construction of gas pipelines, pipeline crossings of railways, testing and commissioning, protection against corrosion, pipeline operation and maintenance, storage and distribution, and reporting of accidents. The Rules are quite prescriptive and include stipulations as to the separation distances between pipelines and the public properties and thoroughfare. The provisions of the rules of the Mineral Gas Safety Rules, 1991 have been updated through amendment in 2003.

iv) The Protection and Conservation of Fish Act, 1950

The Protection and Conservation of Fish Act, 1950 (as amended in 1982, 1995, and 2002) contains provisions for the protection and conservation of fish in inland waters of Bangladesh. This is relatively unspecific and simply provides a means by which the Government may introduce rules to protect those inland waters not subject to private ownership. This is framework legislation with rule making powers, among others, some of these rules prohibited the destruction of, or any attempt to destroy, fish by the poisoning of water or the depletion of fisheries by pollution, by trade effluent or otherwise.

To date no fishing area or place within the Bangladesh territory has been declared a Fishing Reserve by the Government. The only restriction imposed was found from leaflets distributed by the Directorate of Fisheries, which referred to Bangladesh Gazette Extra-Ordinary dated October 27, 2005, adding section 13 to the Protection and Conservation of Fish Act, 1950. This required that certain areas be excluded from all fishing during high breeding periods.

Table-2.3 : Fish conservation areas and fishing restriction periods

Serial No.	Hilsha Conservation Area	Period
1.	From Shatnal of Chandpur District to Char Alexander of Laxmipur District (100 k.m. downstream area of Meghna river)	March to April of every year.
2.	Char Elisha to Char Pial of Madanpur of Bhola District. (90 km. area of Meghna rivers estuary at Shahbazpur)	March to April of every year.
3.	Veduria of Bhola District to Char Rustam of Patuakhali District (about 100 k.m. area of Tetulia river)	March to April of every year.
4.	Entire 40 k.m. area of Andharmanik river of Kolapara Upa-Zilla of Patuakhali District.	November to January of every year.

And the leaflet further provided that -Hilsha catching prohibited in the Column 1 area and catching Hilsha or cause to catch Hilsha during the period as stated in column 2 is prohibited.

Table-2.4 : Hilsha conservation areas and fishing restriction periods

Area	Main breeding season
North-East	Shaherkahli/ Haitakandi Point, Mirsharai (GPS Point 91o 28'55.20" East Longitude and 22o 42'57.60" North Latitude
North-West	North Tajmuddin/ West Syed Aulia Point (GPS Point 90o 49'12.00" East Longitude and 22o 19'56.40" North Latitude
South-East	North Kutubdia/ Gondamara Point (GPS Point 91o 52'51.60" East Longitude and 21o 55'19.20" North Latitude
South-West	Lata Chapali Point, Kolapara (GPS Point 90o 12'39.60" East Longitude and 21o 47'56.40" North Latitude

Anyone caught violating the above will forfeit the catch and the fishing equipment.

(v) The Protection and Conservation of Fish Rules, 1985

These are a set of rules in line with the overall objectives of the Fish Act. Section 5 of the Rules requires that "No person shall destroy or make any attempt to destroy any fish by explosives, gun, bow and arrow in inland waters or within coastal waters". Section 6 of the Rules states - "No person shall destroy or make any attempt to destroy any fish by poisoning of water or the depletion of fisheries by pollution, by trade effluents or otherwise in inland waters".

So, the project activities must be conducted in a manner that it is not going to either destroy any fish by means of any explosives used for any reason whatsoever.

(vi) The Territorial Waters and Maritime Zone Act, 1974

Section 3 of the Act provides that the Territorial Waters of Bangladesh shall be declared by the Government through official Gazette Notification. Regarding Contiguous Zone it is stated in section 4, that– "... The zone of the high seas contiguous to the territorial waters and extending seawards to a line six nautical miles measured from the outer limits of the territorial water ...". May it be taken into notice that territorial water also includes waters within the country apart from the water in the sea.

Section 6 further provides that–

The Government may, with a view to maintenance of the productivity of the living resources of the sea, by notification in the Official Gazette, establish a conservation zone in such areas of the sea adjacent to the territorial waters as may be specified in the notification and may take such conservation measures in any zone so established as it may deem appropriate for the purpose including measures to protect the living resources of the sea from indiscriminate exploitation, depletion or destruction.

Section 7 of the Act deals with the Continental Shelf and Section 8 with Control of Pollution as the Government may decide.

(vii) Coast Guard Act, 1994

Amongst the functions of the Coast Guards as embodied in section 7 of the Act, it also embraces to– "investigate into the activities causing pollution to the environment in the maritime zone of Bangladesh and taking measures for their prevention".

As such specific permission from the Coast Guard authority is required and thus information as to taking prior permission should be obtained about the Project Execution.

(viii) The Penal Code, 1860

The Penal Code, 1860, in Chapter XIV (sections 268-294B), under the heading of "offences affecting public health, safety, convenience, decency and morals" provides for the following, amongst others:

Section 268 deals with public nuisance;

269-Negligent act likely to spread infection of diseases dangerous to life;

270-Malignant act likely to spread infection of disease dangerous to life;

271-Disobedience to quarantine rule;

272-Adulteration of food or drink intended for sale;

277-Fouling water of public spring or reservoir;

278-Making atmosphere noxious to health;

279-Rash driving or riding on public way;

283-Danger or obstruction in public way or line of navigation;

284-Negligent conduct with respect to poisonous substance;

285-Negligent conduct with respect to fire or combustible matter;

286-Negligent conduct with respect to explosive substance;

287-Negligent conduct with respect to machinery;

288-Negligent conduct with respect to pulling down or repairing building;

289-Negligent conduct with respect to animal

So, sections 285 and 287 are directly concerned with activities and/or materials that are likely to be used in the proposed seismic survey.

(ix) Acquisition and Requisition of Immovable Property Ordinance, 1982

This statute is meant to deal with acquisition i.e. permanently acquiring of some property and requisition i.e. temporarily acquiring some property of immovable property by the government for public purpose and / or of public interest. In the case of this proposal property acquisition

may be undertaken in the area wherein the Pipe laying & Tie-in are planned.. This right is vested in the government through constitutional safeguard in Article 47 of the Constitution of the People's Republic of Bangladesh. This includes forgoing compulsory acquisition or requisition of the properties that are going to be used for a very short period of time by implementing a private contract with the land owners and/or by paying compensation for the damage that is caused to either to their crop, usage or disturbance. The requirement may also require removal of properties of movable nature, if any, and the compensation package would require the same nature of contract with the owners of the properties.

This present Ordinance has replaced the land Acquisition Act of 1894 and the East Bengal (Emergency) Requisition of Property Act of 1948.

The acquisition and requisition process is lengthy and cumbersome, and also requires the Deputy Commissioner's involvement as he is the authority to pass the necessary order (section 3 for acquisition and section 18 for requisition). The Ordinance has well-defined procedures regarding payment of compensation for acquiring any land required for any purpose. However, it is provided in the Bangladesh Petroleum Act, 1974, section-7, that:

"Any land required for carrying on any petroleum operation shall be deemed to be required for a public purpose."

Therefore if any land is to be acquired or requisitioned then the requirement must be placed before the Deputy Commissioner of the District of Cox's Bazar. It may also be done on a private contract basis but the planned usage will involve explosions and will involve many laws, so it is advisable that the authorities concerned are involved in the process.

The rate of compensation is well defined in the Acquisition and Requisition of Immovable Property Ordinance, 1982. If a land is used for rice growing, then an amount equivalent to approximately 1.5 times the market value of a given variety of rice (e.g., paddy) that is currently being (or could be) produced annually is fixed as a yearly lease value. In case of outright purchase (carried out on a 99-year lease), the compensation-value of acquired land varies widely according to the locality, soil fertility, and access to transportation and related infrastructure factors. The current compensation and resettlement provisions are however inadequate both in terms of timing of payments and amount. The procedures involved are cumbersome and time consuming and often causes hindrance to the smooth execution of the project. Legal provisions covering adequate compensation to the project affected persons, particularly disadvantaged groups such as women & squatters and such other vulnerable groups are yet to be defined.

(x) The Contract Act, 1872

This is the statute under which any contract is executed in Bangladesh. The statute relates to entering into any contract either with the Government to use its land or with any private, corporate person or corporate entity to use its land or services.

(xi) Compliance with Bangladesh Labor Act, 2006

Chevron will employ workers in the field for the purposes of the survey and as such must comply with the Bangladesh Labor Act, 2006. In this statute definition of labor is provided in section 2, whilst classification of a labor is entailed in section 4(1). Every laborer must be provided with a contract and an identification card (section 5). Whilst child labor is clearly defined in section 34, the nature of the project will inherently exclude any child (section 40) or women laborers (section 45). Compliance to health and safety is provided in Chapters V (sections 51-60) and VI (sections 61-78), and special provisions regarding health and safety are provided in chapter VII (sections 79-85). With regard to welfare of the laborers, chapter VIII states that first aid materials (section 89) are mandatory.

Regarding working hours for the laborers, chapter IX sections 101 & 102 and section 105-108 (overtime) are required to be followed. Payment of wages of the laborers is provided for in Chapter X (section 120-123 and 137 must be looked at specifically). Compensation for accidents during work (Chapter XII) is contained in sections 150-153 and 155. Schedule IV provides specific mention of laborers engaged in handling explosives and working in mines.

Project Specific Legal Compliance Provisions

Permission from DOE under the Environment Conservation Act (1995) (ECA) and Environment Conservation Rules (1997) (ECR).

- Permission from the Local Authority as part of the requirement
- Permission from the Bureau of Mineral Development;
- Permission from the Director of Fisheries;
- Permission from the Department of Forests;
- Permission from the Department of Shipping and
- Permission from the Department of Explosives, etc of the Government of the People's Republic of Bangladesh

An initial list of applicable consents for the floating LNG terminal and the relevant authority is provided in Table-2.3 below. This is a preliminary list and will be subject to further requirement as and when applicable.

Table-2.3: Consents and Approvals

Consent / Approval	Preliminary Remarks
<ul style="list-style-type: none"> • Letter of support for the project from the Bangladesh Government. • Government commitment to fiscal stability and liability vis-à-vis government entities and third parties consistent with Petrobangla contract. • No encumbrance or impediments to effective bank sureties required for financing of project. 	<ul style="list-style-type: none"> • The authority for approving the Offshore LNG Project under Bangladesh's Public Procurement Act (2006) and Public Procurement Rules (2008) is the Cabinet Committee of Purchase (CCP) headed by the Prime Minister. • The Bangladesh Government will take care of these issues under special arrangement if the situation demands. • Bangladesh Government existing policy to be followed, information regarding BOOT facilities in Bangladesh is available from Bangladesh's I1FC website.
<ul style="list-style-type: none"> • Certification from Bangladesh Comptroller General that bidding procedure fully complies with all government requirements and will be serving as a satisfactory basis for adjudication. 	<ul style="list-style-type: none"> • Certification will not be required.
<ul style="list-style-type: none"> • Labor restrictions. • Local procurement requirements? 	<ul style="list-style-type: none"> • No restriction for local labor. But for foreign expatriates Government permission will be needed. • The developer will be able to procure as they require.
<ul style="list-style-type: none"> • Government commitment that the terminal developer will have no lingering liabilities related to environment or facilities at transfer of the terminal after 15 years. 	<ul style="list-style-type: none"> • Terminal Company will comply with the Environment Act of 1995 and will have to comply with Effluent Treatment Plant (ETP) requirements.
<ul style="list-style-type: none"> • Details of the fiscal regime under which the LNG terminal company will operate. • Details of the taxes/duties or other levies which the LNG terminal company will be liable for. 	<ul style="list-style-type: none"> • The requirements and details would be as per prevailing National Board of Revenue (NBR) rules. • National Board of Revenue.
<ul style="list-style-type: none"> • Letter of no objection to LNG terminal development from relevant Government Shipping authorities. • Agreement / approval from relevant Port Authority (Sonadia / Chittagong / Cox's Bazar as applicable) as to the proposed terminal location. 	<ul style="list-style-type: none"> • Obtaining no objection from shipping authority is said to be in process. • Obtaining no objection from Cox's Bazar local authority is said to be in process.

Consent I Approval	Preliminary Remarks
<ul style="list-style-type: none"> Letter of no objection from Bangladesh military to LNG terminal development. Responsibility for policing of fishing access issues around the FSRU location. 	<ul style="list-style-type: none"> Obtaining no objection from Bangladesh Navy is in process. Bangladesh Coast Guard (BCG) is responsible for coastal and offshore area. Obtaining no objection from this authority is said to be in process.
<ul style="list-style-type: none"> Letter of no objection from local government authorities to LNG terminal development. 	<ul style="list-style-type: none"> Obtaining no objection from Cox's Bazar District Authority is in process.
<ul style="list-style-type: none"> Description of import or customs duties that the LNG terminal may be liable for in its operations. 	<ul style="list-style-type: none"> National Board of Revenue (N BR) is the authority for customs duties.
<ul style="list-style-type: none"> License for the transmission of natural gas via a sub sea gas pipeline linking the LNG terminal to the onshore gas receipt point (GTCL'). 	<ul style="list-style-type: none"> No such license is required. But, local authority permission will be needed but approval of the Chief Inspector, Inspectorate of Explosives is mandatory under Gas Safety Rules.
<ul style="list-style-type: none"> License for construction and operation of LNG terminal 	<ul style="list-style-type: none"> The permission to establish the terminal itself will be considered as license for its construction and operation. License from Bangladesh Energy Regulatory Commission (ERC) is yet another responsibility for the Operator
<ul style="list-style-type: none"> Safety regulations and approvals that will apply to the LNG terminal and the pipeline to the onshore gas receipt point, Ongoing inspections during construction and operation phases with procedure to ensure comments are reasonably addressed. 	<ul style="list-style-type: none"> Approval from the Chief Inspector of Explosives will be required. However, International Regulations also need to be followed. During the construction phase of the project Consultant will prepare a monthly monitoring report on the terminal developer's activities. During the construction and operation phase of the project the Project Sponsor will also prepare reports to be submitted to Petrobangla monthly on the terminal activities.
<ul style="list-style-type: none"> Seabed access consents for offshore LNG terminal and sub sea gas pipeline 	<ul style="list-style-type: none"> Local authority (Cox's Bazar District Authority) consent will be obtained for access to the seabed.
<ul style="list-style-type: none"> Land access consents for onshore gas receipt point at Moheshkhali Island and onshore pipeline to be constructed to Chittagong. 	<ul style="list-style-type: none"> Local authority (Cox's Bazar District Authority) consent will be obtained.
<ul style="list-style-type: none"> Registration of the Project Company. 	<ul style="list-style-type: none"> Registration of Joint Stock Company.
<ul style="list-style-type: none"> Environmental approvals for offshore LNG terminal and sub sea gas pipeline, 	<ul style="list-style-type: none"> Department of Environment (DOE) is the authority for Environmental approval,
<ul style="list-style-type: none"> Other relevant approvals or regulations under the laws of the national / provincial / local government regarding the erection and ongoing operation of the offshore LNG terminal. 	<ul style="list-style-type: none"> Bangladesh Board of Investment.

2.5 International Treaties and Guidelines

Bangladesh already had accessed to, ratified or signed a number of major international treaties, conventions and protocols related to environment protection and conservation of natural resources which shall have to be complied with during implementation of any project. The Environment related International conventions, protocols, treaties signed/ratified by Bangladesh are listed below.

2.5.1 International Convention for the Prevention of Pollution of the Sea by Oil London, 1954 (as amended on 11 April 1962 and 21 October 1969)

The main objective of this convention is to take action to prevent pollution of the sea by oil discharged from ships. This Convention applies to all ships, except tankers of under 150 tons gross tonnage and other ships of under 500 tons gross tonnage, registered in the territory of, or having the nationality of, a Party. Naval ships and ships engaged in whaling are also excepted (art. 2). Discharges are prohibited, except when a ship is proceeding en route or

when the instantaneous rate of discharge does not exceed 60 litres per mile. The prohibition is not applicable when the following conditions are satisfied: in the case of a ship-the oil content of the discharge is less than 100 parts per million parts of the mixture, or the discharge is made as far as practicable from land; in the case of a tanker -the total quantity of oil discharged on a ballast voyage does not exceed one fifteen-thousandth of the total cargo-carrying capacity, or the tanker is more than 50 miles from the nearest land (art. 3); Exceptions to article 3 are provided in cases of necessity to secure safety of ships, save life or prevent damage to cargo, or where leakage is unavoidable and all measures have been taken to minimize it (art. 4). Ships are to be fitted within 12 months to prevent escape of oil into the bilges (art. 7). Parties undertake to provide appropriate facilities at ports and oil-loading terminals (art. 8). All ships covered by the Convention are to carry an oil record book in a form specified in the annex, to be completed whenever certain operations take place (art. 9). Parties agree to send texts of laws, decrees, orders and regulations giving effect to the Convention to the United Nations.

2.5.2 Rio Declaration

The 1992 United Nations Conference on Environment and Development (UNCED) adopted the global action program for sustainable development called 'Rio Declaration' and 'Agenda 21'.

Principle 4 of the Rio Declaration, 1992, to which Bangladesh is a signatory along with a total of 178 countries, states, "In order to achieve sustainable development, environmental protection should constitute an integral part of the development process and cannot be considered in isolation from it".

2.5.3 Convention on Biological Diversity, Rio de Janeiro, (1992)

The Convention on Biological Diversity, Rio de Janeiro, 1992 was adopted on 05 June 1992 and entered into force on 29 December, 1993. Bangladesh ratified the Convention on 20 March, 1994.

The Contracting Parties of the Convention have committed to:

- Introducing appropriate procedures requiring environmental impact assessments of its proposed projects that are likely to have significant adverse effects on biodiversity, with a view to avoiding or minimizing such effects, and where appropriate allow for public participation in such procedures; and
- Introducing appropriate arrangements to ensure that environmental consequences of its programmes and policies, that are likely to have significant adverse impacts on biodiversity, are duly taken into account.

Obligation has been placed on State parties to provide for environmental impact assessments of projects that are likely to have significant adverse effects on biological diversity (art. 4).

2.5.4 Convention on Wetlands of International Importance especially as Waterfowl Habitat, Ramsar (1971)

This convention is also known as the Ramsar Convention. It was adopted 02 February, 1971 and entered into force on 21 December, 1975. Bangladesh has ratified the Convention 20 April, 2002. This provides a framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. There are 127 Parties with 1085 wetland sites designated as Wetlands of International Importance'.

This is an intergovernmental treaty, which provides the framework for international co-operation for the conservation of wetlands habitats. Obligations for Contracting Parties include the designation of wetlands to the "List of Wetlands of International Importance', the provision of wetland considerations within their national land use planning, and the creation of Natural Reserves.

Bangladesh has two Ramsar sites-Parts of Sundarbans Reserved Forest (Southwest of Bangladesh) and Tanguar Haor (Northeast of Bangladesh).

2.5.5 United Nations Convention on the Law of the Sea

This Convention was adopted on 10 December 1982 at Montego Bay, Jamaica. Bangladesh has ratified this Convention.

Main objectives of the convention are:

- To set up a comprehensive new legal regime for the sea and oceans, as far as environmental provisions are concerned, to establish material rules concerning environmental standards as well as enforcement provisions dealing with pollution of the marine environment; and
- To establish basic environmental protection principals and rules on global and regional cooperation, technical assistance, monitoring, and environmental assessment, and adoption and enforcement of international rules and standards and national legislation with respect to all sources of marine pollution.

2.5.6 Others (Convention and Agreements)

The following conventions and agreements may include provisions relevant to different aspects of oil and gas operations for environmental management, nature protection, and biodiversity conservation:

- Convention relative to the Preservation of Fauna and Flora in their Natural State 1933;
- International Convention for the Protection of Birds, Paris, 1950;
- International Plant Protection Convention, Rome. 1951;
 - Convention concerning the Protection of the World Cultural and Natural Heritage, Paris, 1972: This convention has been ratified by 175 states. This defines and conserves the world's heritage by drawing up a list of natural and cultural sites whose outstanding values should be preserved for all humanity. Of the 730 total sites, there are currently 144 natural, 23 mixed and 563 cultural sites that have been inscribed on the World Heritage List (distributed in 125 State parties). These are the 'Jewels in the Crown' of conservation;
 - Convention on International Trade in Endangered Species of Wild Fauna and Flora, Washington, 1973 (Popularly known as CITES): This provides a framework for addressing over harvesting and exploitation patterns which threaten plant and animal species. Under CITES, governments agree to prohibit or regulate trade in species which are threatened by unsustainable use patterns; and
 - Convention on the Conservation of Migratory Species of Wild Animals, Bonn. 1979 (Amended 1988): This provides a framework for agreements between countries
 - important to the migration of species that are threatened.

2.5.7 National Oil Spill Contingency Plan (NOSCOP), (Upcoming)

National National Oil Spill Contingency Plan (Draft) has been placed to the Honorable Prime Minister for Approval. This Draft policy is attached in Annexure-12. After finalization of the act the proponent should follow the regulations in operation stage.

CHAPTER-3: PROJECT DATA SHEET

3.1 Introduction

This chapter has provided a full description of the project incorporating the actual location; general layout, nature and size of the project, project components, project activities, requirement of resources and demand, start up of operation; schedule of staffing, support facilities and services under respective designated sub-headings.

3.2 Project proponent

Summit LNG Terminal Co. (Pvt) will be responsible for financing, designing, constructing, insuring, owning, operating and maintaining the Project and the delivery of five hundred thousand MMBtu/d of RLNG to GTCL's pipeline intake on behalf of 'Petrobangla.

Summit LNG Terminal Co. (Pvt) will supply the Re-gasified LNG (RLNG) to Petrobangla in accordance with the terms and conditions of the agreement signed on 20th April to be entered into with Petrobangla.

GTCL could obtain Environmental Clearance in favor of Offshore LNG Floating Storage and Re-gasification Unit (FSRU) moored at STL (Submerged Turret Loading) Project, Maheshkhali, Cox's Bazar district from DOE and the executing agency would complete the mentioned project.

3.3 Project Location and Area

The project site location of Summit FSRU terminal is in the South East of Bangladesh, driving distance approximately 380 km from Dhaka, 90km south of the port city Chittagong. The site is on the Bay of Bengal. The project coordinate has already fixed up at 21°33' 20.46" N; 91°48' 58.22" E. The area is relatively undeveloped consisting mostly of coastal area and island. Adequate water for a closed cooling system is at the site. For the evacuation of re-gasified gas already Maheshkhali-Anowara 30 inch dia x 91km long gas transmission pipeline installed and 42 inch x 79 km Maheshkhali-Anowara parallel gas transmission pipeline is being installed by GTCL.

The 2 Union Council jurisdictions involve Boro-Moheshkhali and Kutubjom under Moheshkhali Upazila of the Cox's Bazar District for the people who live within 5 km of the Tie-in Point and engage themselves in fish and salt cultivation at Kaladia Char. During local site inspection, it revealed that the proposed Tie-in location is about 3 km from village Boro-Dale of Boro-Moheshkhali Hoanok Unions. (Figure-3.1:Location Map)

3.4 Nature and Size of the Project

The proposed Project falls under the "**Red Category**" as per the Environmental Conservation Rules of 1997. The environmental legislation in Bangladesh, particularly, the Environmental Conservation Act, 1995 (Amended in 2002), states that any development project shall require environmental clearance from the Department of Environment (DOE), Ministry of Environment and Forest, The Government of the People's Republic of Bangladesh. In order to mitigate the existing gas supply crisis of Chittagong and nearby areas as per government decision, the project is being implemented pursuant to the recently introduced "Power & Energy Fast Supply Increase (Special Provision) Act-2010" and as such it is in utmost consideration for expeditious

implementation.

As part of its response, private entrepreneur Summit LNG Terminal Co. (Pvt.) Ltd. has initiated to build up a Offshore LNG Floating Storage and Re-gasification Unit (FSRU) moored at STL (Submerged Turret Loading) Project, Maheshkhali. The LNG terminal will include the following components:

- i) Submerged /Directional Turret Loading FSRU
- ii) Floating Storage and Regasification Unit (FSRU) with storage capacity of 138,000m³ to 170,000m³;
- iii) Regasification onboard FSRU for send out of RLNG with 600 MMSCFD as peak capacity;
- iv) High pressure 24" inches (24") subsea re-gasified LNG (RLNG) pipeline of 3-8 km;

3.5 Project Concept

Bangladesh is heavily dependent on natural gas and the demand for natural gas is growing rapidly while existing reserves are depleting. The country faces severe gas shortages of around 500-650 MMSCFD that are forecasted to increase. Its recoverable gas reserves of 16.36 trillion cubic feet is set to be exhausted within the next decade if no new gas fields are discovered.

The World Bank estimates that most industrial facilities in Bangladesh are operating at half of their installed capacity due to a lack of reliable power and gas. Reliable long-term availability of natural gas is critical to the development of competitive industry in the country.

This severe gas deficit has especially affected gas-fired power plants. These plants are either running below their rated capacity or have been shut down due to non-availability of gas. To address this gas crisis, Government of Peoples' Republic of Bangladesh i.e. Government of Bangladesh (GoB) is initiating projects related to import of LNG. GOB is proposing to change the lease agreement model from Build, Own and Operate (BOO) for 22 years (as proposed earlier based on FSU) to Build, Own, Operate and Transfer (BOOT) for 15 years (as revised now). Thus the Lease Agreement would result in transfer of the Project with FSRU to GOB after 15 years.

3.6 Project Components

The Project includes installation of Offshore LNG Floating Storage and Re-gasification Unit (FSRU) moored at STL (Submerged Turret Loading) Project, Maheshkhali, Cox's Bazar district approximately 3-8 km offshore from Maheshkhali Island (co-ordinates 21°33' 20.46" N; 91°48' 58.22" E.) in a water depth of approximately 30-40 meters on the Bay of Bengal.

3.7 Project Activities and schedule

As per monthly progress report (October-November-2017) submitted by SUMMIT LNG Terminal Co. Ltd. To RPGCL current activities and scheduled of the project is given below:

Major Project Milestones

Description	Start Date	End Date	Remarks
Execution of TUA and IA Executed		20 th Apr' 17	
Geo-Physical Study	20 th May'17	Oct'17	Recent monsoon season has deferred the study. After expiration of monsoon period, study was completed. Awaiting to receipt the report.
Geo-Technical Study	15 Sep' 17	End of Nov' 17	Due to Monsoon thereafter cyclonic weather delayed the mobilization of vessel spread for performing this study. Even in month of November total approximately 10 hrs were lost for weather. Site investigation has been completed on 21 st Nov-2017
Expected Financial Close	21 st Apr' 17	Jan'18	
Expected date Execution of TCP	1 st Sep'16	31 st July '17	Signed
EPC of Fixed Infrastructure	1 st Mar'17	30 th Sep' 17	Signed Signing is expected to be consummated by Oct'17 as EPC brought number of issues related to import of Temporary Equipment.
Approved ECC from DoE	5 th Oct'17	04 th Jan18	GTCL engaged BETS to conduct EIA study for proposed project.
Site Work Begins	Dec'17		Depending upon weather
Expected CSD		Dec-Jan 2018-19	-do-

3.8 Required Resources and Utilities

Manpower: During peak construction phase, the project would deploy sufficient persons, mostly unskilled workers (60%). Construction of project is expected to be completed in 12 months (working three shifts a day) from date of obtaining of all project related approvals. Construction manpower will be temporarily employed from within the local regions to extend possible. The operation of the LNG terminal post construction will require full time skilled employees on board the FSRU for round the clock operations.

Water: During construction and operation phase, project will require domestic water for normal construction activities including water for drinking use after desired treatment for the labour to be engaged on site (to be sourced through barges from the Chittagong Port).

Power: For FSRU operations adequate power will be generated using RLNG on board FSRU.

3.9 Sources of Primary Fuels

Petrobangla has signed a contract with Raslaffan Liquefied Natural Gas Co. of Qatar to import LNG for SLNG and MLNG (operated by EEBL). Even though Petrobangla can procure LNG from open market with required specifications and negotiated price.



Figure-3.1 Location Map

CHAPTER-4: DESCRIPTION OF THE PROJECT

4.1 Introduction

This chapter has provided a full description of the project incorporating the actual location; general layout, activity flow diagram, start up of operation; schedule of staffing and support facilities and services under respective designated sub-headings.

It may be highlighted here that the purpose and need of the proposed Project is to establish an LNG marine terminal capable of receiving imported LNG from LNG carriers, and storing and re-gasifying the LNG at an average send out rate of 500 mmscf/d (Open Loop) with capacity to deliver 600 mmscf/d (Open Loop) on uninterruptible basis per day at full development. The terminal would provide a new source of reliable, long-term, and competitively priced natural gas to the Chittagong City and adjoining markets by connecting to the existing natural gas pipeline system of the National Gas Transmission Grid of GTCL.

4.1.1 Background Information

Industrialization is rapidly growing in the entire Chittagong region and gas consumption rate is increasing day by day. The Government of the People's Republic of Bangladesh (GOB) has adopted a strategy for the development of the gas sector which envisages private participation in this sector. As part of that strategy, the GOB decided that a new LNG terminal will be installed and operated by the private sector. As part of its response, private entrepreneur Summit LNG Terminal Co. (Pvt.) Ltd. has initiated to build up a Offshore LNG Floating Storage and Re-gasification Unit (FSRU) moored at Submerged Turret Loading (STL) Project, Maheshkhali, Cox's Bazar district and co-ordinate 21°33' 20.46" N; 91°48' 58.22" E has already fixed up. It can be added that in the mean time Summit LNG Terminal Co. (Pvt.) Ltd. has already signed Implementation Agreement (IA) with the Ministry of Power, Energy and Mineral Resources of GoB on 20th April, 2017 and Terminal Use Agreement (TUA) on same date with Petrobangla. Petrobangla has signed a contract with Raslaffan Liquefied Natural Gas Co.-03 of Qatar to import LNG for SLNG and MLNG (operated by EEBL). SLNG will receive maximum 183,000m³ LNG in every shipment.

The use of natural gas for electrical generation, rather than coal or oil, is directed toward meeting regional air quality objectives. The proposed Project would reduce the area's future need for new or expanded natural gas pipeline system by providing a local supply of natural gas that uses existing distribution facilities.

4.1.2 Project Overview

Summit LNG Terminal Co. (Pvt) will be responsible for financing, designing, constructing, insuring, owning, operating and maintaining the Project and the delivery of five hundred thousand MMBtu/d of RLNG to GTCL's pipeline intake on behalf of 'Petrobangla.

Summit LNG Terminal Co. (Pvt) will supply the Re-gasified LNG (RLNG) to Petrobangla in accordance with the terms and conditions of the agreement signed on 20th April to be entered into with Petrobangla.

Table-4.1 : Salient Features of the LNG facility with FSRU/FSU Options

Parameter	Specifications
Class	Bureau Veritas, ABS, DNV, Lloyds Register
CargoStorageCapacityonboard FSRU	135,000m ³ -138,000m ³

Parameter	Specifications
NominalRegasificationOutput	500 mmscfd (Open Loop)
PeakRegasificationOutput	600 mmscfd (Open loop)
BoilOffRate	Max.0.15% perday
RegasificationEquipment Sparing	N+1
MajorMaintenancePlan	15years dockingcycle
LNGRegasification System	Openloopfor FSRU
NominalPressureofSend-Out Gas	70-100bar g afterRegasification
Regas send out Quantity and Quality	Ultrasonic meter+ Gas Chromatograph

Source: Schedule 03, Minimum Functional Specifications Part-1, Initial FSRU, TUA agreement/20th April 2017

4.1.2.1 The Fixed Infrastructure

Natural Gas delivery system—Transmission of high pressure Natural Gas from the delivery flange on the FSRU high pressure manifold through the Fixed Infrastructure to the Downstream Facilities. A layout plan of pipeline from FSRU to tie-in-point is shown in Figure-4.1 and 4.2.

The components of the Fixed Infrastructure are anticipated to be the following, but will depend on the final design:

- Buoy;
- 16-inch Riser;
- Buoyancy modules;
- PLEM;
- Umbilical;
- Communication link from the FSRU to the CTMS with the necessary hardware

Mooring

- Chain and/or wire for mooring;
- Suction piles for mooring anchors; and
- Stern mooring.

Delivery Pipeline (Subsea)

- The pipeline will be outfitted with a pig launcher for the purposes of inspection and cleaning.
- Pipeline diameter is subject to final site selection and hydraulic analysis to be performed in detailed design, currently anticipated to be Class 600 with a minimum diameter of at least 24-inch.

Tie-in Point

- Tie-in layout is subject to detailed design. The following is the anticipated list of equipment to be provided:
- Temporary or permanent pig receiver
- Manual isolation valves
- Class 600 24-inch tee with flanged end
- 24-inch ESD valve for connection to main line
- Isolation of CP system
- Provisions of necessary equipment for ensuring uninterrupted operation upto Delivery Point

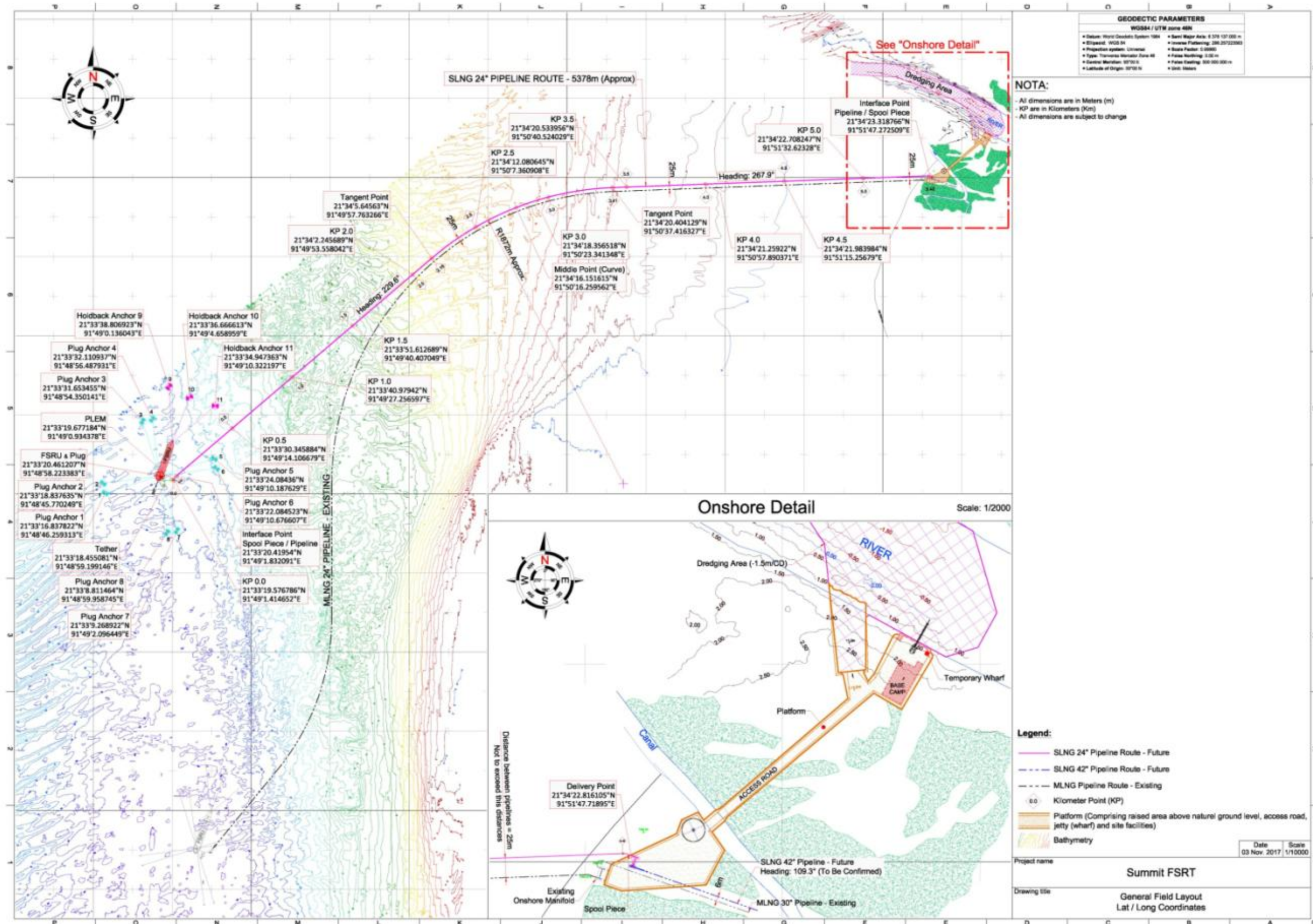


Figure-4.1: Layout plan of pipeline from FSRU to tie-in-point

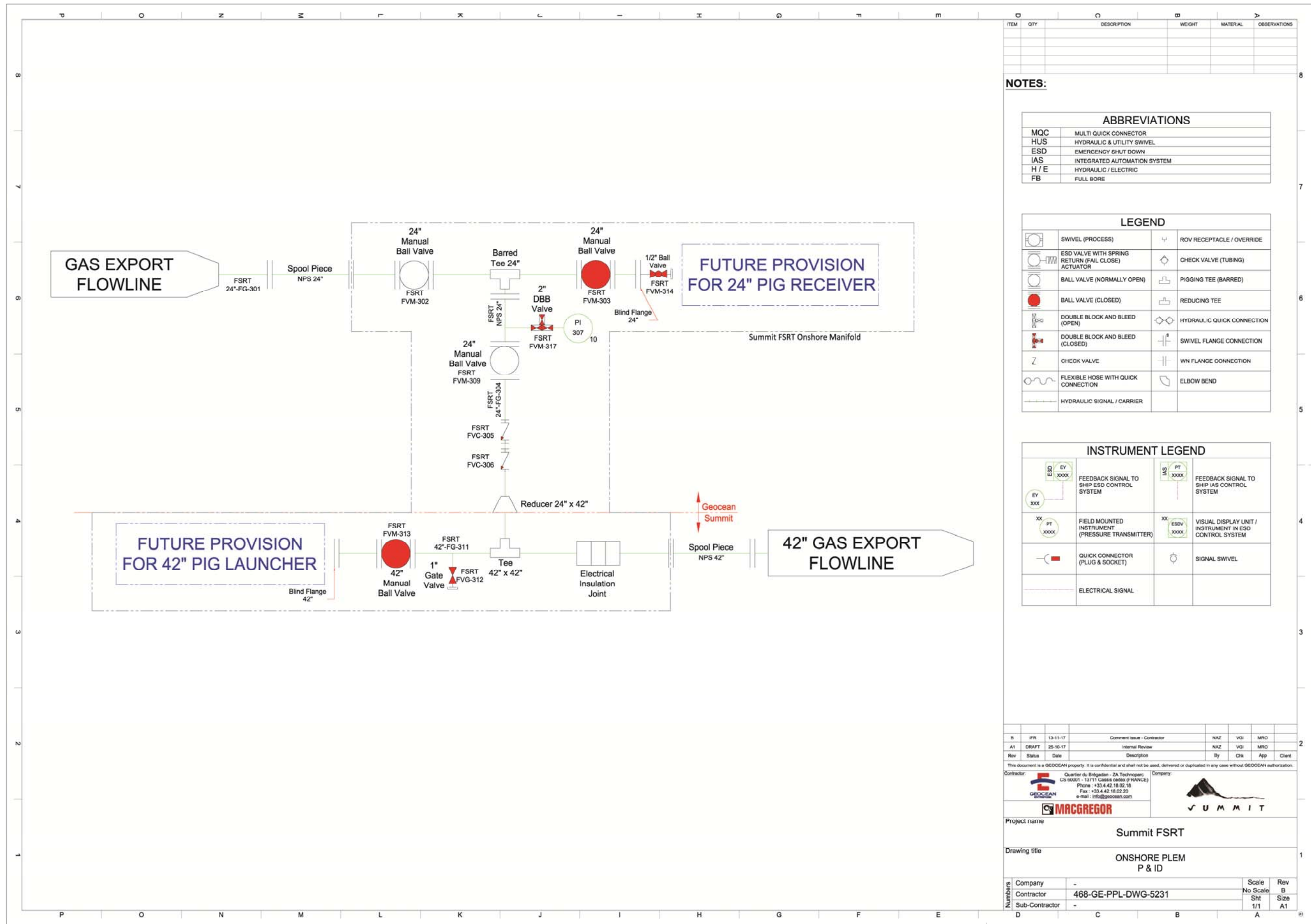


Figure-4.2: Natural Gas delivery system

This schedule shall be updated and finalized by Terminal Co on or prior to the Relevant Date.

4.1.2.2 Supply of RLNG

Currently Petrobangla is planning to import weekly 270,000 m³ LNG from Qatar and to delivery partial amount of it (approx. 183,000 m³) to SLNG over a period of fifteen (15) years. The rest amount delivers to MLNG which operates by EEBL. SLNG will supply 500 mmscfd by open loop to national pipeline through CTMS.

4.1.2.3 Offshore LNG Terminal

Summit LNG Co. Ltd (SLCL) will be required to undertake all activities necessary and appropriate to receive LNG at the Receipt Point and redeliver RLNG to Petrobangla at the Delivery Point. The "Receipt Point" means the point at which the flange coupling of the Offshore LNG Terminal receiving line joins the flange coupling of the LNG unloading manifold on board an LNG vessel. The "Delivery Point" means the Point of interconnection between the outlet of the Offshore LNG Terminal subsea pipeline as shown in Figure-3.1 and a Downstream Pipeline.

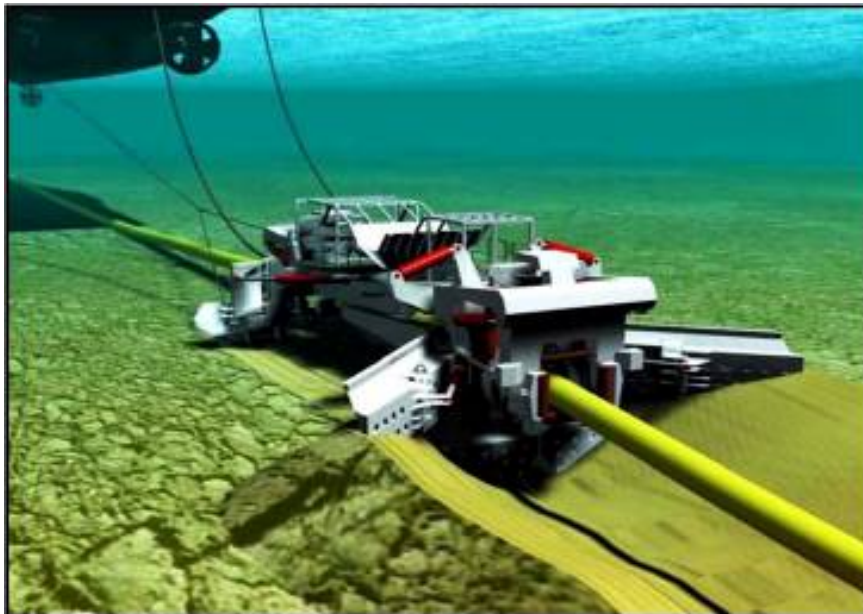


Figure-4.3: Typical Sub Sea Pipeline under construction at the Sea Bed
(Source: Internet)

Petrobangla expects that this will include the receipt, storage and re-gasification of LNG at the Offshore LNG Terminal and the transportation and redelivery of RLNG to Petrobangla via the subsea gas pipeline to be connected to GTCL's gas transmission pipeline intake on the Moheshkhali Island shoreline.

4.1.2.4 Expected Activities of the Project Proponent

- a) SLCL will be required to undertake (at a minimum) the following activities in developing and operating the offshore LNG Terminal:
 - Select and justify the location and concept selected for the Offshore LNG Terminal. Exhibit 2 provides a description of the proposed terminal location offshore from Moheshkhali Island. The Project Proponent would submit a development proposal for a terminal that is either an FSRU located at a sea island or an FSRU located on a turret mooring. Petrobangla will consider other terminal options only on the basis that the Project Proponent provides strong evidence that such option is better than the development options proposed.
 - Obtain all approvals, licenses, NOCs and consents to develop and operate the

Offshore LNG Terminal with assistance from Petrobangla.

- Design, develop, operate and maintain an Offshore LNG Terminal that satisfies the LNG receipt and RLNG delivery requirements described above. Petrobangla expects the Offshore LNG Terminal to have the following capabilities:
- appropriate systems for communications with LNG vessels
- berthing facilities (If required);

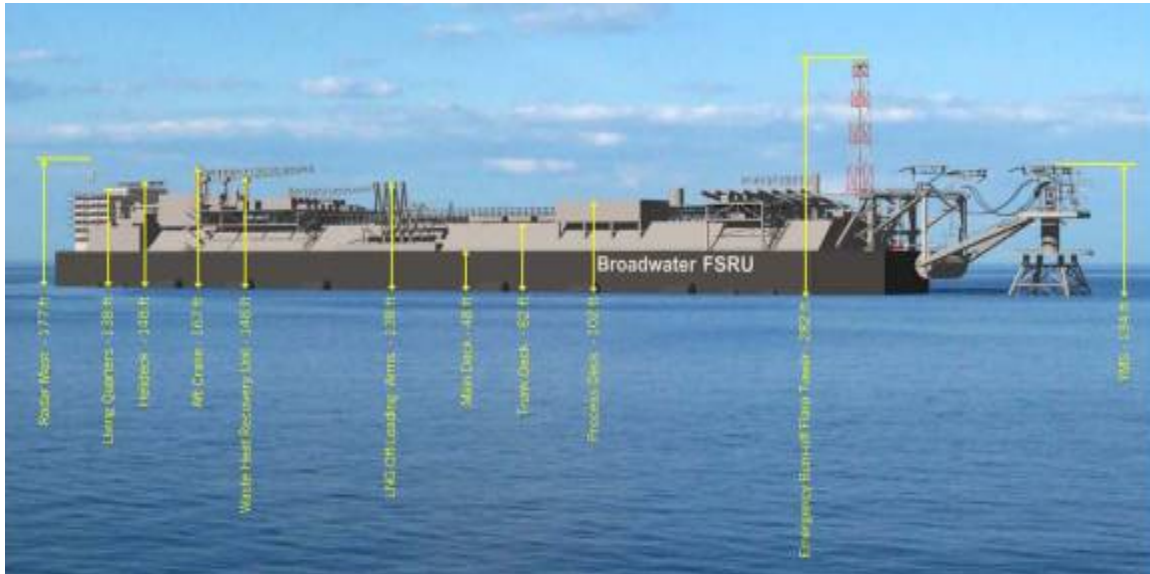


Figure-4.4: A typical FSRU of the Broadwater LNG Project

(Source: Internet)

- b) A turret mooring system for an FSRU with facilities to moor and unload LNG vessels
- Unloading berth facilities capable of berthing an LNG vessel having a designated usual capacity between 125,000m³ and 220,000m³, where such LNG vessels can safely reach fully laden, and safely depart, and where such LNG vessels can lie safely berthed and unload safely afloat
 - lighting that is sufficient to permit unloading operations by day or by night, to the extent permitted by Government Authorities
 - Unloading facilities capable of receiving LNG at a rate of up to an average of 6,000m³ per hour with unloading arms each having a reasonable operating envelope to allow for ship movement
 - A vapor return line system of sufficient capacity to transfer to an LNG vessel quantities of gas necessary for the safe unloading of LNG at required rates, pressures and temperatures
 - Facilities allowing transfer between the Offshore LNG Terminal and the LNG vessel by representatives of Government Authorities for purposes of unloading operations and an independent surveyor for purposes of conducting tests and measurements of LNG on board the LNG vessel
 - A Floating LNG Storage and Re-gasification Unit (FSRU) with a targeted LNG storage capacity of 150,000 m³ or greater. Figure-4.4 a typical Plant shows of such configuration
 - The FSRU shall incorporate LNG re-gasification facilities with a total daily capacity of 500,000 MMBtu at all times and up to 600,000 MMBtu when requested by Petrobangla
 - A sub sea pipeline to deliver gas to the Delivery Point.
 - Activities to be consistent with requirements of the port authority with jurisdiction over the Offshore LNG Terminal and its associated marine facilities. Such Port Authority will be established and controlled by the Shipping Ministry of Bangladesh.

4.2 LNG Specifications

4.2.1 Gross Heating Value

LNG when delivered by Customer shall have, in a gaseous state, a Gross Heating Value of not less than 1000 BTU per standard cubic foot and not more than 1170 BTU per standard cubic foot.

4.2.2 Components

(a) The LNG when delivered by Customer to the Receipt Point, in a gaseous state, shall contain not less than 84 Mol percent of methane and, for the components and substances listed below, such LNG shall not contain more than the following:

Nitrogen (N ₂)	2.0 MOL %
Ethane (C ₂)	8.0 MOL%
Propane (C ₃)	3.0 MOL%
Butanes and heavier (C ₄)	2.0 MOL%
Pentanes (C ₅)	1 MOL%
Hydrogen Sulphide (H ₂ S)	6 mg/cum
Total Sulphur Content	48 mg/cum

Source: Schedule 04, TUA between BETS and Petrobangla, April-2017

(b) The LNG when delivered shall contain no water, mercury, active bacteria or bacterial agents (including sulphate reducing bacteria or acid producing bacteria) and other contaminants or extraneous material.

4.2.3 Temperature

The temperature of the LNG when delivered shall not be warmer than negative one hundred fifty nine degrees Celsius (-159.0° C).

The LNG Specifications as set out in this schedule can be modified by mutual agreement of the Parties from time to time.

Petrobangla will arrange delivery of LNG from one or more LNG suppliers to be delivered to the Offshore LNG Terminal in accordance with delivery programs and schedules included in the agreement. The Project Sponsor will receive LNG as required by Petrobangla. The approximate amount of LNG delivered on a DES basis will be 3.5 MMt /year. The Figure-3.3 Shows a typical LNG carrier on the sea.



Figure-4.5: A typical LNG carrier in the sea

(Source: Internet)

4.4.4 Determination of Volume of LNG Unloaded from LNG Carrier to FSRU

The list (heel) and trim of the LNGC shall be measured and recorded at the same time as the liquid level and temperature of LNG in each LNO tank are measured. The Status of the LNGC's cargo transfer piping, so far as practicable, shall be the same status at both the initial gauging and the final gauging.

Determination setting forth the volume of LNG in cubic meters to the nearest 0.001 cubic meter shall be made in accordance with reference to the tank gauge Table-s referenced above and by applying the volume corrections Set forth therein.

Such determination may be calculated by using an automated cargo tank gauging system.

4.5 Natural Gas Specifications

Components

The Natural Gas when delivered by Terminal Co to the Delivery Point shall contain not less than 86 Mol percent of methane and, for the components and substances listed below, such Natural Gas shall not contain more than the following:

Nitrogen (N ₂)	1.0 MOL %
Oxygen (O ₂)	0.0 MOL%
Carbon Dioxide (CO ₂)	0.0 MOL%
Pentanes (C ₅) and heavier	1 MOL%
Hydrogen Sulphide (H ₂ S)	5 mg/cum
Total Sulphur Content	10 mg/cum

Source: Schedule 05, TUA between BETS and Petrobanngla, April-2017

The Natural Gas when delivered shall contain no water, mercury, active bacteria or bacterial agents (including sulphate reducing bacteria or acid producing bacteria) and other contaminants or extraneous material.

4.6 Land Requirement

GTCL requires (30 m X100 m=3000 m²) area of land for Tie point platform, Summit donotrequire land, as tie point is at land fall point.A GIS analysis was taken for finding land use pattern of the project area. For this purpose, the land use map of Bangladesh was over laid to the project area (5 km radius). After analysis, it has been found that project area most prominent land use features barren land, forest and transplanted aman rotation. The land use map of project area is shown in Figure-4.6. But, most of the area of project location for land use is barren land and forest.



Figure-4.6: Land Use pattern of Project Location

(Source: National Water Resource Database)

4.7 Proposed Offshore FSRU Operation

It appeared that a Site Assessment Report was prepared based on available data collected in the vicinity of the proposed terminal. The information in the Site Assessment Report was sourced from:

- Bangladesh Meteorological Department.
- Space Research and Remote Sensing Organization (SPARRSO).
- Bangladesh Geological Survey.
- Bangladesh Ministry of Shipping Deep Sea Port Cell
- Bangladesh Navy.

The Ministry of Shipping provided a significant amount of site information based on a feasibility study conducted on a proposed deepwater port at Sonadia Island. The Sonadia Port location considered was 2 to 3 km south of the proposed Offshore LNG Terminal location shown in Figure-4.8. Much of the meteorological data was collected at Cox's Bazar which is located approximately 20 km south east of the proposed Offshore LNG Terminal location. Overall, the available site data was reasonable and adequate to make preliminary assessments on the site. Sonadia location is shown in the Map placed at Figure-4.7 of this section.

The preliminary conclusions are that the terminal is at an open sea location but is operationally feasible. The location is suitable from the perspective of water depth, marine approaches and constructability. Weather downtime will need to be carefully assessed in this unprotected offshore environment. In adverse weather and cyclones there may be times where LNG supply vessels may be unable to berth or may be required to sail away from the terminal.

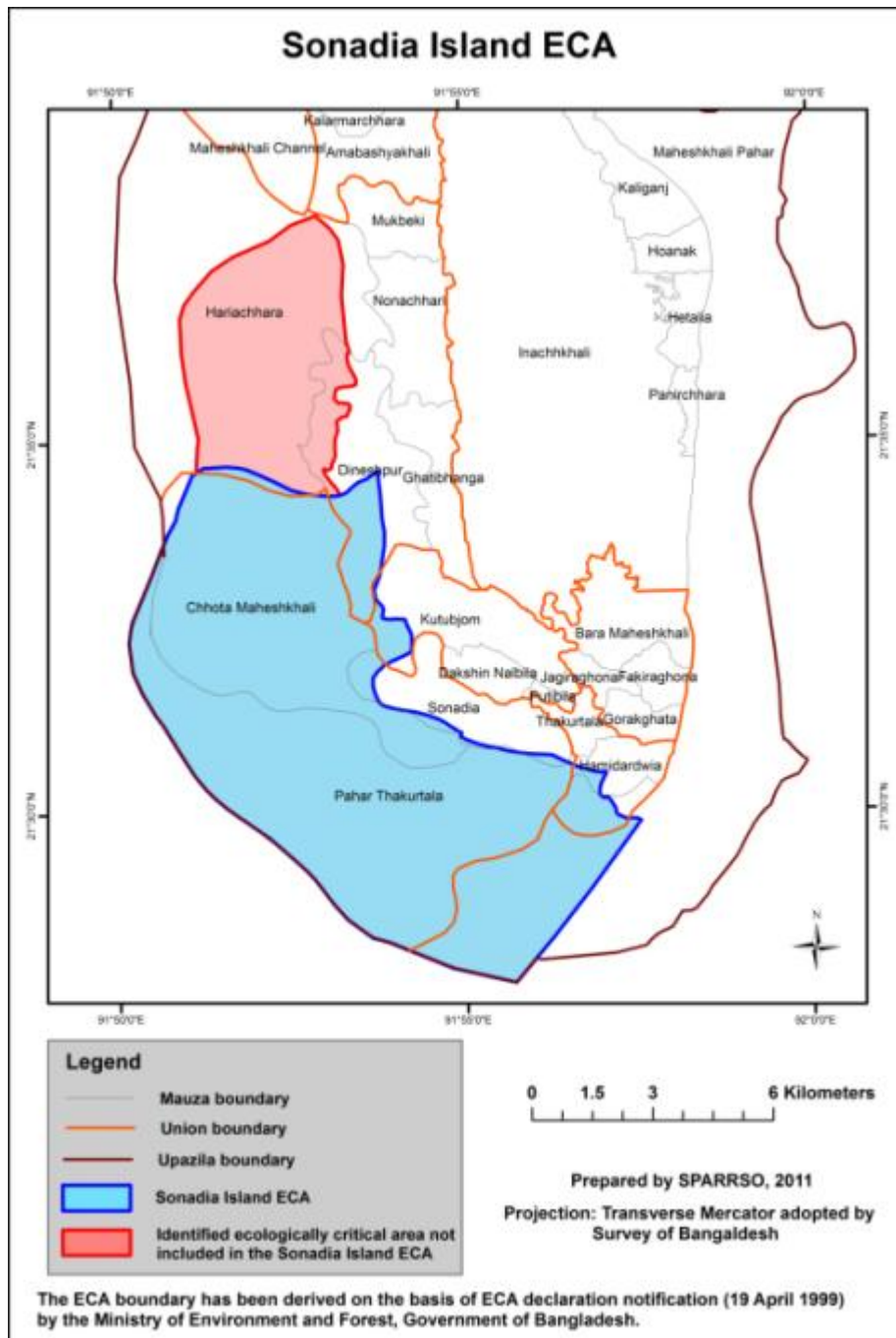


Figure-4.7: Sonadia location is shown in the Map
(Source, DoE, ECA Area MaP, CBECAECAB Project)

In less adverse weather LNG supply ships may be required to stop transferring LNG to the FSRU temporarily. Specific consideration of these issues will be required in design to manage weather downtime.

There are potential problems at the site during the south west Monsoon and cyclones. Potentially, an FSRU moored at a sea island may have to sail away in cyclones shutting down production for a number of days.

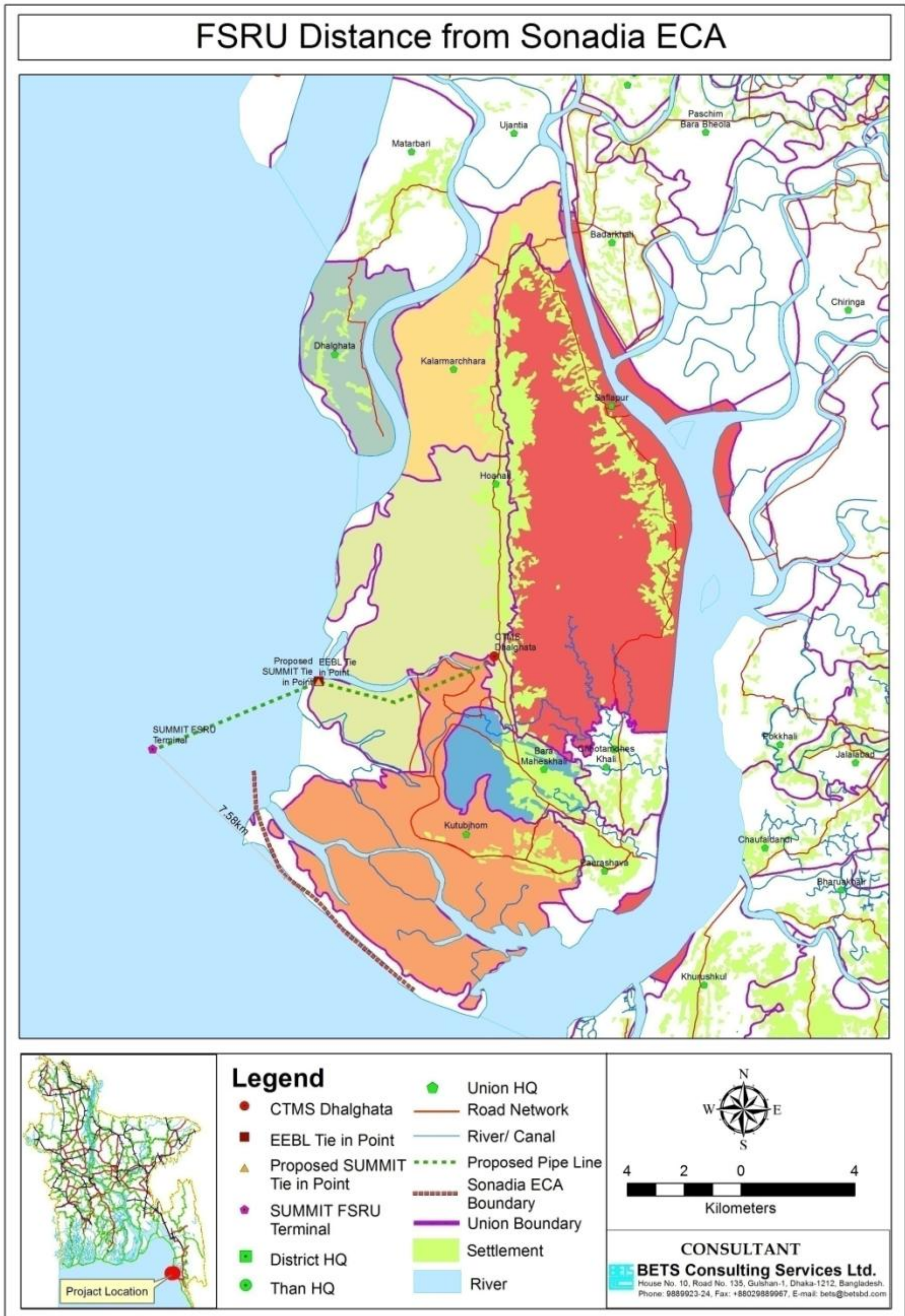


Figure-4.8: Proposed Offshore LNG Terminal location from Sonadia Island

The Turret Moored option, because of its ability to better align with the weather, appears to have the potential to remain on station during cyclones. However, the Turret Moored option may have a disadvantage during side-by-side unloading operations in adverse weather conditions.

The potential for weather delays suggests that the FSRU, whether at a sea island or a turret, should be of a size larger than currently in use -say 170,000 m³ LNG capacity. This is the reason for stating in the Basis of Design that the FSRU should target a total gross LNG storage capacity of approximately 150,000m³.

The Site Assessment Report and the preliminary conclusions have been intended for the guidance of Project Proponents only. It has been expected that the Project Proponents shall be obligated to fully inform themselves of all local conditions and factors which may have an effect on its ability to execute the Project. The Project Proponent shall have the sole responsibility to determine and to satisfy itself, at its own cost and arrangement, by such means as it considers necessary or desirable as to all the matters pertaining to the execution of the Project including but not limited to, the nature and condition of the sea, weather, terrain, geological conditions and all other factors that may affect the cost, duration and execution of the Project.

4.8 Proposed Offshore FSRU Operation

4.8.1 FSRU is permanent

Terminal operations are conducted entirely offshore, requiring no buildings at the pipeline landing site. FSRU with permanent at fixed location on sea bed with directional Turret mooring with help of 4 pairs cluster anchor and 3 stern mooring anchor. In the case of turret-moored FSRU, the FSRU is permanently secured to a single-point mooring-type (SPM) turret anchored to the seabed. The fixed turret allows the FSRU to withstand prevailing currents, winds and sea conditions. LNG supply vessels will be periodically moored directly alongside the FSRU to allow ship-to-ship LNG unloading to the FSRU storage tanks

4.8.2 FSRU is moored at STL (Submerged Turret Loading)

This is not STL but directional Turret Mooring. The terminal will be a turret-moored type FSRU, the Vessel will LNG supply vessels periodically berthed on the opposite side for LNG unloading.

4.8.3 Power Generation System in FSRU

The FSRU will be provided with a main power generation system designed for power supply. The actual power requirement onboard FSRU is expected to be ~10 MW. Because of the necessity to handle the boil off gas (BOG) that naturally boils from cargo tanks, almost all FSRU are designed to use the vaporized LNG as fuel for power production and propulsion. The boil off gas is collected in the vapour header and compressed by the low duty (LD) compressors into the fuel gas main that feed the power plant and/or boilers. If the natural boil off is not sufficient, forced vaporizers will be used for vaporizing part of the cargo and feed the fuel gas main. The main power requirements onboard FSRU will be for:

- Regasification unit;
- Low duty and high duty compressors;
- Ballast pumps;
- Cargo pumps; and
- Accommodation load.

4.8.4 LNG Ship to Ship (STS) transfer across the jetty

There is no jetty. FSRU will be moored and LNGC will berth alongside FSRU to carry out STS and leave from FSRU. This supplement for liquefied natural gas (LNG) ship to ship (STS) transfers shall be used in conjunction with the respective Cargo Operations Manual of the

vessel involved in the STS operation. In order to comply with internationally accepted guidelines relating to liquefied gas transfers, the following publications, as amended, shall be used as reference guides where applicable:

- OCIMF Ship to Ship Transfer Guide, Second Edition, 1995
- SIGTIO Liquefied Gas Handling Principles on Ships and in Terminals, Third Edition, 2000
- Hazard Operability Study I, "Ship to Ship Cargo Transfer Hazard Operability Study", Revision 3, May 2005 by Lloyds Register
- Bureau Veritas Operational Manual for Partial Filling Operation in Gulf of Mexico Site, March 13, 2005
- GTT document No. 2961 "Calculation of maximum loading flow rate considering two by two cargo tanks configuration
- STS Transfer Hazard Operability Study II, November 2006 by Lloyds Register
- SIGTIO LNG Ship to Ship Transfer Guidelines, First Edition, 2011

This list is not meant to be all-inclusive as there are a number of other suitable-reference publications available to supplement this list which could be given consideration during the planning stages of the STS transfer operation.

In situations where the content of this supplemental guideline differs with other authoritative texts, guidelines and regulations, it shall remain incumbent upon the Masters of the vessels involved to reach agreement regarding "the manner in which to proceed always taking into account best industry practices, safety of life the environment, and protecting their respective vessels.

4.8.5 LNG is vaporized aboard the FSRU using either seawater or steam from the ships boiler as the heat source

Sea water will be used and then to reach contractual temp of 5 C, heating by boiler source will be used. All LNG re-gasification takes place on the FSRU vessel, using sea water to heat and vaporize the send out LNG. The Figure-4.9 shows the functional block diagram of a typical re-gasification plant.

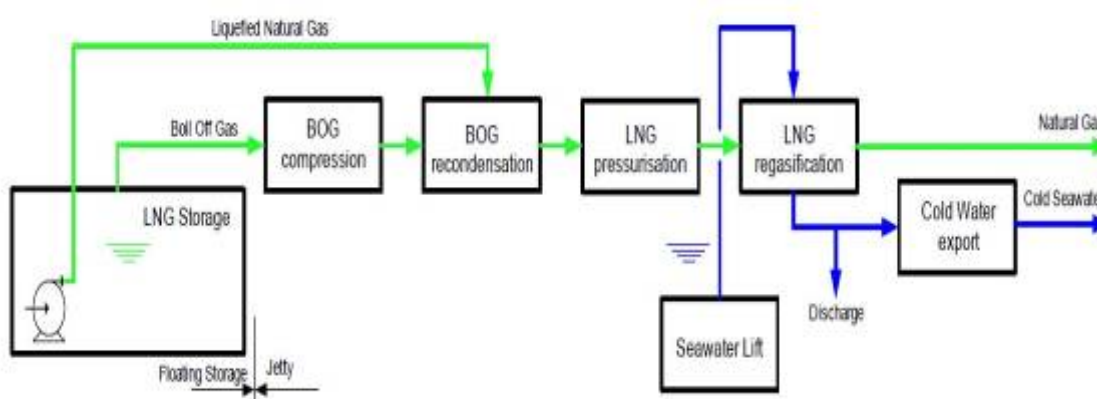


Figure-4.9: Functional Block diagram of a typical Re-gasification process,
(Source: ESIA Report of RLNG of Reliance Power Bangladesh)

4.8.6 Vaporized LNG from the FSRU is transferred to shore through high pressure (HP) gas arms and a gas pipeline

Not via arms. There is riser which passes through Turret will connect to PLEM and via sub sea pipe line to tie point at land fall point.

High Pressure Subsea Pipeline

The high pressure subsea pipeline of length ~3-8.0 km and will be designed for LNG at delivery pressure of ~95 bars (g) [range 70 to 100 bar(g)]. It will be designed for operability of the plant design life (at least 25 years). The salient features of the proposed subsea pipeline areas covered in Table-4.2.

Table-4.2: Salient Features of the High Pressure Subsea Pipeline

Parameter	Units	Value
Length	Km	~2.0
Diameter	Inch	30
Design pressure	bars(g)	150 bar(g)
Design temperature	°C	5

In the case of a sea island terminal, hard gas arm connections to the jetty piping, an underwater pipeline to shore, and finally a buried pipeline to the onshore connection point for the Petrobangla transmission pipeline.

4.8.7 Determination of QUANTITY AND QUALITY of LNG

Each LNGC shall supply, operate and maintain, or cause to be supplied, operated and maintained, suitable gauging devices for the LNG tanks of the LNGC, as well as pressure and temperature measuring devices and all other Measurement or testing devices that are incorporated in the structure of such LNGC or customarily maintained on board a vessel of this type.

The FSRU is also fitted with similar, state of the art, devices highly compliant with industry standards.

The FSRU shall be fitted with provisions to take and/or analyze representative LNG samples.

The Vapor return gas shall be measured on the FSRU's vapor crossover meter, which is of non-fiscal grade standard. In the event of the failure of such FSRU vapor crossover meter, the vapor return gas may be a calculated value based upon conditions within the containment of time LNG Carrier. Any such calculations are done by an independent expert.

The Fuel Gas shall be metered at the Fuel Gas Meter aboard the LNGC, which is customary of fiscal grade standard. Copies of gauging and measurement records shall be furnished to all Parties, and in the absence of manifest error, shall be conclusive. Gauging devices shall be selected, and measurements shall be effected, in accordance with the procedures.

The quantity of LNG in BTUs delivered shall be calculated by the independent surveyor basis the load port composition. All measurements, gauging and analyses provided shall be witnessed and verified by an independent surveyor. All records of measurements and the computation results shall be preserved by the Party responsible for effecting such measurements and held available to the other relevant Party.

4.8.8 Three kilometer offshore gas pipeline to transfer natural gas from FSRU to GTCL transmission pipeline

In the case of a turret-moored terminal, a gas line connection to the turret, a flexible riser connected to pipeline end manifold on the seabed (PLEM), and finally a buried pipeline to the onshore connection point for the Petrobangla transmission pipeline. The terminal will be located 3 to 10 km west from the shore of southern Moheshkhali Island.

4.9 Routine Operational Discharge

The Basis of Design of the project has been firmed up by Petrobangla and has been provided as placed in the foregoing subsections to demonstrate its expectations with regard to the design of the Offshore LNG Terminal. However, the Basis for Design in the request for proposal (RFP) is intended for the guidance of Project Proponents only. SLCL shall have the sole responsibility to determine and to satisfy itself by such means as it considers necessary or desirable as to the design of the Offshore LNG operation. In this context, certain operational aspects are examined below so far as potential environmental impacts are concerned:

4.9.1 Sea water System

After cooling sea water will be discharge to sea. Aseawatersystemwillbe providedto supply therequiredseawaterto the LNG vaporizers for LNGvaporization. Seawatersystemis made up of:

- Seawater intakes;
- Seawater pumps;
- Seawater filters installed upstream seawater pumps provided for protecting pumps;
- Seawater filters provided for protecting LNG vaporizers; and
- Cold seawater and equipment cooling seawater discharges.

The seawater intake will be through seawater filters and will be pumped by the seawater pumps to the LNG Vaporizers. Seawater filters will be provided on discharge header to protect LNG vaporizers. Seawater will then be routed overboard through gooseneck and, then, to the seawater discharge line.

4.9.2 Drainage Discharges

The system is closed loop and no drainage is expected. The liquid will evaporate into gas when exposed to atmospheric temp.

4.9.3 Waste Generation & Their Management

Wastes will not be usually generated as clean liquid from gas, if any,will evaporate if leakage occurs. The FSRU will have a sewage treatment system to treat and discharge offshore and meet the MARPOL standards. Similarly, treatment facilities for bilge water and for safe discharge of sea water used for Re-gasification will be provided on the FSRU. The sewage will involve generation of grey water and black water. Either a septic tank-soak pit system or, a potable-sewage treatment will be installed for treatment of sewage generated.

Various kinds of solid wastes that will be generated at the FSRU will be either safely incinerated or safely brought onshore and disposed in onshore waste facilities available with the Chitagong Port / Cox's Bazar Town. Food wastes generated on board the FSRU where all plastic materials have been removed will be comminute or ground to a particle size capable of passing through a screen with openings of 25 mm and then discharged into the sea.

Some hazardous wastesare also expected tobe generated atboththe FSRU facility.These include:

- Oil sludge (from maintenance operation);
- Paints, varnishes and thinners;
- Rags and filter materials;
- Packages containing hazardous wastes (i.e. drums for oil and diesel);
- Solvents; and
- Pigging wastes.

Allthesewastes willbe temporarily stored on theFSRU, where proper dedicated areas willbe identified.Wasteswill befurther sent to anon-shore dedicated areafor recycling and/orfinal disposal.

The FSRU related waste will be handled by a MARPOL compliant Ship-Board incinerator capable of handling burning of allowed waste (sludge oil and solid) generated on-board. Un-allowed items as per MARPOL will be collected in separate bins and brought onshore. It is anticipated that a certain portion of the wastes will still remain after burning of the allowed waste in the incinerator. All wastes will be either incinerated on-board FSRU or disposed to an approved onshore disposal facility. Some of the other industrial process wastes likely to be generated from FSRU will include:

- Oil filters; and
- Waste non-contaminated by hydrocarbons.

Approximately 0.15% of boiler gases (BOG) (generated onboard the FSRU) will be compressed and transferred back to LNGC/FSRU. Typical operational of the LNG terminal Project is presented through Figure-4.10.

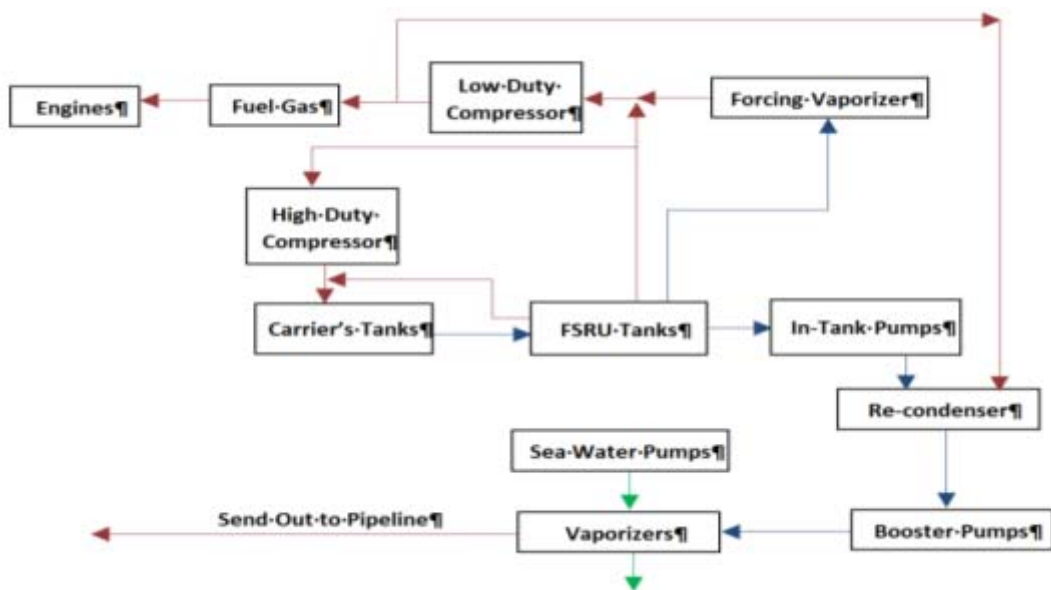


Figure-4.10: Typical Process Flow Diagram - Regasification Unit on board FSRU
 Source: Reliance Power Bangladesh Ltd.

4.10 Access to the Project Area

Access to FSRU will be by TUG, Fast Crew boat and Offshore Service vessel. The gas tie point on land fall is on 4 M height platform with access fenced and locked out.

4.11 Analysis of Suitability

Assessments of alternatives at the time of project design help in finalizing the best option that is techno-commercially viable having minimum impact on the local environmental and social conditions.

Best option chosen from CTMS to directly to Tie point following shortest route. FSRU location is based on 30 m water depth nearest available. Figure-4.11 Location of pilot boarding station (red cross), and anchorage area (purple square), MLNG site (green circle), and SLNG (yellow circle) on BA Chart 90.

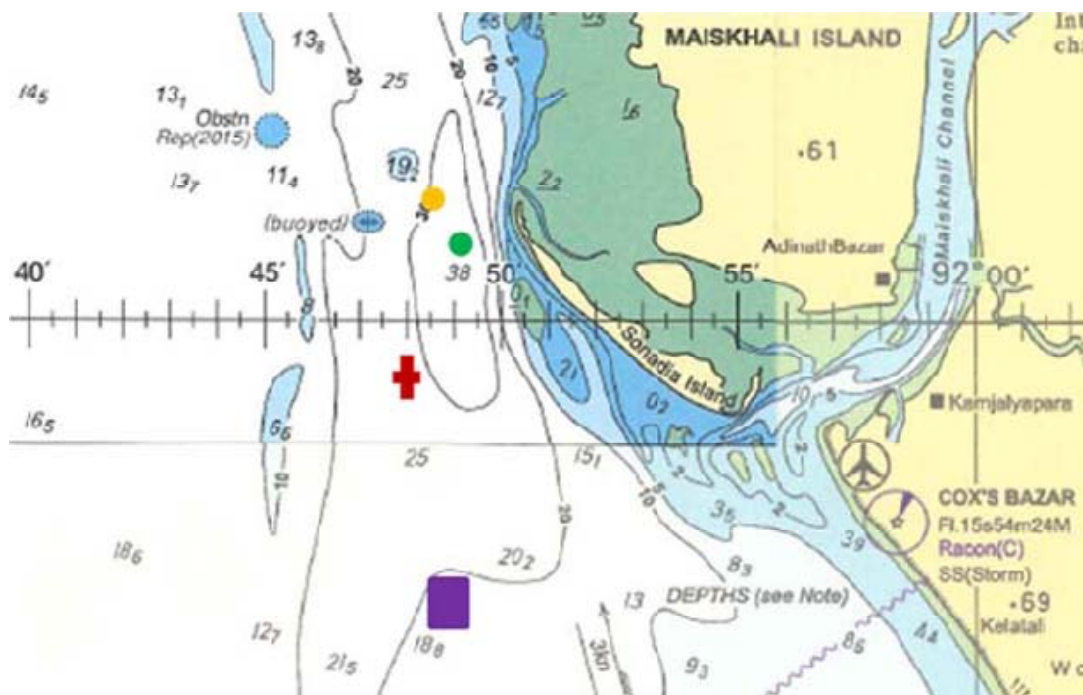


Figure-4.11 Location of pilot boarding station (Red Cross), and anchorage area (purple square), MLNG site (green circle), and SLNG (yellow circle) on BA Chart 90
 (Source: SUMMIT LNG Navigation Study by MITAGS, September 7-8, 2017)

4.13 Project Cost

SUMMIT LNG Co. (Pvt.) Ltd. provided the list of total budget of the FSRU project.

Item	Cost
Project Overhead	3,000 USD'000
Construction Insurance	3,000 USD'000
CSR	500 USD'000
Start Up Cost-FSRU Charter Vessel, Port Services and other	2,093 USD'000
All technical studies, advisors fees permitting etc	5,000 USD'000
Development Fees	10,000 USD'000
EPC Sub Sea Pipelines/Riser/ESD/Gas Meters/Tie-in Procurement and Installation and STL/Mooring	92,000 USD'000
Contingency	13,800 USD'000
Interest during construction	3,257 USD'000
Other capitalized expenses	2,492 USD'000
Total Project Cost	135,141 USD'000

CHAPTER-5: ENVIRONMENTAL DESCRIPTION

5.1 Introduction

This section describes the existing environmental and social baseline of the study area around the FSRU location and along the pipeline corridor. This includes relevant components of physical, biological and socio-economic environment. The purposes of describing the environmental settings of the study area are:

- To understand the project needs and environmental characteristics of the area; and
- To assess the quality of the existing environment, as well as the environmental impacts of the future developments being studied.

The proposed site is known as Kaladiar Char where gas pipeline Tie-in Point will be situated. It is around 07 meter east side from existing EEBL Tie-in-point. This is an area located at a distance of 3-8 km from the proposed floating terminal in the Bay of Bengal. The access to the site in speed boat from the main land at Cox's bazaar and is roughly at a distance of 8km. By local transport it is approx 15 km and on foot it is some 3km in distance from Moheshkhali. The study area was in a radius of 5 km, centering Kalirdiar Char in the middle and extended offshore up to 8 km down to the sea. On the way from Moheshkhali there is a natural canal named Barer Khal in Moheshkhali. If one wishes to have access from Boradale Union Parishad it would take a travel distance of 3km.

5.2 Project Boundary

The project affected probable site is known as Kaladiar Char. It's of size 2kmx1km and is on the west of Boro Moheshkhali Union Parishad. The villages surrounding Kaladiar Char are Baro Moheshkhali, Natun bazaar, Borodale, Debaangapara, Shukuripara, Fakirakata, Panirchara and Ghatibhanga under Baro Moheshkhali and Kutubjom Union Parishad (UP) within a radius of 5 km. During visiting the site location during October-November 2017, no human settlement was found to be in existence there.

5.3 Oceanographic Conditions

5.3.1 Bathymetry

Moheshkhali Island is located in the south-eastern part of Bangladesh and separated from the main land by the Moheshkhali Channel.

Bathymetry of the West Coast Region

The bathymetry map indicates a steep seafloor with 10 m contour reaching within 1 km from the Moheshkhali Island on the west. An area with more than 30 m water depth can be found at 7 km from shore (current project location). Access to this area by LNGCs would be possible without dredging.

SUMMIT engaged MITAGS to conduct Navigational Survey. MITAGS programmed and validated a hydro-dynamically accurate geographic area database that included detailed visual scenes, RADAR, and ECDIS images. The local chart and bathymetric data were assembled to form the base layer of the database. The MITAGS Simulation Engineering Department used proprietary Transas® database modeling software to import the electronic chart display information system (ECDIS) data. This software automatically transferred the information from ECDIS into the simulator database and linked the visual and radar databases. The ECDIS data transferred i

ncluded:

- Hydrographic: depth points, depth lines, depth contours, drying areas, three dimensional (3D) channel bottoms. This included the Fugros bathymetric survey provided by Excelerate and the new survey conducted by Summit LNG in 2017.
- Landmass: 3D terrain, DEM data, coastlines, islands, pier structures, etc.
- Navigation Aids: buoys, ranges, and lighthouses.
- Navigation Signals: color, light timing, light sector, etc.

Figure-

5.1 shows the inputted data from the bathymetric surveys provided by Excelerate and Summit LNG. The depth soundings had a resolution of 25 m and 10 m from the Excelerate provided survey and Summit LNG provided survey respectively. The Figure- shows the 13 m (blue line) and the 15 m (red line) contours. These contours are the restricting depth contours in the area since the 216,000 m³ membrane LNG carrier had a loaded draft of 12.2 m.



Figure-

5.1: Display of database incorporating recent bathymetric survey
(Shown by high density of blue points)

(Source: SUMMIT LNG Navigation Study by MITAGS, September 7-8, 2017)

5.3.2 Wind

As per MITAGS report winds are governed by the monsoon season and the local influences of the land mass. Figure-5.2 and Table-5.1 show a wind rose and joint histogram for January 2017. This characterizes the NE monsoon. During the NE monsoon, the wind speed exceeds 8 m/s (15.6 kt) less than 1% of the time. The wind is from the N-NW (330°) and from the N (360°) 24.3% and 30.1% of the time respectively. Even though the wind is from the N slightly more often, the primary wind direction in the simulations will be assumed to be from the -NW. This orientation caused a more beam-on wind which represented a more critical scenario.

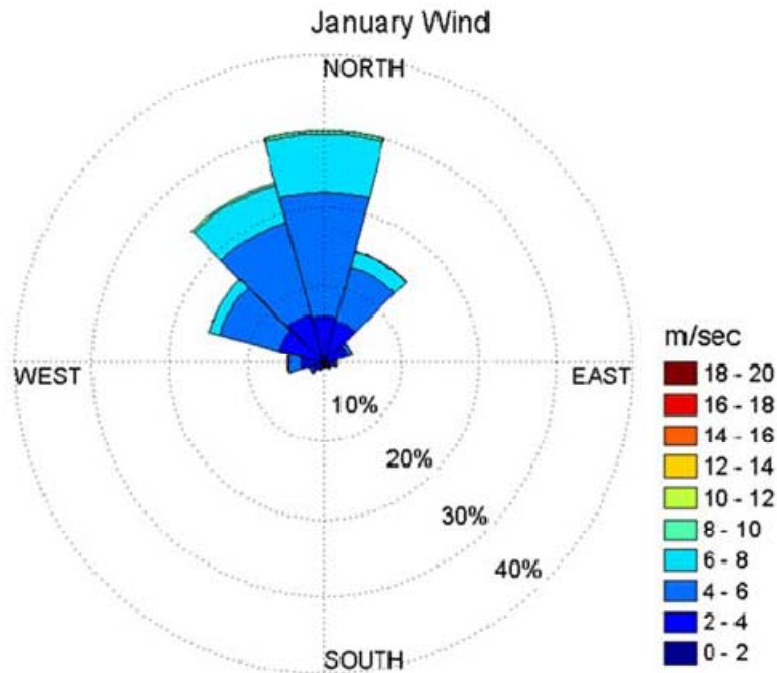


Figure-5.2: January (NE monsoon) wind rose
(Source: SUMMIT LNG Navigation Study by MITAGS, September 7-8, 2017)

Table-5.1: January (NE monsoon) wind speed and direction scatter diagram

Wind Direction	Wind Speed (m/sec)												Sum	
	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24		
30.0	0.5546	5.1034	7.3049	2.0503	0.1008	0	0	0	0	0	0	0	0	15.1140
60.0	0.4874	2.5881	0.605	0.0224	0	0	0	0	0	0	0	0	0	3.7029
90.0	0.3081	1.1092	0.2969	0.0112	0	0	0	0	0	0	0	0	0	1.7254
120.0	0.2577	0.521	0.1737	0.0168	0	0	0	0	0	0	0	0	0	0.9692
150.0	0.2185	0.3473	0.0504	0	0	0	0	0	0	0	0	0	0	0.6162
180.0	0.2073	0.2409	0.1064	0.0056	0.028	0	0	0	0	0	0	0	0	0.5882
210.0	0.2577	0.5602	0.1064	0.0168	0	0	0	0	0	0	0	0	0	0.9411
240.0	0.3641	1.1372	0.3977	0.0224	0	0	0	0	0	0	0	0	0	1.9214
270.0	0.3249	2.6665	1.5741	0.0728	0	0	0	0	0	0	0	0	0	4.6383
300.0	0.4706	5.4395	7.9715	1.4677	0.0112	0	0	0	0	0	0	0	0	15.3605
330.0	0.4426	6.2293	12.229	5.0417	0.3361	0.0056	0.0056	0	0	0	0	0	0	24.2899
360.0	0.5882	5.6075	15.8927	7.6242	0.4089	0.0056	0.0056	0	0	0	0	0	0	30.1327
Sum	4.4817	31.5501	46.7087	16.3519	0.8850	0.0112	0.0112	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	99.9998

Table 4.28. January wind speed and direction scatter diagram. Wind directions are from which the wind blows.

(Source: SUMMIT LNG Navigation Study by MITAGS, September 7-8, 2017)

5.3.3 Current

Strong longshore currents occur in the monsoon season near Moheshkhali Island. Direction of current is predominantly north during peak flood tide and south during ebb tide and NE monsoon.

The current off of Moheshkhali Island can reach 3 to 4 kt to the north or south (SUMMIT LNG Navigation Study MITAGS). During the NE monsoon, the depth averaged current (Figure-5.3 & Table-

5.2) runs N/S (flood/ebb) with the ebb (1 kt) current slightly stronger than the flood current (1 kt). The flood current exceeds 1 kt approximately 15% of the time while the ebb current exceeds 1 kt approximately 18.4% of the time. Note, both the units in Figure-5-5 and Table-5-2 have been modified and corrected from the original source (Forristall) from m/s to cm/s.

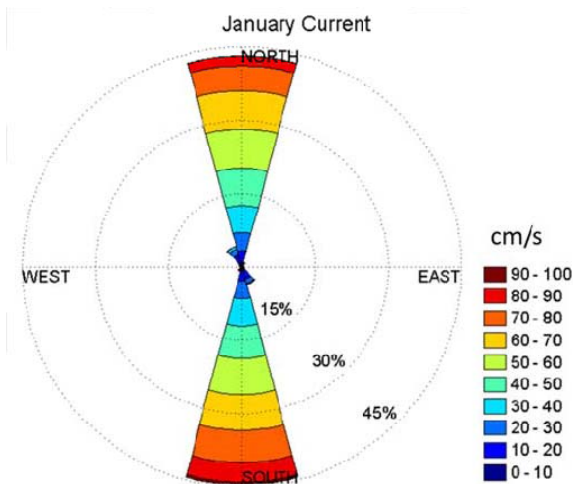


Figure 5.3: January (NE monsoon) current rose (Source: Forristall's Metocean Report (Figure-4.12)); units have been corrected from m/s to cm/s

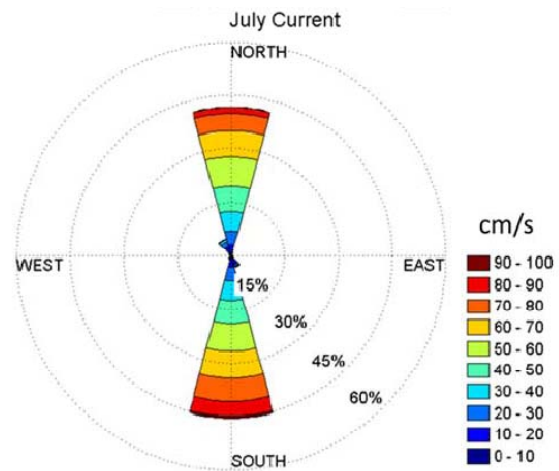


Figure-5.4 July (SW monsoon) current rose (Source: Forristall's Metocean Report (Figure-4.13)); units have been corrected from m/s to cm/s

During the SW monsoon (Figure-5.4 and Table-5.2), the depth averaged current shows the same directionality and magnitude as the depth averaged currents present during the NE monsoon. The flood current exceeds 1 kt approximately 14% of the time while the ebb current exceeds 1 kt approximately 18.8% of the time. (Current velocity scale in tenths of meters). Note, both the units in Figure-4.3 and Figure-4.4 have been modified and corrected from the original source (Forristall) from m/s to cm/s.

Table-5.2: July (SW) current speed and direction scatter diagram

Current Direction	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	100-110	110-120	120-130	130-140	140-150	150-160	Sum
30.0	0.8851	0.0448	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.9299
60.0	0.3193	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3193
90.0	0.3809	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3809
120.0	0.5042	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5042
150.0	0.9259	1.6414	0.8963	0.1513	0	0	0	0	0	0	0	0	0	0	0	0	3.6189
180.0	0.549	2.3416	3.7791	5.5409	6.537	7.3945	7.4786	6.4254	3.9157	0.5546	0	0	0	0	0	0	44.5072
210.0	0.8851	0.094	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.9891
240.0	0.3641	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3641
270.0	0.2745	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2745
300.0	0.5602	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5602
330.0	0.9299	1.9629	1.2772	0.4706	0.0164	0	0	0	0	0	0	0	0	0	0	0	4.2574
360.0	0.661	2.6497	3.8541	5.5409	7.456	8.0932	7.697	5.3666	1.9159	0.0784	0	0	0	0	0	0	43.3140
Sum	7.3432	8.3244	8.7977	11.7081	14.6104	15.4837	15.1794	11.7920	5.8314	0.6330	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	98.9987

Table 4.41. January current speed and direction scatter diagram. Current directions are toward which the current flows.

(Source: SUMMIT LNG Navigation Study by MITAGS, September 7-8, 2017) units have been corrected from m/s to cm/s

Given the hydrodynamic nature around the proposed project areas as established through the hydrodynamic modelling exercise and the nature of marine components proposed under this project (i.e. FSRU as a floating unit moored to an island jetty and sub-sea pipeline), any significant alternation of hydro dynamic behaviour / flow regime is not really foreseen.

5.4 Physical Environment

BETS deputed specialist teams and conducted site surveys and field studies related to environment and biodiversity components. BETS also engaged a group of experienced surveyors for conducting primary environmental baseline data collection in respect of ambient air, surface and ground water, soil and sediment quality, noise levels and engaged Bangladesh Atomic Energy Commission, Central Laboratory of Public Health Engineering Department (DPHE) Bangladesh for laboratory analysis of sample.

5.4.1 Geology

The coast of Cox's Bazar has landforms of two distinct origins: fluvial and marine. Beach and dunes are the two most prominent features of the coast. The regional geology primarily consists of sediments overlying rock. Sediment in the rock contains Hornblende, Garnet, Epidote, Ilmenites, Magnetite, Rutile, Pyrite and small pocket of gas. The sedimentation and its evolutionary sequence of the coastal plain indicates an infilling of a sheltered basin within a relatively high wave and micro-to meson tidal conditions.

Bangladesh occupies major part of Bengal basin which is bordered by Precambrian Indian Shield in the west and north, Indoburman range (orogen) to the east and is open for considerable distance into the Bay of Bengal to the south, Figure-5.5: shows the generalized Geology and Geomorphologic map of the Project area. The tectonic framework of Bangladesh may be broadly divided into two main units:

- Stable-platform in the northwest
- Deep (Geosynclinal) basin to the southeast.

A narrow northwest-southeast trending zone called Hinge zone-separate the above two units diagonally almost through the middle of the country. This project area is located in Deep (Geosynclinal) basin to the southeast and is characterized by huge thickness (maximum about 22 km near the basin center) of sedimentary rocks mostly sandstone and shale of tertiary age. Geosynclinal Basin is subdivided into two major parts

- Fold belt in the east and
- Fore deep in the west.

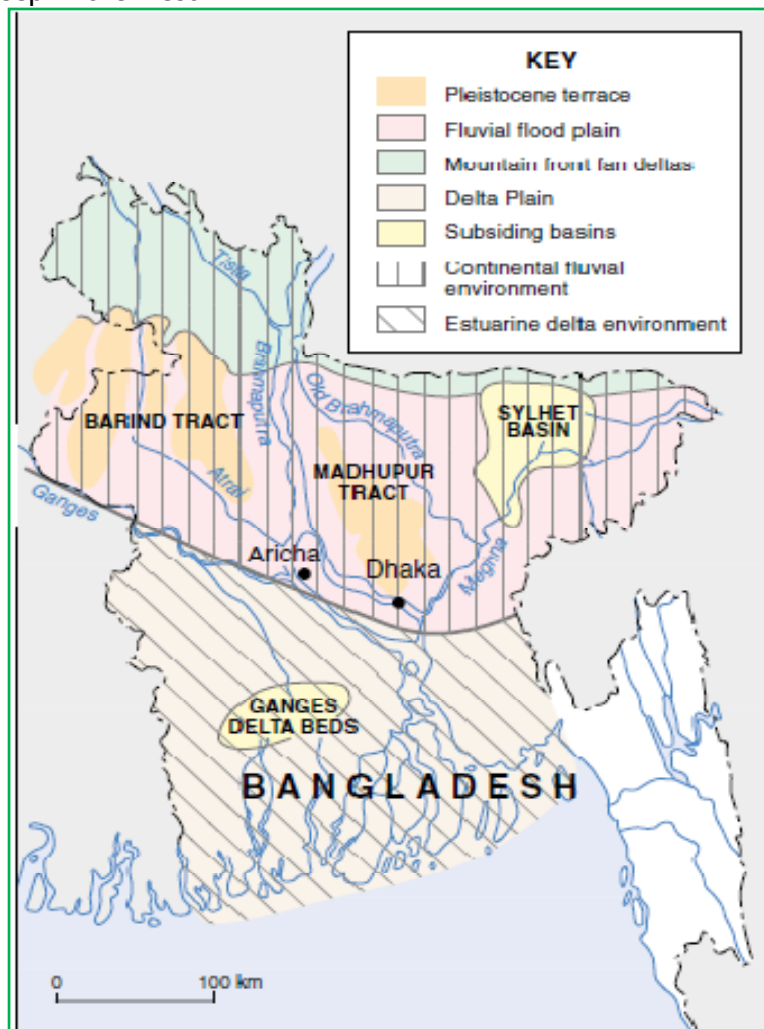


Figure-5.5: Simplified Geology and Geomorphology of Bangladesh,(Source: SEIA Reprt of matarbari Port Development Funded by JICA)

5.4.2 Geomorphology

Bangladesh lies in the northeastern corner of the Indian subcontinent at the head of the Bay of Bengal. It has 144000 Sq Km of onshore and 63000 Sq Km of Offshore Area. It occupies major part of the Ganges –Brahmaputra delta–largest of its kind in the world in term of sediment load carried in the sea. (Orton and Reading 1993). The mightily river system that created this delta carries a sediment load of about 1.67 billion tons annually into the Bay of Bengal. The rate of growth of the delta is however believed to have been retarded because of bypassing of most of the river sediment the swatch of no ground submarine canyon into the deep sea (Kuehl et al 1989). As a result, the growth of the world largest Bengal deep sea fan to the south beyond the continental shelf into the bay of Bengal (Curry and Moore 1971). The geographic location and geomorphic condition of Bangladesh have made it one of the country's most vulnerable to cyclone and other weather disasters.

5.4.3 Meteorology

The climate of Bangladesh is mostly determined by its location in the tropical monsoon region: high temperature, heavy rainfall, often excessive humidity, and distinct seasonal variations. The reversal of the wind circulation between summer and winter is another important feature of the climate of the country. The climate of Cox's Bazar is mostly similar to the rest of the country. It is further characterized by the location in the coastal area. The annual average temperature in Cox's Bazar remains at about a maximum of 34.8 °C and a minimum of 16.1 °C. The average amount of rainfall remains at 4,285 mm.

Table-5.3: Climate data for Cox's Bazar

Climate data for Cox's Bazar													
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average high °C (°F)	27 (80)	28 (83)	31 (87)	32 (90)	33 (91)	31 (87)	30 (86)	30 (86)	31 (87)	31 (87)	29 (85)	27 (80)	29.9 (86)
Average low °C (°F)	14 (57)	16 (61)	20 (68)	24 (75)	26 (78)	25 (77)	27 (81)	25 (77)	25 (77)	24 (75)	19 (67)	16 (60)	21.7 (71.1)
Precipitation mm (inches)	3 (0.1)	13 (0.5)	38 (1.5)	107 (4.2)	323 (12.7)	790 (31.1)	902 (35.5)	706 (27.8)	389 (15.3)	183 (7.2)	84 (3.3)	25 (1.0)	3,559 (140.1)

Source: Weather base, Year-2015

5.4.4 Hydrology

5.4.4.1 Surface Water

Bangladesh is the world's largest delta and also the land of many water bodies. Water dominates life, people and economy of Bangladesh. Water is the most important re-source of Bangladesh and the basis of its agricultural productivity. But excess of water is the cause of floods, the greatest natural hazard of Bangladesh. The developmental needs have changed the pattern of water use, given rise to conflict of interests, incorporated new technologies and have raised major environmental concerns. The different aquatic ecosystems have their own characteristics and their production patterns. The interaction between water resources, their uses and developmental needs raises many environmental concerns.

Main rivers of the Chittagong region are the Karnafuli, Halda, Sangu, Matamuhuri, Bakkhali, Naf, Kasalong, Chingri, Mayani and Kaptai Lake. Of them two major rivers i.e. Karnafuli and Sangu falls in the project area. Kutub dia and Moheshkhali Channels are also prominent as surface water in the project area.

5.4.4.2 Moheshkhali Channel

It lies between the mainland of Bangladesh (Cox's Bazar district) and Moheshkhali Island. The channel carries the combined flow of the Matamuhuri and its tributaries and of other rivers

such as Bharuakhali Khal, Bura Matamuhuri, Mangla Khal, Manikchhari Khal, etc. The length of the channel is 35 km. The channel is connected with the Bay of Bengal.

5.4.4.3 Ground Water

Bangladesh is located over a subsiding basin of tectonic origin with a great thickness of sedimentary strata. This is an unconsolidated alluvial deposit of Recent to sub-Recent age overlying marine sediments. The recent delta and alluvial plains of the Ganges, Brahmaputra and the Meghna Rivers constitute the upper formation. The near surface Quaternary alluvium contains good aquifer characteristics (transmission and storage coefficients). The groundwater storage reservoir has three divisions; upper clay and silt layer, a middle composite aquifer (fine to very fine sand) and a main aquifer consisting of medium to coarse sand.

Groundwater Table-fluctuations indicate the recharge and discharge to the groundwater reservoir. The highest groundwater Table-occurs in the study area during the month of August-September when the aquifer recharges fully and the lowest is during February-March due to natural discharge and groundwater use for domestic and irrigation purposes.

Groundwater is abundant in Bangladesh and the aquifers are highly productive. The sediments are predominantly non-indurate and easy to drill by hand, at least to shallow levels. Water Table-s vary across the country but are typically shallow at around 1–10 m below the ground surface. These factors have made groundwater an attractive and easily accessible resource and have led to a rapid proliferation in the use of groundwater over the last few decades. Today, 97% of the population relies on groundwater for poTable-supplies and groundwater is also an important source for irrigation and industry.

Groundwater levels across Bangladesh become depressed during the dry season, but the aquifers replenish fully during the monsoon. The project area under Moheshkhali Upazila is no exception to it. This is because the occurrences of long-term drawdown of the water Table-exists beneath the major cities only, especially Dhaka due to large-scale abstraction. Some deep tube wells have been installed in adjacent areas to avoid high salinity at shallower levels. Shallow hand-dug wells occur in some areas too, though they are much less common than tube-wells.. In the project area more than 90% people use ground water as a source of drinking water.

It is observed from the ground water analysis that Arsenic, Iron, Manganese and Total Dissolve Solids content in the ground water of the project area exceeded the Bangladesh Standard and Testing Institutes (BSTI) standard. In the Table-5.4 below shows the ground water quality of the Chittagong and Cox's Bazar districts the later of which included Moheshkhali Area as well.

Table-5.4: Ground Water Quality of the Project area

Parameters	Cox's Bazar	Chittagong	BSTI Standard
Ambient Temp. (°C)	33	27.53	-
Water Temp. (°C)	27.08	27.15	-
pH	7.19	7.38	6.4-7.4
EC. (μScm^{-1})	1646.86	2822.13	-
TDS (mgL^{-1})	823.86	787	Max 500
% NaCl	3.01	2.54	-
DO (mgL^{-1})	2.27	1.75	Max 6
Acidity (mgL^{-1})	20.56	40.55	-
T. Alkalinity (mgL^{-1})	283.63	355.83	-
T. Hardness (mgL^{-1})	243.75	224.59	Max 500

Parameters	Cox's Bazar	Chittagong	BSTI Standard
Chloride (mgL ⁻¹)	404.63	378.28	Max 600
NO ²⁻ -N (mgL ⁻¹)	0.09	0.14	Nil
NO ³⁻ -N (mgL ⁻¹)	0.925	2.47	Max 4.5
O-PO ₄ ³⁻ -P (mgL ⁻¹)	2.02	3.35	Max 6
SO ₄ ²⁻ -S (mgL ⁻¹)	404.99	88.67	Max 400
Ni (mgL ⁻¹)	BDL	0.02	-
Zn (mgL ⁻¹)	BDL	0.015	Max 5
Cu (mgL ⁻¹)	BDL	0.01	Max 1
Co (mgL ⁻¹)	0.005	0.008	-
Cr (mgL ⁻¹)	BDL	0.005	Max 0.5
Cd (mgL ⁻¹)	BDL	0.011	0.005
Pb (mgL ⁻¹)	0.045	0.049	Max 0.05
As (mgL ⁻¹)	BDL	0.413	Max 0.05
Fe (mgL ⁻¹)	2.8	1.67	0.3-1.0
Mn (mgL ⁻¹)	0.52	0.19	Max 0.1

BDL: Below detected limit

Source: *Journal of Pak.J.Anal.Environ.Chem.Vol.11,No.2(2010)*

5.4.5 Seabed Morphology

The Bay of Bengal is a region where a thick pile of Bengal Fan sediments covers the entire basement and renders the ocean floor bathymetry virtually featureless. The sediment cover is exceptionally thick (about 21 km) at the apex of the Bengal fan in the Bangladesh offshore region and decreases gradually to about 8 to < 2 km in the central and southern parts (Curry 1991).

In the distal reaches of the fan at 7° S, the sediments are a few hundred meters thick. Very little is known about the features associated with the oceanic basement of the Bay of Bengal. Systematic studies have been carried out by different workers to understand the nature of the basement of the Bay of Bengal on which the morphological features are existing (Ramana et al. 1992).

The lithosphere of the earth is broken up into what are called tectonic plates. Underneath the Bay of Bengal is the Indian Plate which is part of the great Indo-Australian Plate and is slowly moving north east. This plate meets the Burma Micro plate at the Sunda Trench. The Nicobar Islands and the Andaman Islands are part of the Burma Micro plate. The India Plate sub ducts beneath the Burma Plate at the Sunda Trench or Java Trench.

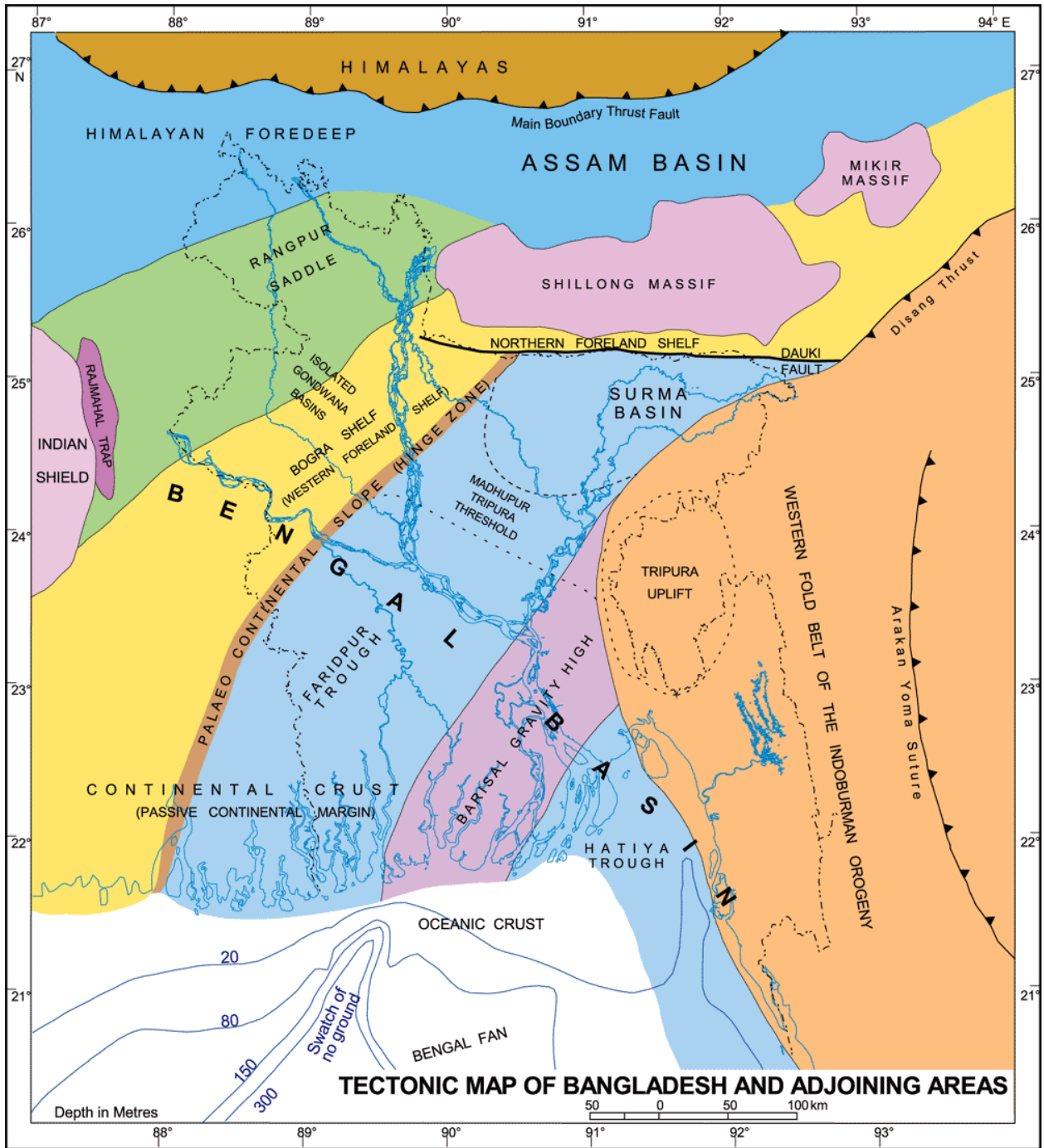
Here, the pressures of the two plates on each other increase pressure and temperature resulting in the formation of volcanoes such as the volcanoes in Myanmar, and a volcanic arc called the Sunda Arc. Sumatra-Andaman earthquake and Asian Tsunami was a result of the pressure at this zone causing a submarine earthquake which then resulted in a huge Tsunami.

The deltaic river processes mostly influence morphology of the offshore river grabens, mass movement and turbidity currents. "V" shaped Canyons, fan Valleys, fault valleys etc are some of the prominent morphological features of the offshore Bengal Basins. The outer shelf of these basins is associated with sediment slumps and neo-tectonic faults.

The K.V.L.N.S.Sarma et al. studies suggest that though the Bengal Fan in general has a smooth topography, there exist several valleys like features in the north and isolated highs in the

southern Bay of Bengal. The mass movement, turbidity currents, sea level fluctuations, tectonics and the effect of Himalayan uplift might have played a significant role for the morphological development of the fan.

Study of sediments and their depositional history perhaps provide key to decipher the development history of fan in time and space. Thus the morphological development of the Moheshkhali Project area seabed is in consonance with the morphological development of the fan.



Source: Guha (1978), GSB (1990), Reimann (1993)

Figure-5.6: Plate Tectonic Map of Bangladesh and Adjoining areas

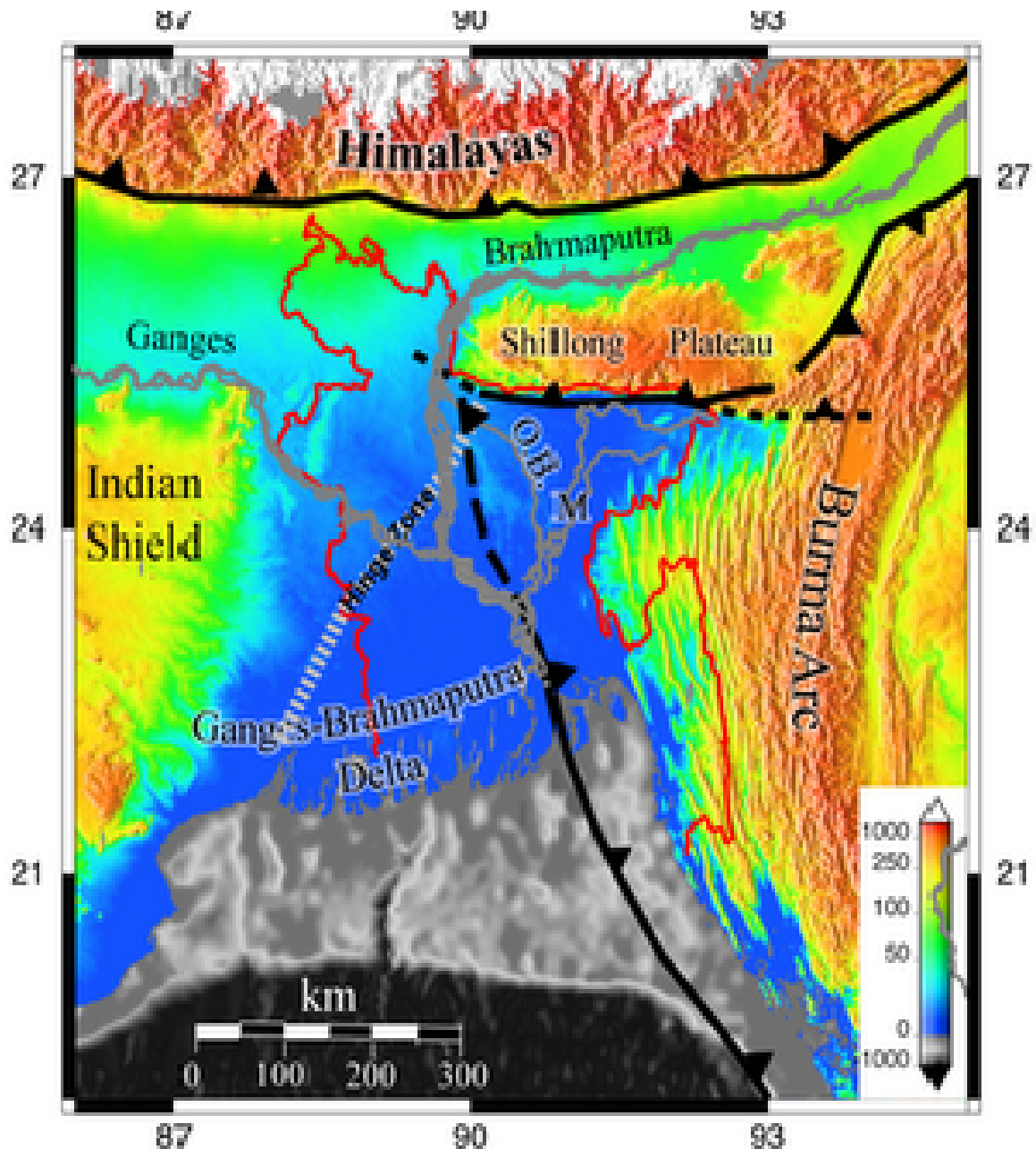


Figure-5.7: Plate Tectonic of Bay of Bengal
(Source: internet)

5.4.6 Rate of Sedimentation and Sediment Mobility

It has been reflected in the research paper entitled Morphological features in the Bay of Bengal (Sarma et al, J. Ind. Geophysics. Union (2000) Vol. 4, No.2, pp. 185-190) that Bengal Fan is one of the world's largest submarine fans having an area of 2.8-3.0 x10⁶ sq. km. It extends from Ganges/Brahmaputra delta around 20° N latitude to south of 7° S, with a maximum width of about 1000 km around 15° N latitude.

Large volume of continental sediments are being discharged by Ganges and Brahmaputra Rivers into the Bay of Bengal and the finer sediment particles reach even 7° S latitude. The sediments rest on the early cretaceous ocean floor characterized by the Mesozoic anomalies

Another study shows that a substantial amount of the suspended sediments at the rate of about 1.2 billion tons per year reaches to Bangladesh territory and passes through the Ganges, Brahmaputra and Meghna river system. These in turn passes through the lower Meghna

estuary, situated in the north of the Moheshkhali island which contains the project area too, and ultimately fall in the Bay of Bengal (Figure-4.7). (Kudrass et al., 1998).

It reveals from a more recent study of the hydrological characters of the estuaries in the context of rate of sedimentation and sediment mobility that the combined flow carries about 80,000 m³/s and 8,000 m³/s of water during the rainy season and the dry seasons respectively (Azam et al., 2001).

About 60% of the Sediments reaching the estuary are responsible in the formation of the present delta lobe in the Sunderban forest in the West to Chittagong in the southeast, even up to Cox's Bazar and thus inclusive of Moheshkhali island, The remaining 40% of the sediments flows westward from the Meghna estuary through the 'Swatch of No Ground', a submarine canyon, in to the deep seawater.

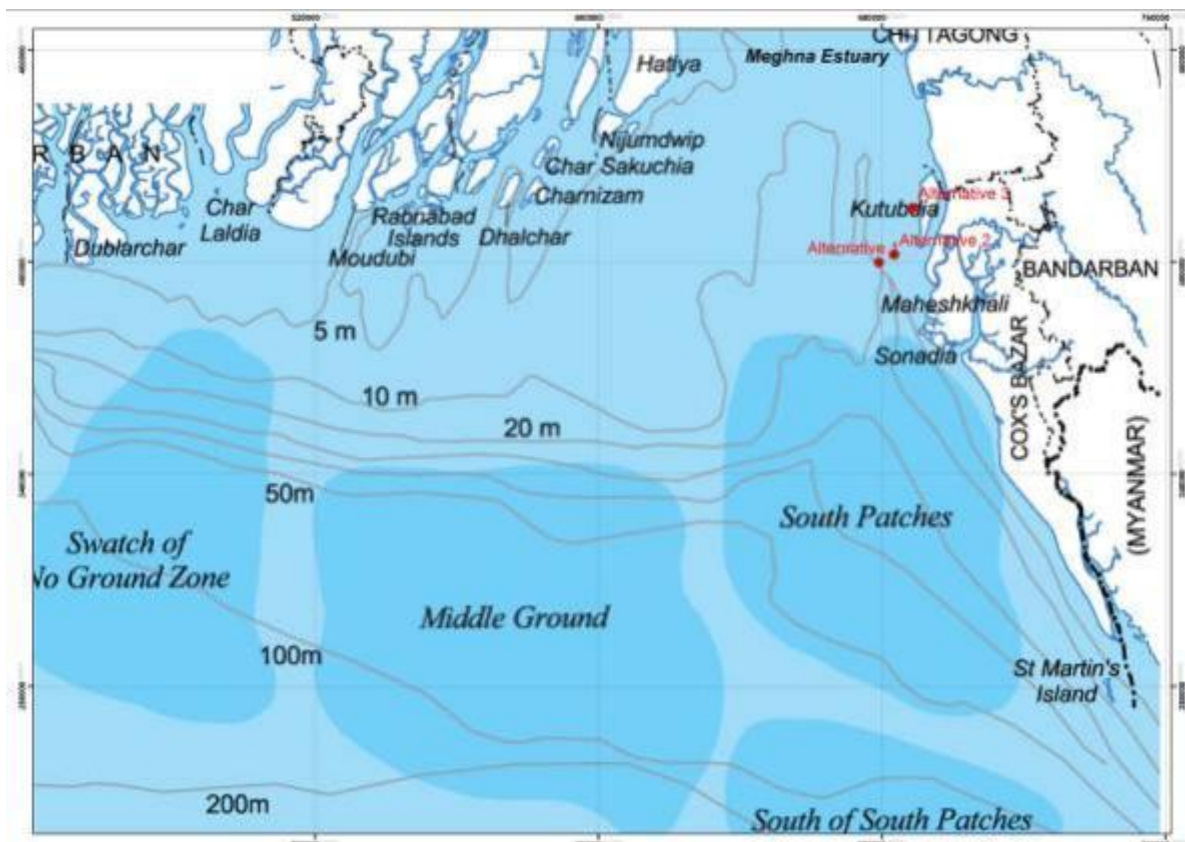


Figure-5.8: Map of the Meghna Estuary of Bangladesh Showing Bathymetry in and Around Moheshkhali Island and the North Eastern Part of the Bay of Bengal

Source: Internet

5.4.7 Coastal Erosion and Deposition Aspect

In general coastal erosion occurs due to single or combined effect of subsidence, sea level rise and insufficient sediment supply. Since coastal areas in Bangladesh are used for wide variety of purposes e.g. settlement, agriculture, fishing and communication coastal erosion and deposition aspects of coastal plains are of the key focal points of human interest. These aspects and the process of coastal erosion and deposition attracting the project area is no exception.

Over the last two or three decades, rapid population expansion on the coastal plains have exerted tremendous pressure on the fragile coastal resource base. For instance, vast littoral Chakaria mangrove forest has been cleared for aquaculture. A large number of polders and embankments have been constructed along the sea fronts for reclaiming land, and securing

settlement and agriculture against sea surges and saline water intrusion. Some of the estuarine tidal rivers have been regulated for augmenting dry season irrigation.

These activities have significantly altered the hydro-geo-morphological regime along the coast. Initial research interest on coastal zone started about more than three decades back with an aim at understanding the morphological characteristics of the coast. In the subsequent years, research priority has been shifted towards more on coastal zone management. However, systematic researches have not been accomplished so far.

Understanding the present day coastal environments, particularly the land forms, processes and their products were considered as vital for an efficient management of the coastal zone. Huge discharge of rivers exceeds the capabilities of the river channels during the monsoon seasons. Most of the rivers are characterized by soft unstable banks and beds which are very vulnerable to the meandering and shifting to new channels.

This instability in river regime, coupled with huge discharge and sediment load causes erosion and scouring and chain reactions start. In some cases, river shifting is related to the geotectonic activities. Hence the process of coastal erosion and deposition occurs continually due to afore mentioned single or combined effect of subsidence, sea level rise and insufficient sediment supply.

5.4.8 Sediment Quality

Preliminary review of the available boring logs (Poten & Partners, November 2011) indicate that sea conditions appear to be a combination of soft to stiff marine clays and fine to medium grained sand which gives a fair view of the physical condition of the sediment quality deposits in the sea bed. For the convenience of further studies during design stage, sediment quality standards are tabulated considering the USEPA sediment standards as a guiding reference for Bangladesh. The Muller scale is also present here for defining the sediment quality by classifying six classes.

Table-5.5: EPA Guidelines for Sediments (Mg/Kg dry weights)

Metal	Not polluted	Moderately polluted	Heavily polluted
Pb	<40	40-60	>60
Cd	>6
Cr	<25	25-75	>75
Cu	<25	25-50	>50
Zn	<90	90-200	>200

Table-5.6: Muller's Classification for the Geo-accumulation Index

I_{geo} Value	Class	Sediment Quality
≤ 0	0	Unpolluted
0-1	1	From unpolluted to moderately polluted
1-2	2	Moderately polluted
2-3	3	From moderately to strongly polluted
3-4	4	Strongly polluted
4-5	5	From strongly to extremely polluted
>6	6	Extremely polluted

I_{geo} : Geo-accumulation Index = $\log_2[C_n/1.5B_n]$ where, C_n : Concentration of element n and B_n : Geochemical

Source: publications of 2011 2nd International Conference on Environmental Science and Technology IPCBEE vol.6 (2011) © (2011) IACSIT Press, Singapore.

5.4.9 Topography

Cox's Bazar is a town, a fishing port and district headquarters in Bangladesh. It is known for its wide sandy beach which is the world's longest natural sandy sea beach. It is an unbroken 125 km sandy sea beach with a gentle slope. It is located located in between 20°43' and 21°56' north latitudes and in between 91°50' and 92°23' east longitudes. It is bounded by Chittagong district on the north, Bay of Bengal on the south, Bandarban district, Arakan (Myanmar) and the Naf river on the east, the Bay of Bengal on the west.

Moheshkhali structures situated in Cox's Bazar district between latitude 21°28'N and 21°45'N and longitude 91°05'E and 92°01'E. The hill ranges form a parallelogram along the eastern side of the island. The trend of the ranges is NNW-SSE. The highest elevation is 86.26m above mean sea level almost at the centre of the range.

5.5 Environmental Monitoring

5.5.1 Air Quality

Agriculture and fishery are the main industry of the Moheshkhali Island. There is no industry in this area. There is no official air quality data for the project area due to the non-availability of a regular air quality-monitoring program. However, the prevailing conditions are generally typical of rural Bangladesh, which implies generally good conditions. There is hardly any factories/industries located in the Project areas; therefore, air pollution is comparatively less than in other areas of Bangladesh. Generally, air pollution in the Project area would be from road dust, black smoke from diesel engines, construction dust, windblown dust from agricultural lands, domestic heating and cooking and brick kilns. The principal source of pollutants in the region is from vehicular traffic which may also be termed as insignificant.

Consultant Team engaged Atomic Energy Commission (AEC) to conduct Ambient Air Quality Monitor at project location in two different points. **Table- 5.7** and **Table- 5.8** shows the result. At **Annexure-7**. Dealtis report attached.

Analysis

The particulate matters, SPM concentration was measured by collecting sample on Teflon filter using Aerometric portable-sample and subsequent gravimetric analysis using microbalance. The ambient SO₂, NO₂, and CO were monitored sequentially at project site using Gas Badge Pro monitor. The results are also presented below:

Table- 5.7: Sampling Location 01: 6 meter east side of EEBL tie-in-point (21°34.390N & 91°51.775 E)

Sampling date	SPM	SO ₂	NO ₂	CO
	µG/M ₃ (8h average)	µG/M ₃ (24h average)	µG/M ₃ (1h average)	µG/M ₃ (1h average)
03-11-2017	21.2	<12	<13	<0.3
ECR 1997	200	365	100	40mg/m ³

Note: The SPM concentration is lower than ECR 1997 due to seasonal effect (Post monsoon season)

Table- 5.8: Sampling Location 02: Proposed SLNG tie-in-point (21°33.618N & 91°51.681 E)

Sampling date	SPM	SO ₂	NO ₂	CO
	µG/M ₃ (8h average)	µG/M ₃ (24h average)	µG/M ₃ (1h average)	µG/M ₃ (1h average)
03-11-2017	20.6	<12	<13	<0.3
ECR 1997	200	365	100	40mg/m ³

Note: The SPM concentration is lower than ECR 1997 due to seasonal effect (Post monsoon season)



Air monitoring near the EEBL FSRU Tie-in-Point.



Deploying second air monitoring equipment at coordinates 21°33'15.43"N, 91°51'37.19"E

Figure-5.9 : Air Monitoring

5.5.2 Water Quality

5.5.2.1 Surface Water

The source of surface water (SW) in and around the Project area comprising the Tie-in Point is mainly rivers, canals, ponds and wetlands. There is one stream named Barer Khal flowing nearby the project site. Every year during the monsoon, rain water and storm surges causes flooding in the low-lying parts of Project Sites.

The quality of SW in the Project areas during the monsoon season is usually good as the concentration of contaminants is low, but during the dry, winter seasons when flows decrease, the saline water from the Bay of Bengal enters into the Project areas and as a result, SW is contaminated by salinity.

The GW level is at, very close to, or above the surface during the monsoon, and it is at its maximum depth during the months of April and May (Banglapedia, 2006). A review of GW Table-in the Project areas shows that the GW Table-remains within 2.5m from the surface level during the dry period but rises very close (about 1m or higher) to the surface level during the rainy season (HCL,2005). The Project areas are located well south of the major arsenic contaminated area.

Two nos sample of sea water collected from the sea water from the shore line of the onshore project site was tested and the report is attached at **Annexure-7** and placed below in **Table-5.9** which reflects high salinity as usual.

Physical/Chemical /Bacteriological Analysis of Water Sample

Table-5.9 Laboratory Test Results (SW-1)

Sl.	Water quality parameters	Bangladesh Standard (Inland surface water)	Concentration present	Analysis Procedure	LOQ
01	Alkalinity	-	115	Titrimetric	-
02	Biochemical Oxygen Demand (BOD) 5 days	50 mg/l	400	5 days Incubation	0.20
03	Chemical Oxygen Demand (COD)	200 mg/l	1600	CRM	-
04	Chloride	150-600 mg/l	14290	Titrimetric	

Sl.	Water quality parameters	Bangladesh Standard (Inland surface water)	Concentration present	Analysis Procedure	LOQ
05	EC	1200 mg/l	43500	Multimeter	-
06	pH	6-9	8.7	pH Meter	-
07	Total dissolved Solid (TDS)	2100 mg/l	22200	Multimeter	-
08	Total Suspended Solid (TSS)	150 mg/l	14	Gravity Multimeter	-

Table-5.10 Laboratory Test Results (SW-2)

Sl.	Water quality parameters	Bangladesh Standard (Inland surface water)	Concentration present	Analysis Procedure	LOQ
01	Alkalinity	-	105	Titrimetric	-
02	Biochemical Oxygen Demand (BOD) 5 days	50 mg/l	120	5 days Incubation	0.20
03	Chemical Oxygen Demand (COD)	200 mg/l	400	CRM	-
04	Chloride	150-600 mg/l	140150	Titrimetric	-
05	EC	1200 mg/l	414000	Multimeter	-
06	pH	6-9	8.8	pH Meter	-
07	Total dissolved Solid (TDS)	2100 mg/l	21100	Multimeter	-
08	Total Suspended Solid (TSS)	150 mg/l	12	Gravity Multimeter	-

N.B.: AAS-Atomic Absorption Spectrophotometer, UVS-UV-VIS Spectrophotometer, MFP-Membrane filtration Procedure, LOQ Limit of Quantitation



Water sample collection near FSRU terminal point



Collecting water sample

Figure-5.10 : Water Sample collection from

5.5.2.2 Ground Water

In general groundwater Table-fluctuates due the recharge and discharge to the groundwater reservoir and that of the project are no exception to. The highest groundwater Table-occurs in the study area during the month of August-September when the aquifer recharges fully and the lowest is during February-March due to natural discharge and groundwater use for domestic and irrigation purposes.

The Table-below shows the ground water quality of the Chittagong and Cox's Bazar districts which includes that of project site at Moheshkhali.

Parameters	Cox's Bazar	Chittagong	BSTI Standard
Ambient Temp. (°C)	33	27.53	-
Water Temp. (°C)	27.08	27.15	-
pH	7.19	7.38	6.4-7.4
EC. (μScm^{-1})	1646.86	2822.13	-
TDS (mgL^{-1})	823.86	787	Max 500
% NaCl	3.01	2.54	-
DO (mgL^{-1})	2.27	1.75	Max 6
Acidity (mgL^{-1})	20.56	40.55	-
T. Alkalinity (mgL^{-1})	283.63	355.83	-
T. Hardness (mgL^{-1})	243.75	224.59	Max 500
Chloride (mgL^{-1})	404.63	378.28	Max 600
$\text{NO}_2^{-}\text{-N}$ (mgL^{-1})	0.09	0.14	Nil
$\text{NO}_3^{-}\text{-N}$ (mgL^{-1})	0.925	2.47	Max 4.5
$\text{O-PO}_4^{3-}\text{-P}$ (mgL^{-1})	2.02	3.35	Max 6
$\text{SO}_4^{2-}\text{-S}$ (mgL^{-1})	404.99	88.67	Max 400
Ni (mgL^{-1})	BDL	0.02	-
Zn (mgL^{-1})	BDL	0.015	Max 5
Cu (mgL^{-1})	BDL	0.01	Max 1
Co (mgL^{-1})	0.005	0.008	-
Cr (mgL^{-1})	BDL	0.005	Max 0.5
Cd (mgL^{-1})	BDL	0.011	0.005
Pb (mgL^{-1})	0.045	0.049	Max 0.05
As (mgL^{-1})	BDL	0.413	Max 0.05
Fe (mgL^{-1})	2.8	1.67	0.3-1.0
Mn (mgL^{-1})	0.52	0.19	Max 0.1

BDL: Below detected limit

Source: Journal of Pak.J.Anal.Environ.Chem.Vol.11,No.2(2010)

5.5.2.3 Marine Sediment

A sedimentation/erosion assessment in the natural channel, for the period of 1990 to 2005, has been performed, based on the available nautical charts, in order to define the geomorphological conditions of Matarbari Island Area for the SPM project of Eastern Refinery Limited. It was evident from that project study that the natural channel is affected by an erosive pattern.

Bangladesh does not have standard values for heavy metals contained in sea bottom sediment. Globally, ERL (Effects Range-Low) and ERM (Effects Range-Median) are proposed by the NOAA (National Oceanic and Atmospheric Administration, U.S.) as the guidelines to help categorize the range of concentrations of heavy metals and organic chloride compounds in sediment which affect benthic organisms.

In a series of data of ascending levels of contaminants and their toxicity effects, the 10th percentile and the 50th percentile (median) of the effects database were identified for each substance. The 10th percentile values were named the "Effects Range-Low" (ERL), indicative of concentrations below which adverse effects rarely occur. The 50th percentile values were named the "Effects Range-Median" (ERM) values, representative of concentrations above which various effects frequently occur.

The measurement results of the CPGCBL power plant study indicated that ERL was not exceeded in any of the parameter except for mercury (Hg), and even then it did not exceed ERM. The sea bottom sediment quality is not contaminated in the project study area.

Table-5.11 Results of Sea bottom sediment survey (Heavy metals) of the Project Study Area

Parameter	Unit	Results		Guideline of NOAA	
		15/October /2012	28/January /2013	ERL	ERM
Hg	mg/kg	0.142	0.456	0.15	0.71
Cd	mg/kg	0.032	0.05	1.2	9.6
Pb	mg/kg	11.6	3.39	46.7	218
As	mg/kg	4.45	2.91	8.2	70
Cu	mg/kg	23.8	3.75	34	270
Zn	mg/kg	63.7	20.2	410	410
Fe	mg/kg	27,400	11,183	-	-

(Source: JICA Study Team)

Consultant collected sediment from two locations near project area. Till now they do not receive the report from SRDI. The details will submit on final report at Annexure-7.

5.5.2.4 Noise

The noise levels of project site are lower than the ECR 1997. Details of noise level monitoring report is attached in **Annexure-7**. In following Table-shows result.

Noise Level at Plant Sites

The noise level is monitored using Sound Meter (Model No. SL 4012) which is calibrated using Tenma 72-945 (NEDA-19604 IEC-6F22). The noise Level at project sites is presented below.

Table-5.14: The Noise level of projects site is lower than the ECR 1997

Sl. No.	Monitoring Point	Bangladeshi Standard	Test Time	Result
1	Middle points sand filling on existing pipe	Day Time 60dba	Day	39.4±0.3dBa
		Night Time 50dba	Night	40.2±1.5dBa
2	6 meter east side EBBL tie-in point, Moheshkhali	Day Time 60dba	Day	52.5±0.5dBa
		Night Time 60dba	Night	48.5±0.5dBa
3	Proposed the –in-point of SLNG, Moheshkhali	Day Time 60dba	Day	55.6±0.4dBa
		Night Time 60dba	Night	47.4±0.3dBa

Observations: Noise level monitoring data is complaint with the National Noise Level Standards (ECR 1997) of mixed area.

5.6 Biological Environment

The habitats of the study area sustain wildlife as well as plant communities. But many of these remain unrecognized. Verities of plant species and wild animals have been identified and recorded during this study of the project. Common Flora and fauna as avail in Bangladesh and particularly those around the project area are listed in Annexure-4. Every species play an important role in its natural community and ecosystem and removal of that species is likely to

have adverse impact. Bio-habitat of the project area may be divided into two major types viz- terrestrial habitat and wetland (aquatic) habitat.

5.6.1 Flora

From a rapid field survey in different terrestrial habitats around the study area a number of species have been identified and listed in above Annex-4. It may be mentioned here that various saline tolerant trees are available in the area with local names of 'bine', 'karkagola' tree, 'Jhau' and 'Akashi' etc.

Terrestrial flora is classified according to their habitats. In the study area, terrestrial floras are present mainly in the homestead regions, roadsides, village groves, playgrounds, upland/high cultivated lands. Human being as well as wildlife uses these floral species for different purposes. They play an important role in the socio-economic and ecological balance. Wildlife that fully depends on the terrestrial ecosystems for life, shelter, food and breeding is called terrestrial fauna. A number of terrestrial species have been identified during the brief and rapid assessment in the project area is listed in Annexure-4.

5.6.2 Fauna

The wildlife that fully or partially depends on water reservoir such as river, canal and pond etc. for life, shelter, food, nesting, breeding and reproduces inside the water reservoir is known as wetland fauna. Important aquatic fauna comprises some species of amphibians, reptiles, birds and mammals. Aquatic fauna may act as sensitive bio-indicators of the altered state of the ecosystem resulting from human influence. The survey area represents two major type of wetland's namely permanent wetland (rivers, canals and fishponds) and seasonal wetland (agricultural land during flood). Environmentally Sensitive Areas usually includes the following and most of which are not directly concerned with the project activities:

- Coral Reefs
- Sandy Beaches and Sand Dunes
- Mudflats
- Marine Wildlife Protected Areas
- Coastal freshwater bodies
- Salt Marshes
- Turtle Nesting Grounds
- Horseshoe crab Habitats
- Sea grass Bed
- Seaweed bed
- Nesting Ground of Bird

Wildlife that fully depends on the terrestrial ecosystems for life, shelter, food and breeding is called terrestrial fauna. A number of terrestrial species have been identified during the brief and rapid assessment in the project area and is listed in Annexure-4.

5.6.3 Fisheries

The study area has the characteristics of a mixture of marine, coastal and inland fishing. Fishing in such habitats is carried out using diversified gears and appliances for catching different fish species. Gears and gear specific fish species are as follows: (i) Ilish jal (Chikon)-Ilish, Mitty, Surma Mitty, Chhuri, Loitya, Lakhya etc.; (ii) Behundi jal-Gura chingri, Bele etc.; (iii) Sori jal/Ber jal-Icha, Ulua mach, Kachki etc.; (iv) Current jal-Koral, Tailla etc.; (v) Tounga jal/Thela jal-Baishat jal-Post Larvae of shrimp, other hatchlings; (vi) Sot jal/Charpata jal-Guli tengra, Bhol, Kala Poa, Icha, Bele etc.; (vii) Jhaki jal-Chiring, Icha, Bata, Telapia, Koral etc.; (viii) Kondra jal-Loitya, Pairsa, Bele, etc; (ix) Lal jal-Chhaba Mitya, Keda, Bom mach etc.; and Borshi-Koral, Kain magur, Kala Poa, Koir mach, etc. Ilish fish is caught in warm weather in Boishakh (i.e. first month of Bengali year) when the habitat experiences more salinity.

The study area fish habitats are still moderate rich in species diversity and composition as represented by the low species dominance. This area is believed to have about 90-100 species of fish and shrimp. Among the saline and brackish water fishes like Hilsa, Choikka, Loitya, Surma, Puka (Poa), Keda/Chamfula, Pairsa (Chouka), Dome Machh, Bhara, Kauwa, Tek Chanda, Ayer Chanda, Foilya/Rupchanda, Bagda, Lobster, Chhuri, Korai, Sada Datina, Chiring etc. are abundant in the study area and the composition of the species is illustrated in Figure-4.9. Fish species like Korai, Bata (Kharul), Gula Tengra (Guillya), Bhol, etc and shrimp species such as Chaka Chingri, Loilya Chingri, and Bagda PL are regularly caught in different nets set in the confluence of Moheshkhali Channel, Sangu River, Matamuhuri River and Karnaphuli River. Bagda post larvae (PL) are still abundant in these Channels and sea shore. Crabs are also harvested using bamboo made small cages locally called chai/doghair. The crab harvesters set crab trap in spring tide and harvest crab in the neap tide. Crabs are caught largely in warm weather while less in the cold weather. Small fish species like Punti, Kholisha, Bele, Kakila, Taki, Shingh etc. are the main species of the khals and chharas which are mainly concentrated in the northern part of the study area shown in Figure-5.15. Fishes are mostly harvested during rainy season in the study area. It is also observed that exotic carp and perch (Tilapia) species are available in the culture system in the study area.

The dominating fish species of the open water habitat around the proposed plant site are Ilisha megaloptera, Hilsa kelee, Chanos chanos, Harpadon nehereus, Mystus gulio, Mugil cephalus, Epinephelus sp., Leiognathus brevirostris, Gerres filamentosus, Acanthopagrus latus, Acanthopagrus berda, Acanthopagrus latus, Polydactylus sextarius etc.

The shrimp gher/ghona is intruded naturally by a number of commercially important fish species like Korai, Bata, Guli tengra, Chaka Chingri, Loilya chingri, crab etc. while water entering into the Ghona. The composition of species of the shrimp gher is shown in Figure-5.11. Water is generally exchange in the Ghona in every 15 days interval in 'Full moon-Bharagonn'. The composition of fish pond aquaculture of this area is shown in Figure-5.12.

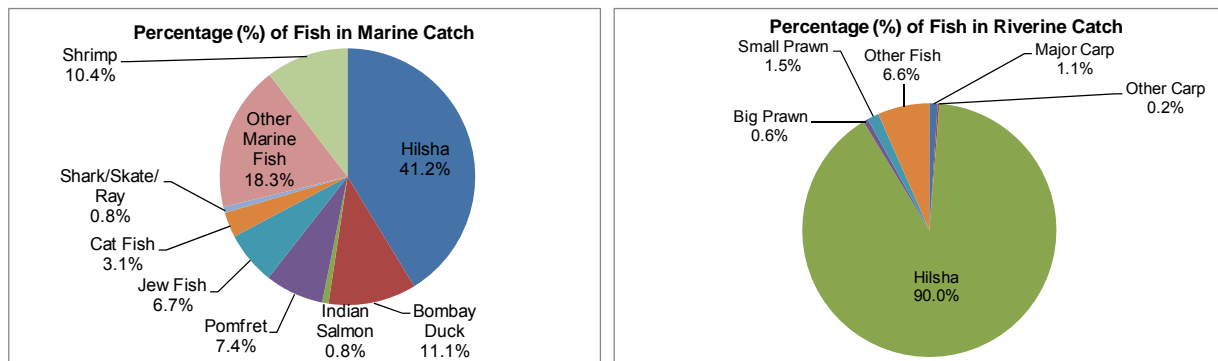


Figure-5.12: Species composition of marine catch (Source, FRSS 2011-12)

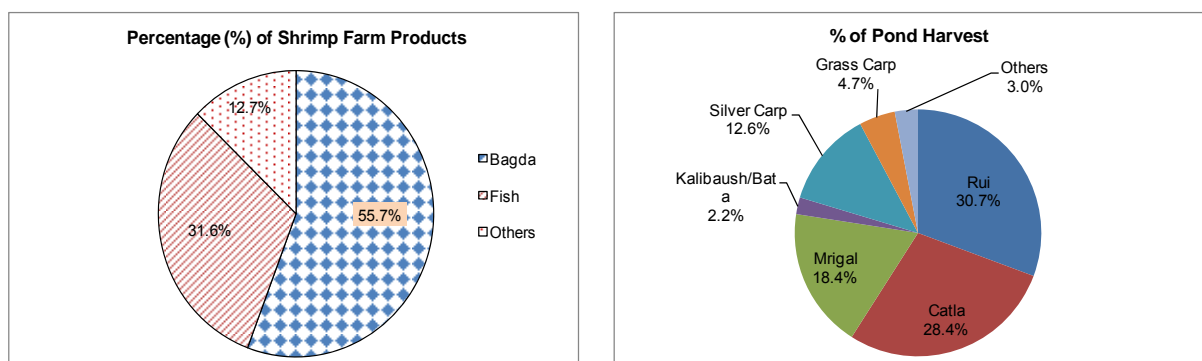


Figure-5.13: Species composition of shrimp Farm (Source, FRSS 2011-12)

Figure-5.14: Species composition of cultured pond (Source, FRSS 2011-12)



Figure. 5.15 Fish and shrimp species composition of catch

Report of local fishermen and also the catch revealed that the fish biodiversity has been declining over the years. Factors responsible for the downturn of the species diversity are: (i) narrowing down fish habitats; (ii) deteriorating water as well as habitat quality; (iii) increasing fishing pressure; (iv) collection of shrimp PL which causes the mortality of other fish fauna; (v) obstruction in fish migration routes; (vi) aggradations of riverine habitats due to geomorphological processes; (vii) nullification of mangrove forests; (viii) alteration of fish breeding grounds; (ix) expansion of culture fishery and (x) changing of land use pattern. A list of indicative fish species of the study area is given in Table-5.14.

Table-5.14: Indicative fish species diversity with their habitats and breeding periods

Sl. No.	Scientific Name	Local Name	Common English Name	Status IUCN	Habitat				Breeding period
					Sea shore /channel	Mangrove	Khal	Pond	
1	<i>Ilisha megaloptera</i>	Choikka	Big eye Hilsa	-	P	A	A	A	Aug-Sep
2	<i>Hilsa kelee</i>	Beng ilish	Kelee shad	-	P	A	A	A	Aug-Sep; Jan-Feb
3	<i>Chanos chanos</i>	Akharul/ Chela	Milk fish	-	P	P	A	A	-
4	<i>Harpadon nehereus</i>	Loitya	Bombay duck	-	P	P	A	A	-
5	<i>Mystus gulio</i>	Guilla	Long whiskers catfish	-	P	P	P	A	-
6	<i>Mugil cephalus</i>	Kharul bata	Flathead mullet	-	P	P	A	A	-
7	<i>Epinephelus spp.</i>	Bole	Grouper	-	P	P	A	A	-

Sl. No.	Scientific Name	Local Name	Common English Name	Status IUCN	Habitat				Breeding period
					Sea shore /channel	Mangrove	Khal	Pond	
8	<i>Leiognathus brevisrostris</i>	Tek chanda	Shortnose pony fish	-	P	P	A	A	-
9	<i>Gerres filamentosus</i>	Dome machh	Whipfin silverbidy	-	P	A	A	A	-
10	<i>Acanthopagrus latus</i>	Sada Datina	Yellow fin sea bream	-	P	P	A	A	-
11	<i>Acanthopagrus berda</i>	Kala Datina	Picnic sea bream	-	P	A	A	A	-
12	<i>Acanthopagrus latus</i>	Datina	Yellow Sea Bream	-	P	P	A	A	-
13	<i>Polydactylus sextarius</i>	Surma/Tailla	Blackspot threadfin	-	P	P	A	A	-
14	<i>Johnius amblycephalus</i>	Puka/Poa	Bearded croaker	-	P	P	A	A	-
15	<i>Scartelaos histophorus</i>	Chiring	Walking goby	-	P	P	A	A	-
16	<i>Lepturacanthus savala</i>	Chhuri	Savalani hairtail	-	P	A	A	A	-
17	<i>Euthynnus affinis</i>	Maitta/ Kawa	Kawakawa	-	P	A	A	A	-
18	<i>Pampus argenteus</i>	Foli chanda	Silver pomfret	-	P	P	A	A	-
19	<i>Pampus chinensis</i>	Rupchanda	Chinese silver pomfret	-	P	A	A	A	-
20	<i>Acentrogobius caninus</i>	Bailla	Tropical Sand Goby	-	P	P	A	A	-
21	<i>Catla</i>	Catla	Katla	-	P	A	P	P	-
22	<i>Cirrhinus mrigela</i>	Mirka	Mrigel	-	P	A	P	P	-
23	<i>Ctenopharyngodon idellus</i>	Grass carp	Grass carp	-	A	A	A	P	-
24	<i>Cyprinus carpio</i>	Carpio	Common carp	-	A	A	A	P	-
25	<i>Hypophthalmichthys molitrix</i>	Silver carp	Silver carp	-	A	A	A	P	-
26	<i>Labeo boga</i>	Bhangon	Boga Labio	-	P	A	A	A	-
27	<i>Labeo calbasu</i>	Calbaus	Black Rui	EN	A	A	P	P	-
28	<i>Labeo rohita</i>	Rui	Rohu	-	A	A	P	P	April-August
29	<i>Lates calcarifer</i>	Koral	Sea Bass	-	P	P	A	A	June-July
30	<i>Lepidosephalus guntia</i>	Gutum	Guntia Loach	-	P	A	P	A	-
31	<i>Liza parsia</i>	Parse	Goldspot Mullet	-	P	P	A	A	-
32	<i>Mystus tengara</i>	Bajari-tengra	Tengara Mystus	-	P	A	A	A	-
33	<i>Oreochromis niloticus</i>	Tilapia	Tilapia	-	A	A	P	P	-
34	<i>Plotosus canius</i>	Gang magur	Canine Catfish	VU	P	P	A	A	-
35	<i>Polynemus paradiseus</i>	Tapsi	Paradise Threadfin	-	P	P	A	A	-
36	<i>Thrssa mystex</i>	Faisha	Anchovy	-	P	P	A	A	-

Here, A= Absent and P=Present, VU=vulnerable, EN=Endangered Sources: Red Book of threatened Fishes of Bangladesh, IUCN and fishermen consultation

5.6.4 Biodiversity/ Environmental Sensitive Areas

Based on the significance and ecological sensitivity, Ministry of Environment & Forest (MOEF) has declared a number of areas as "ECAs" and "Protected Areas", but there is not much

information or study on the Ecologically Sensitive Area (ESA's) of different coastal and marine Ecosystem and its habitat.

Ecologically Sensitive Areas are:

- ✓ Mangroves
- ✓ Coral Reefs
- ✓ Sandy Beaches and Sand Dunes
- ✓ Mudflats
- ✓ Marine Wildlife Protected Areas
- ✓ Coastal freshwater bodies
- ✓ Salt Marshes
- ✓ Turtle Nesting Grounds
- ✓ Horseshoe crab Habitats
- ✓ Sea grass Bed
- ✓ Seaweed bed
- ✓ Nesting Ground of Bird

The proposed port project area is out of the Ecologically Critical Area (ECA).

Table-5.15 : Protected area in the Coastal zone of Bangladesh

Type	Name	Area (ha)	Location	Effects of 1-m Sea Level Rise (SLR)
Reserved Forest	-	885,043	Khulna, Satkhira, Bagerhat, Bhola, Patuakhali, Noakhali, Chittagong, Cox'sbazaar	Yes
National Park	Himchari	1,729	Cox'sbazaar	No
Wild life Sanctuaries	NijhumDeep	4,232	Hatiya, Noakhali	Yes
	Sundarban south	36,970	Khulna	Yes
	Sundarban west	71,502	Satkhira	Yes
	Char Kukri-Mukari	2,017	Bhola	Yes
	Chunati	7,761	Chittagong	No
Ramsar Site	Sunderbans	601,700	Khulna, Satkhira, Bagerhat	Yes
Environmental Critical Areas	Sonodia	4,916	Cox'sBazar	Yes
	Teknaf	10,465	Cox'sBazar	Yes
	St. Martin's Island	590	Cox'sBazar	Yes
World Heritage Site	Wild life Sanctuaries of the Sunderbans		Khulna, Satkhira, Bagerhat	Yes
Marine Reserve		69,800	Bay of Bengal	Yes

Source: Islam 2004 in Hussain & Haq (eds.), 2010

The Sonadia Island Figure-5.16 is an identified ECA of the Cox's Bazar. Its outer boundary is almost 3.4 Km away from the Proposed Area. So the project activities will not intervene the ECA.



Figure-5.16 Comparative Position of ECA and WS

5.7 Tectonics Behavior & Seismic Activity of the Area

Earthquake is one of the most deadly natural disasters that may affect the human environment. Even a relatively moderate earthquake can cause a very large number of deaths. Although in recent past no major earthquake has affected this country, a major event may affect the country at any moment. To analyze the earthquake entire Bangladesh is subdivided into four seismic zones where port project is located in the earthquake zone III (Figure-5.18) according to the draft of Bangladesh National Building Code (BNBC) updated in 2012 (Sarraz A., et. al. 2015). This zone-III comprises of NNW-SSE area including Chittagong-Tripura folded belt where the basic seismic coefficient is 0.28. There is a possibility of earthquake in this region as because the region is located adjacent to the Burmese Arc, where a large number of shallow depth earthquakes originate. On 22 July, 1999 a notable-earthquake occurred at Maheshkhali Island with the epicenter in the same place. The Richter scale magnitude of that earthquake was 5.2 and the surface wave magnitude was 4.2 feeling severely around Maheshkhali Island and adjoining areas. In that incident fatalities were explored as: death 6 persons, injury 200 persons, a number of houses faced crack while some has been collapsed (SADKN, 2012).

Accurate historical information on earthquakes is very important in evaluating the seismicity of Bangladesh in close coincidences with the geotectonic elements. Information on earthquakes in and around Bangladesh is available for the last 250 years. The earthquake record suggests that since 1900 more than 100 moderate to large earthquakes occurred in Bangladesh, out of which more than 65 events occurred after 1960. This brings to light an increased frequency of earthquakes in the last 30 years. This increase in earthquake activity is an indication of fresh tectonic activity or propagation of fractures from the adjacent seismic zones.

Before the coming of the Europeans, there was no definite record of earthquakes. Following is a chronology of important earthquakes from 1548.

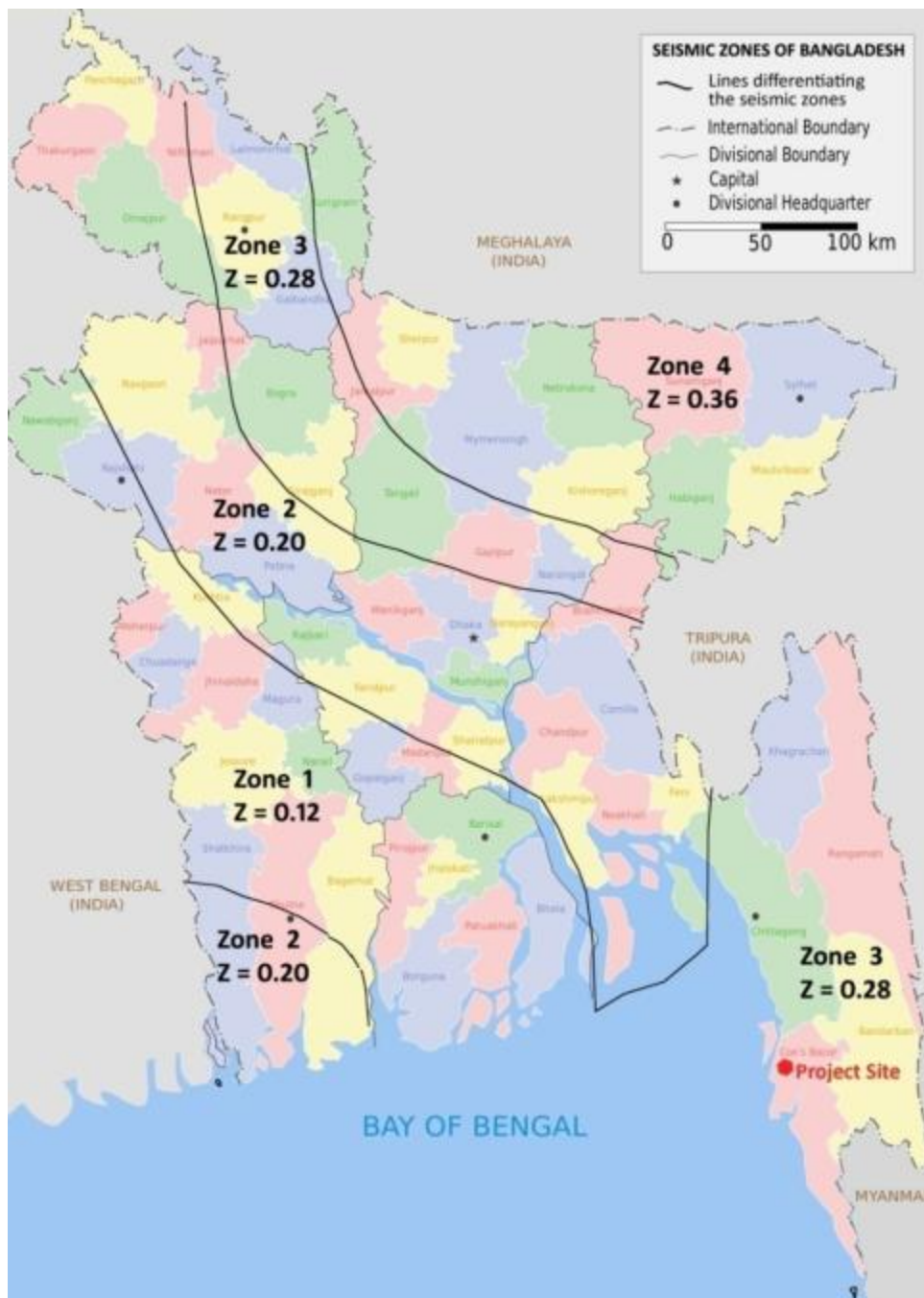


Figure-5.17: Earth quake zone of Bangladesh

Table-5.16: Chronology of Important Earthquakes From 1548

1548	The first recorded earthquake was a terrible one. Sylhet and Chittagong were violently shaken, the earth opened in many places and threw up water and mud of a sulphurous smell.
1642	More severe damage occurred in Sylhet district. Buildings were cracked but there was no loss of life.
1663	Severe earthquake in Assam,, which continued for half an hour and Sylhet district was not free from its shock.
1762	The great earthquake of April 2, which raised the coast of Foul island by 2.74m and the northwest coast of Chedua island by 6.71m above sea level and also caused a permanent submergence of 155.40 sq km near Chittagong. The earthquake proved very violent in Dhaka and along the eastern bank of the Meghna as far as Chittagong. In Dhaka 500 persons lost their lives, the rivers and jheels were agitated and rose high above their usual levels and when they receded their banks were strewn with dead fish. A large river dried up, a tract of land sank and 200 people with all their cattle were lost. Two volcanoes were said to have opened in the Sitakunda hills.
1775	Severe earthquake in Dhaka around April 10, but no loss of life.
1812	Severe earthquake in many places of Bangladesh around May 11. The earthquake proved violent in Sylhet
1865	Terrible shock was felt, during the second earthquake occurred in the winter of 1865, although no serious damage occurred.
1869	Known as Cachar Earthquake. Severely felt in Sylhet but no loss of life. The steeple of the church was shattered, the walls of the courthouse and the circuit bungalow cracked and in the eastern part of the district the banks of many rivers caved in.
1885	Known as the Bengal Earthquake. Occurred on 14 July with 7.0 magnitude and the epicentre was at Manikganj. This event was generally associated with the deep-seated Jamuna Fault.
1889	Occurred on 10 January with 7.5 magnitudes and the epicentre at Jaintia Hills. It affected Sylhet town and surrounding areas.
1897	Known as the Great India Earthquake with a magnitude of 8.7 and epicenter at Shillong Plateau. The great earthquake occurred on 12 June at 5.15 pm, caused serious damage to masonry buildings in Sylhet town where the death toll rose to 545. This was due to the collapse of the masonry buildings. The tremor was felt throughout Bengal, from the south Lushai Hills on the east to Shahbad on the west. In Mymensingh, many public buildings of the district town, including the Justice House, were wrecked and very few of the two-storied brick-built houses belonging to zamindars survived. Heavy damage was done to the bridges on the Dhaka-Mymensingh railway and traffic was suspended for about a fortnight. The river communication of the district was seriously affected (Brahmaputra). Loss of life was not great, but loss of property was estimated at five million Rupees. Rajshahi suffered severe shocks, especially on the eastern side, and 15 persons died. In Dhaka damage to property was heavy. In Tippera masonry buildings and old temples suffered a lot and the total damage was estimated at Rs 9,000.
1918	Known as the Srimangal Earthquake. Occurred on 18 July with a magnitude of 7.6 and epicenter at Srimangal, Maulvi Bazar. Intense damage occurred in Srimongal, but in Dhaka only minor effects were observed.
1930	Known as the Dhubri Earthquake. Occurred on 3 July with a magnitude of 7.1 and the epicenter at Dhubri, Assam. The earthquake caused major damage in the eastern parts of Rangpur district.
1934	Known as the Bihar-Nepal Earthquake. Occurred on 15 January with a magnitude of 8.3 and the epicenter at Darbhanga of Bihar, India. The earthquake caused great damage in Bihar, Nepal and Uttar Pradesh but did not affect any part of Bangladesh.
	Another earthquake occurred on 3 July with a magnitude of 7.1 and the epicenter at Dhubri of Assam, India. The earthquake caused considerable damages in greater Rangpur district of Bangladesh.
1950	Known as the Assam Earthquake. Occurred on 15 August with a magnitude of 8.4 with the epicenter in Assam, India. The tremor was felt throughout Bangladesh but no damage was reported.
1997	Occurred on 22 November in Chittagong with a magnitude of 6.0. It caused minor damage around Chittagong town.
1999	Occurred on 22 July at Moheshkhali Island with the epicenter in the same place, a magnitude of 5.2. Severely felt around Moheshkhali island and the adjoining sea. Houses cracked and in some cases collapsed.
2003	Occurred on 27 July at Kolabunia union of Barkal Upazila, Rangamati district with magnitude 5.1. The time was at 05:17:26.8 hours.

Source: National Encyclopedia of Bangladesh, Banglapedia, CD Edition February 2006

Bangladesh is surrounded by the regions of high seismicity which include the Himalayan Arc and Shillong plateau in the north, the Burmese Arc, Arakan Yoma anticlinorium in the east and complex Naga-Disang-Jaflong thrust zones in the northeast. It is also the site of the Dauki Fault system along with numerous subsurface active faults and a flexure zone called Hinge Zone. These weak regions are believed to provide the necessary zones for movements within the basin area.

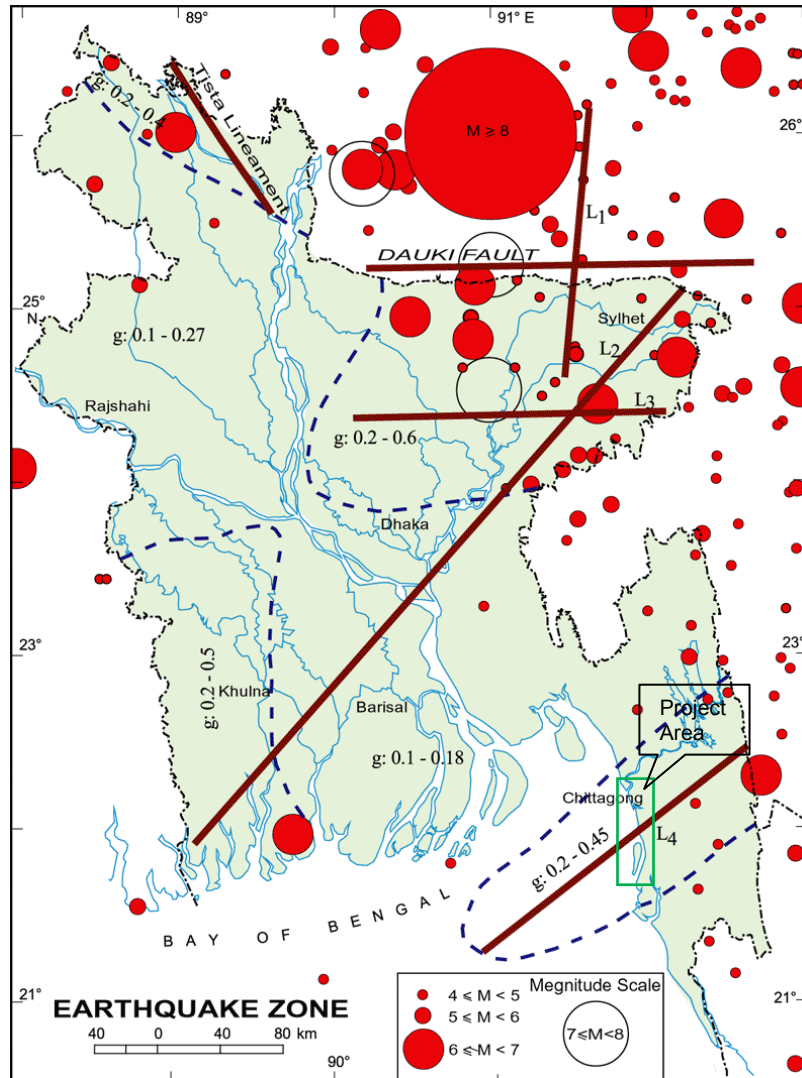


Figure-5.18: Earthquake Zone of Bangladesh
 Source: National Encyclopedia of Bangladesh, Banglapedia, CD Edition February 2006

In the project area the earthquake magnitude is 4-5 and in July 1999 the Moheshkhali Island and its adjoining sea were affected by around 5.2 magnitude earthquake. During the design of the project structure the historical information of earthquake should be taken care of. A recent historical earthquake statistics are provided below (Source: Bangladesh Meteorological Department).

Table-5.17: Historical Earthquake around Bangladesh

SI No.	Date (D/M/Y)	Lat (°N)	Long (°E)	Magnitude (Richter Scale)	Location of Epicenter
1	10-01-1869	24.79	93.17	7.5	Kachar , Assam , India
2	14-07-1885	24.70	89.55	7.0	Eastern Province , Nepal
3	12-06-1897	25.84	90.38	8.8	Shilang , Meghalaya , India
4	08-07-1918	24.16	91.75	7.6	Dauki , Meghalaya , India

SI No.	Date (D/M/Y)	Lat (°N)	Long (°E)	Magnitude (Richter Scale)	Location of Epicenter
5	02-07-1930	25.95	90.04	7.1	Dhubri , Assam , India
6	15-01-1934	26.60	86.8	8.3	Bihar-Nepal Border
7	23-10-1943	26.80	94.00	7.2	Assam, India
8	15-08-1950	28.79	95.62	8.6	Tibet , China
9	21-03-1954	25.86	94.00	7.2	Assam , India
10	08-07-1975	25.58	92.60	6.5	Assam, Sillon
11	06-08-1988	25.13	95.15	6.6	Manipur-Myanmar Border
12	21-11-1997	22.07	92.75	8.5	Arakan , Myanmar
13	11-08-2009	15.01	92.30	7.8	Andaman Islands

Source: National Encyclopedia of Bangladesh, Banglapedia, CD Edition February 2006

The latest earthquake status of Bangladesh and adjoining areas are stated below:

Table-5.18: Earthquake Status July 2011

Date	Time (UTC)	Latitude (deg:min)	Longitude (deg:min)	Magnitude	Distance(Km) from Dhaka Seismic Observatory	Region
28/07/2011	17:53:39.12	25:02.00N	088:58.00E	4.4	228	Nawgaon Region, Bangladesh
22/07/2011	00:58:49.36	24:20.67N	092:02.85E	4.1	183	Bangladesh-India Border Region
15/07/2011	19:59:37.22	27:51.30N	087:47.38E	4.4	525	Nepal-China Border Region
14/07/2011	12:15:13.69	22:38.00N	092:35.00E	3.2	254	Rangamati Region, Bangladesh
10/07/2011	23:16:08.00	21:14.00N	094:21.00E	4.2	491	Myanmar
10/07/2011	00:40:25.00	21:10.00N	093:80.00E	4.8	460	Myanmar

Source: National Encyclopedia of Bangladesh, Banglapedia, CD Edition February 2006

In July 2011 the magnitude of the earthquake was 3-5. The LNG project and Myanmar are very close and around 100 to 130 Km distance 4.2 and 4.8 magnitude earthquake happened in July 2011.

5.8 Availability of Sweet Water

Sweet water for drinking, household and other purposes is only available through shallow and deep tube wells sunk in the area and some sweet water homestead ponds of the localities around the project area.

5.9 Rate of Sedimentation

Coastal changes data during the last 55 years .reveal that the area is progressively changing due to high rate of sedimentations and a considerable land has been added to the main land.

5.10 Cyclone Effect

In meteorology, a cyclone is an area of closed, circular fluid motion rotating in the same direction as the Earth. This is usually characterized by inward spiraling winds that rotate anti-clockwise in the Northern Hemisphere and clockwise in the Southern Hemisphere of the Earth. Most large-scale cyclonic circulations are centered on areas of low atmospheric pressure. It is a

natural phenomenon which is unpredictable in terms of timing, intensity and the actual track. Obviously, no measure of design consideration can influence any of those three factors. The only option is to try to predict, as early as possible, the track and intensity of the cyclone storm. Figure-4.18 shows the track of the cyclone and maximum wind speed during the last 1960 to 2007.

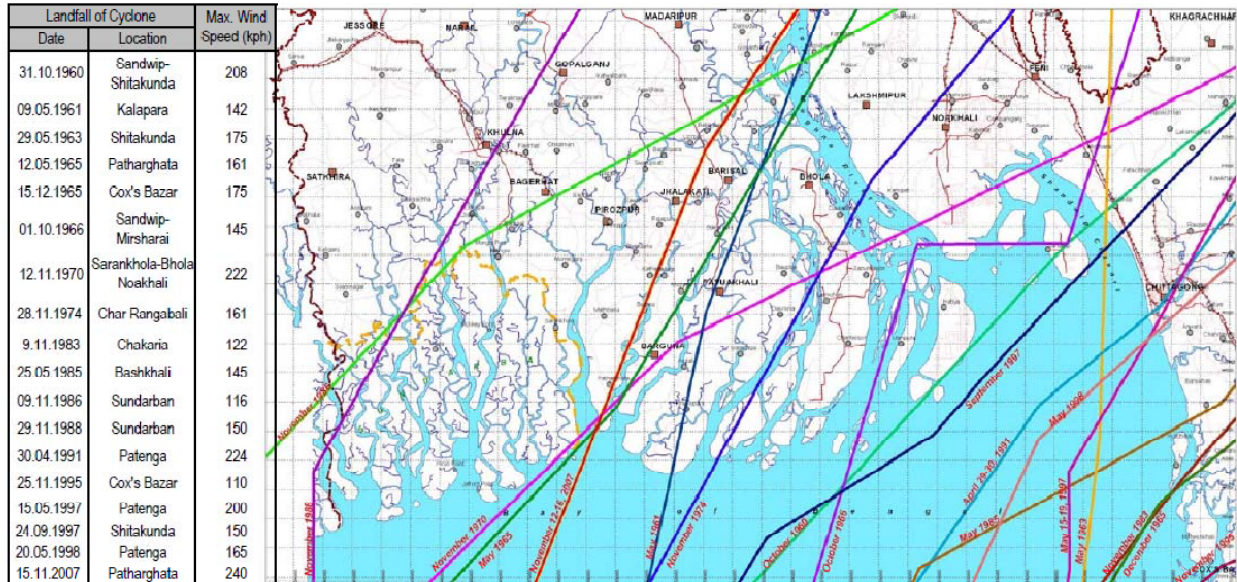


Figure-5.19: Tracks of major cyclones that crossed Bangladeshi coast from 1960-2007 Source:BMD 2007

Bangladesh Meteorological Department (BMD) regularly monitors the tropical cyclones and the Table-4.11 shows the enlisted major historical cyclones that occurred in and around Bangladesh from 2005 to 2015. Table-5.19 shows the Historical and major cyclones crossed Bangladesh Coastal Area, and their maximum wind speed. Cyclone, surge and tornado significance in the project area are shown in the Figure-5.20, Figure-5.21and Figure-5.22.

Table-5.19: Historical Cyclone

Sl. No.	Cyclone Name	Status	Landfall Area	Landfall Date
1	BAAZ	Cyclonic Storm	Weakened into a well-marked low pressure area over southwest Bay	02.12.2005
2	AKASH	Cyclonic Storm	Crossed south Bangladesh coast close to south of Cox's Bazar	14.05.2007
3	SIDR	Very Severe Cyclonic Storm	Crossed Bangladesh coast near Baleshwar River	15.11.2007
4	RASHMI	Cyclonic Storm	Crossed Bangladesh coast near Khepupara	26.10.2008
5	BIJLI	Cyclonic Storm	Crossed Bangladesh coast near Chittagong	17.04.2009
6	MAHASEN	Cyclonic Storm	Crossed Bangladesh coast between Chittagong and Feni	16.05.2013

Source: Bangladesh Meteorological Department, 2014

Table-5.20:Major Cyclones in Bangladesh

Date of landfall	Nature of Phenomenon	Landfall Area	Max. Wind Speed (kph)
11.10.1960	Severe Cyclonic Storm	Chittagong	160
31.10.1960	Severe Cyclonic Storm	Chittagong	193
09.05.1961	Severe Cyclonic Storm	Chittagong	160

Date of landfall	Nature of Phenomenon	Landfall Area	Max. Wind Speed (kph)
30.05.1961	Severe Cyclonic Storm	Near Feni	160
28.05.1963	Severe Cyclonic Storm	Chittagong-Cox's Bazar	209
11.05.1965	Severe Cyclonic Storm	Chittagong-Barisal Coast	160
05.11.1965	Severe Cyclonic Storm	Chittagong	160
15.12.1965	Severe Cyclonic Storm	Cox's Bazar	210
01.11.1966	Severe Cyclonic Storm	Chittagong	120
23.10.1970	Severe Cyclonic Storm	Khulna-Barisal	163
12.11.1970	Severe Cyclonic Storm with a core of hurricane wind	Chittagong	224
28.11.1974	Severe Cyclonic Storm	Cox's Bazar	163
10.12.1981	Cyclonic Storm	Khulna	120
15.10.1983	Cyclonic Storm	Chittagong	93
09.11.1983	Severe Cyclonic Storm	Cox's Bazar	136
24.05.1985	Severe Cyclonic Storm	Chittagong	154
29.11.1988	Hurricane wind	Khulna	160
18.12.1990	Cyclonic Storm	Cox's Bazar Coast	115
29.04.1991	Severe Cyclonic Storm with a core of Hurricane wind	Chittagong	225
02.05.1994	Severe Cyclonic Storm with a core of Hurricane wind	Cox's Bazar-Teknaf Coast	204
25.11.1995	Severe Cyclonic Storm	Cox's Bazar	140
19.05.1997	Severe Cyclonic Storm with a core of hurricane wind	Sitakundu	232
27.09.1997	Severe Cyclone with Hurricane wind	Sitakundu	150

Source: Bangladesh Meteorological Department, 2014

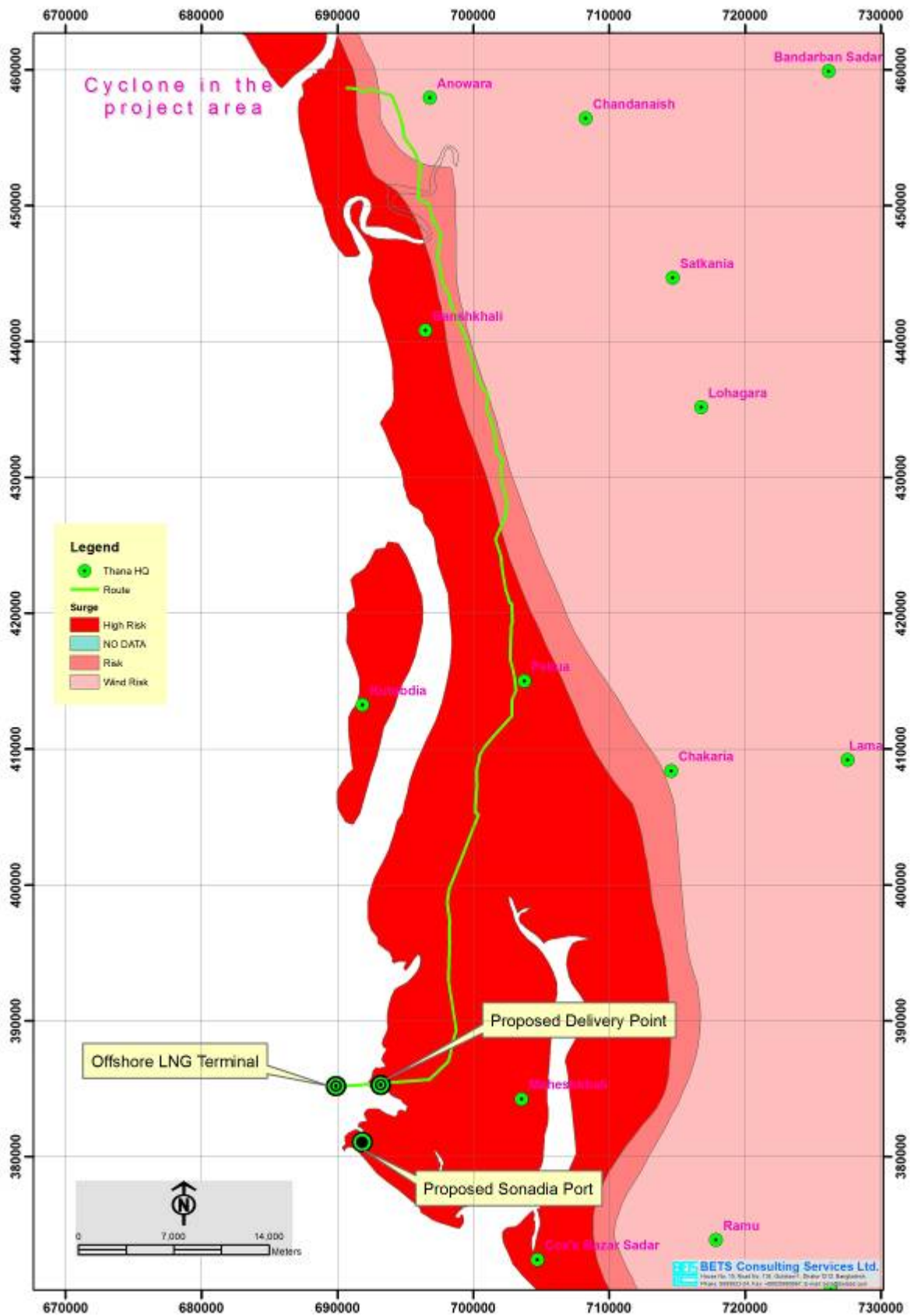


Figure-5.20 Project area Cyclonic Significance
 Source: Centre for Hazard and Risk Research

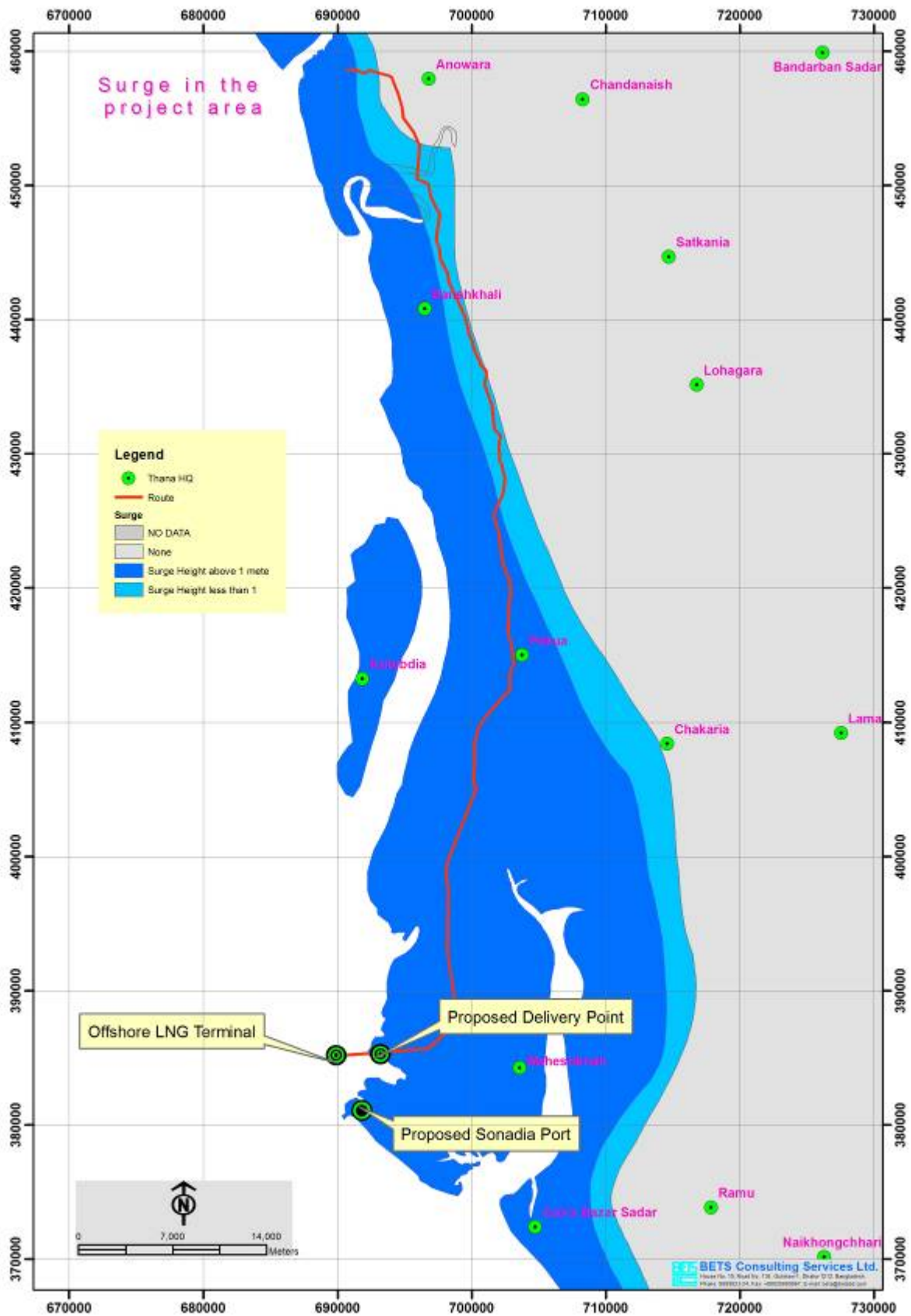


Figure-5.21 Project area surge significance
 Source: Centre for Hazard and Risk Research

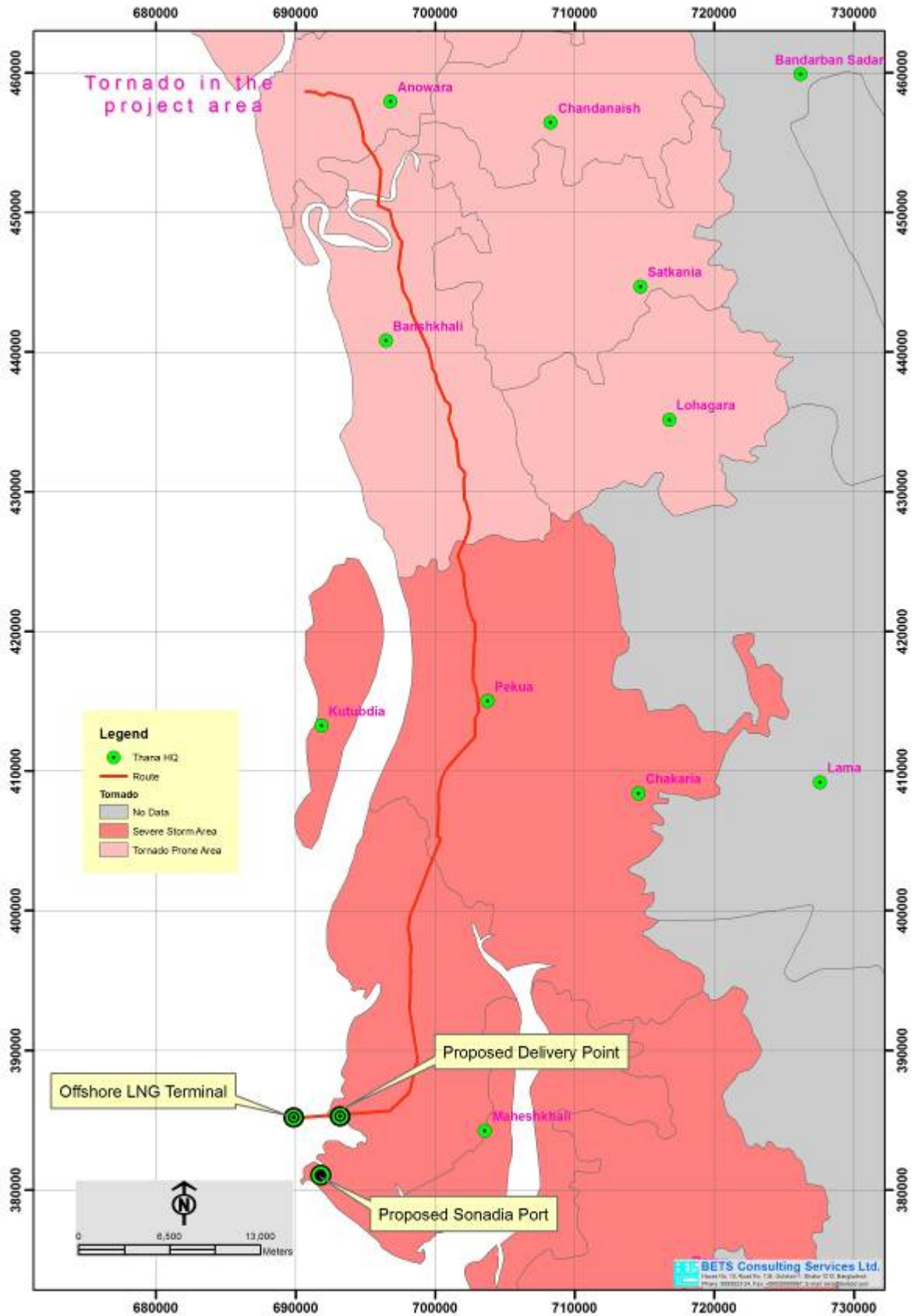


Figure-5.22 Project area Tornado significance

Source: Centre for Hazard and Risk Research

5.11 Seal Level Rise

Sea level rise is a crucial issue of climate change and has various impacts on Bangladesh. Its potential threats will come even more strongly in the future. Shore line erosion, river bank erosion, salinity intrusion, flood, damage to infrastructures, crop failure, destruction of fisheries, loss of biodiversity may be caused due to the sea-level rise etc.

The average increase in temperature of Bangladesh would be 1.3°C and 2.6°C by the year 2030 and 2075 respectively with respect to the base year 1990 (Ahmed and Alam, 1999). Two estimations of potential future sea level rise for Bangladesh are 0.30-1.5 m and 0.30-0.50 m for 2050 (DoE, 1993). Analysis of historical data from 1977 to 1998 shows annual sea level rise at the rate of 7.88 mm, 6 mm and 4mm respectively in Cox's Bazaar (Shamsuddoha and Chowdhury, 2007). Figure-5.23 shows the Erosion and Accretion Map of the project Area.

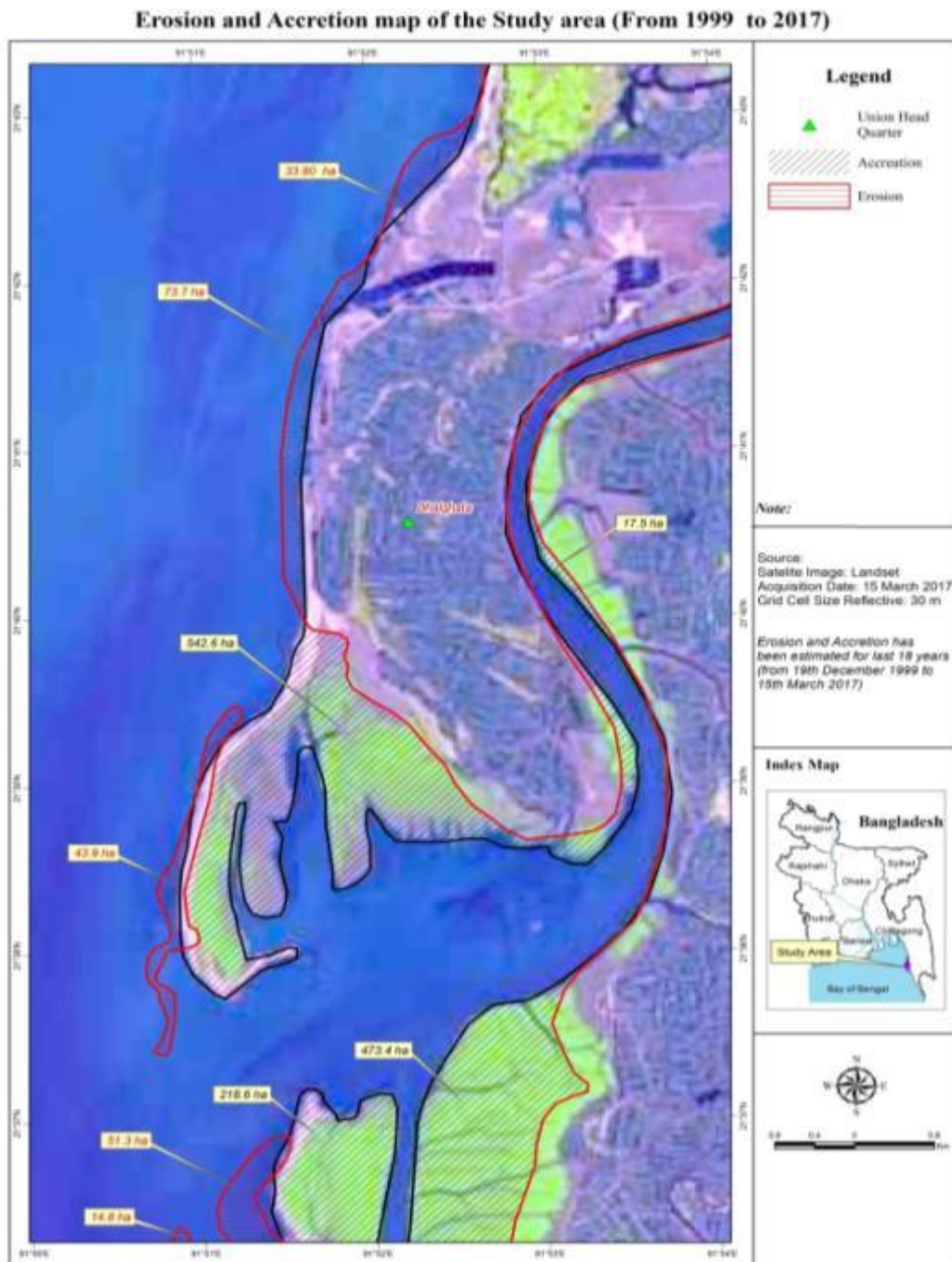


Figure-5.23 Erosion and Accretion Map of the project Area

5.12 Habitation

In the study area there are villages for human settlement with seasonal agricultural and fishery farms. Small farm size is one acre land with highest farm size is of 5 acre approximately. Though salt and shrimp production are the main sources of earning, one should be skilled enough and understand the process. Regarding distribution of income, goods and service, it may be mentioned that about 95% family depends on salt and shrimp cultivation and rest 5% depend on business and service. 20% families are landless and they work as daily labor on others land. And roughly 75% cultivates own land. Of 75 % (45% cultivates own land and in lease land and 30% cultivates absolutely in own land). The landless family earn monthly about Tk. 6,000. Farmer of Share cropper (own plus share cropping) earn about Tk.10,000 monthly. And rich farmer earns Tk.20, 000+ per month. Businessmen and service holder earn on an average of Tk 10,000 to 15,000 monthly.

5.12.1 Recreation

There are no recreational facilities in the area except listening to radio and watching TV. There is cable connection in the market area. Poor people watch TV in the tea stall. But occasionally educational institutions arrange cultural function and cricket and football matches as a part of recreation.

5.12.2 Public Health

No health facilities are available in the area except community health centre. But no mentionable facilities were found particularly within the survey area. In case of requirement of health facilities poor ones goes to Upazila health centre and Cox's bazaar General Hospital. But rich ones go to Chittagong. Normally poor and common people go to quack doctors and medicinal shop. About 50% people use sanitary latrine. Others have hanging latrine. Normally, the diseases they suffer from are: dysentery, diarrhea, cough, jaundice etc.

5.12.3 Education

Education is not wide in the area. Literacy rate is about 60%. Out of this 60% about 10% is in the group of HSC+. 40% of the total population roughly is illiterate. There is primary and high school in Panirchara bazaar. And there is a college in Upazila headquarters of Moheshkhali.

5.12.4 Cultural Property

Historical Adinath temple situated in Moheshkhali Upazila. No historical and archaeological site is found within the survey area.

5.12.5 Vulnerable group

No vulnerable or religious minority group was found in the area during the survey. But some 'Raphine' community live in Moheshkhali. But in general, the landless people are mainly in vulnerable situations in the survey area.

5.12.6 Customs, aspirations and attitudes

The people of the area are very conservative. So female normally wear scarf and work only in the household. They do not work in the field. Local road network is not developed so much. They need more pucca road. Sometimes tidal surge damage shrimp ghers and washes away salt land. Hence, polder protection is needed for future development.

Lack of needed cyclone shelter causes losses of lives and property during cyclone. So, local people urge necessary infrastructure development. It may be highlighted here that Moheshkhali is a beautiful offshore island with hills and greeneries all around. There is a historic temple, called Adinath Mandir in Moheshkhali Upazila headquarter. So the island can be developed as tourist hub. Also, the people have been demanding more educational facilities in the island.

There is no provision of gas distribution in Moheshkhali and they have been asking for the same since long. In fine, plenty of salt, shrimp and sea fish are available in the island. It should be supported and proper price is to be ensured for the primary producers.

5.12.7 Planned Development Activities

No planned development activities were seen in and around the site. Normal development activities are local government road, growth centre and educational institution in the survey area.

5.13 Socio-Economic Condition

5.13.1 Population & Land use pattern

According to the citizen charter of two unions (Boro Moheshkhali and Kutubjom unions) of study area total population is of in the survey area is 130,000. (<http://www.bangladesh.gov.bd/site/view/union-list>). Land use broadly observed to be of salt cultivation with sea water and shrimp cultivation, human settlement, growth centers, educational institutions and kutchra road and mangrove trees.

All the land in Kaladiar Char is barren. Main land of Kalirdiar Char is mostly used for salt cultivation (May to October) and shrimp cultivation ((November-April).

5.13.2 Human settlement & Community Structure

In the study area there are villages for human settlement. The local name of human settlement unit is known as 'bari'. In a Bari, normally one H.H lives. The community is locally known as 'samaj' and is clustered by mosque. Approximately, about 200 H.H makes a 'Samaj' or community. Normally a samaj is made by relatives who live in the village. Traditionally elder person and influential lead the samaj and it mainly deals marriage, social transaction and social security etc.

5.13.3 Employment and Labor market

Land use pattern of the onshore study area mostly comprises salt and shrimp cultivation. People mainly depend on salt and shrimp cultivation in the survey area. None was found to be in migration in the survey area but in Moheshkhali some labor goes to Chittagong, Cox's bazaar and for overseas job. And some workers go to sea with mechanized fishing boat in the Bay of Bengal. Wages of labor is Tk. 300 per day for salt cultivation. Production of salt is usually 1, 700 mounds per acre of salt land. Current year's salt price is Tk.300 for 40 kg of salt. So per acre production price is Tk. 2, 10,000. The lease money is 25,000 per acre for 6 months. Material cost is Tk. 10,000. labour cost (300x2x180=1, 08,000). Current year's net profit is Tk. 67,000. But last year salt price was too cheap Tk 90 per 40 kg. And salt farmers were not benefited at all. Dry fish industry is found in Moheshkhali outside the survey area and this is done in a traditional process.

5.14 Fishing Activities and Communities

The project area is situated on the eastern side of the Bay of Bengal and the Moheshkhali Channel. The area is highly potential for shrimp farming during wet season and in dry season it is replaced by salt pan. Shrimp is a highly valued foreign currency earning product and it earned 2.12% of country total export earnings in 2011-12 fiscal years while country's export earnings from the fisheries sector is 2.46%. This sector contributes 4.39% to the national GDP and almost one-fourth to the agriculture GDP, 22.76% (Bangladesh Economic Review, 2012). The study area falls in Cox's Bazar districts has alone the potential of contributing around 0.07% of export earnings through shrimp. The growth rate of this sector over the last 10 years is almost steady and encouraging, varying from 4.76% to 7.32% with an average 5.61%. During field investigation following habitats have been identified in the study area. These are:

(i) Canal/Khal/Chhara, (ii) Mangroves and (iii) Intertidal area broadly under inland capture fishery; (iv) Pond, (v) Lake, (vi) Ditch, and (vii) Shrimp farms, broadly under inland culture fishery; and (viii) Marine capture fishery. Habitats are highly diversified in the range of fresh water to saline water condition having variety fish species.

In and around the project area there are twelve fishing catch composition points. These twelve land survey points the Department of Fisheries do the survey on fishing activities. Of them six land survey points fishermen are directly involved in the project areas socioeconomic activities.

As said earlier people mainly depend on salt and shrimp cultivation in the project area. Some workers go to sea with mechanized fishing boat in the Bay of Bengal. Dry fish industry is found in Moheshkhali outside the survey area and this is done in a traditional process. Sometimes fish are dried by using unhygienic chemical. A lot of labor works in fish drying. But no such initiative was found in survey area. Regarding fishery, lease value of land is Tk. 6,000 per acre for 6 months. After paying off the production costs and current year's price of Tk.700 per kg of fish, net profit stands at Tk. 41,000 per acre. Approximate Land price in the field is 5 lacs per acre.

There are 42 nos Fishing association currently exists in Moheshkhali upazila. Consultant Team conducted a Focus Group Discussion (FGD) with an association of Fishermen named "Gotibhanga Fishing Association" During discussion they informed major fishermen of their association currently live in Boromoheshkhali, Dhalghata and kutubjom union.

Department Fisheries distributed Registration Identification Number Card under "Fishermen Registration Programme-2012-2016". A typical Fisherman ID card shown in Figure-5.24 Currently in Moheshkhali upzial total number of registered fishermen is 11,442 (Date-18/10/2017)



Figure-5.24: Typical Fishermen ID card

CHAPTER-6: IDENTIFICATION & EVALUATION OF POTENTIAL IMPACTS

6.1 Introduction

This section identifies and assesses the potential impacts in the environment that could be expected from the proposed LNG terminal off Moheshkhali Island in Bangladesh. The impacts due to the Project activities across different phases have been identified and assessed. The Project activities will impact the physical, social and ecological environment in two distinct phases:

- Construction
- Operation

Impacts are identified and predicted based on the analysis of the information collected from the following:

- Project information (as outlined in *Section 4*);
- Baseline information (as outlined in *Section 5*).

The identification of likely impacts during construction and operation phases has been carried out based on likely activities having their impact on environmental and socio-economic parameters. The impact assessment methodology; identification of potential impacts due to the LNG Project related activities and their potential impacts have been worked out in the following

6.2 Impact Assessment Methodology and Approach

Impact identification and assessment starts with scoping and continues through the remainder of the impact assessment process (IAP). The principal impact assessment (IA) steps are summarized in Figure-6.1 and comprise:

- **Impact prediction:** to determine what could potentially happen to resources/receptors as a consequence of the Project and its associated activities;
- **Impact evaluation:** to evaluate the significance of the predicted impacts by considering their magnitude and likelihood of occurrence, and the sensitivity, value and/or importance of the affected resource/receptor;
- **Mitigation and enhancement:** to identify appropriate and justified measures to mitigate negative impacts and enhance positive impacts;
- **Residual impact evaluation:** to evaluate the significance of impacts assuming effective implementation of mitigation and enhancement measures.



Figure-6.1 Impact Assessment Process

6.3 Identification of Potential Impacts

The potential impacts have been identified through a systematic process whereby the activities (both planned and unplanned) associated with the Project have been considered with respect to their potential to interact with environmental and social resources or receptors. In addition to the project components like the FSRU, subsea gas pipeline, onshore gas spur pipeline from Tie in point to CTMS has also been considered for the purpose of this current assessment.

The interaction matrix shown in Table-6.1 enables a methodical identification of the potential interactions each Project activity may have on the range of resources/ receptors within the Area of Influence i.e. the study area for the Project.

Mitigation measures or management controls to be applied to eliminate or minimize adverse impacts were also identified. The significance of impacts were assessed prior to mitigation and then re-assessed following mitigation measures. If acceptable-, no further mitigation was developed. If unacceptable-, further mitigation has been developed.

Table-6.1: Impact Identification Matrix for LNG Terminal (with FSRU) off Moheshkhali Island

Project Activity/ Hazards																							
	Environmental Resources										Ecological Resource			Social-Economic Resources									
	Aesthetic & Visual Impact	Land Use	Soil/ Sediment Quality	Air Quality	Ambient/Underwater Noise & Vibration	Topography & Drainage	Surface water resource	Surface water quality	Ground water resource	Ground water quality	Traffic (road & river)	Terrestrial Flora & Fauna	Aquatic Flora (Inland & Marine)	Aquatic Fauna (Inland & Marine)	Migratory Route/ Corridor	Job & economic opportunity	Economy & Livelihoods	Social & Cultural Structures	Land Use (Economic Displacement)	Infrastructure & Services	Cultural Resources	Community Health & Safety	Occupational health & safety
Construction Phase																							
Construction of FSRU																							
Setting up of FRSU including initial discharge of ballast water																							
Construction of land based facilities																							
Land Purchase/ Acquisition																							
Site Clearing																							
Filling of land																							
Building of structures including temporary structures																							
Laying on Onshore pipeline and testing																							
Construction of subsea pipeline																							
Associate Activities																							
Heavy equipment operations																							
Storage, handling and disposal of waste																							
Generation of sewage and discharge																							
Influx of construction workers																							
Transportation of manpower, equipment & materials over water or by road																							
Storage and handling of chemicals (unplanned release)																							

Project Activity/ Hazards	Environmental Resources										Ecological Resource				Social-Economic Resources								
	Aesthetic & Visual Impact	Land Use	Soil/ Sediment Quality	Air Quality	Ambient/Underwater Noise & Vibration	Topography & Drainage	Surface water resource	Surface water quality	Ground water resource	Ground water quality	Traffic (road & river)	Terrestrial Flora & Fauna	Aquatic Flora (Inland & Marine)	Aquatic Fauna (Inland & Marine)	Migratory Route/ Corridor	Job & economic opportunity	Economy & Livelihoods	Social & Cultural Structures	Land Use (Economic Displacement)	Infrastructure & Services	Cultural Resources	Community Health & Safety	Occupational health & safety
Operation Phase																							
Fugitive emission from FSRU																							
Emission from captive power plant																							
Emission from LNG carrier ship																							
Illumination from FSRU and CTMS Facility																							
Physical presence of FSRU (Safety zone)																							
Noise generation due to operation of plant and auxiliaries																							
Discharge of return cold water from FSRU																							
Generation and discharge of Ballast & Bilge water from FSRU/ LNG Carrier ship																							
Generation of domestic waste water and discharge from FSRU, onshore facility																							
Industrial and domestic water demand for operation of facilities																							
Wastewater discharge/ disposal																							
Wastes – domestic waste and other non-hazardous wastes handling, storage																							
Hazardous material and waste storages																							

- = Represents "no" interactions is reasonably expected
- = Represents interactions reasonably possible but none of the outcome will lead to significant impact impacts
- = Represents interactions reasonably possible with one of the outcomes may lead to potential significant impact

6.4 Construction Stage Impact

During Project construction, the primary impacts would be associated with installation of some 4 km long sub sea pipeline, including physical disturbance of the seafloor / benthic habitat and temporary turbidity and sedimentation associated with the seafloor disturbance. It is presumed that Project construction would disturb a few hundreds of acres and most disturbances would be caused by anchor cable sweep. Hence, if mid-line buoys are used on all anchors of the construction barges, cable sweep impacts would be substantially reduced and the total seafloor impacts would be reduced thereby or alternatively, use a dynamically positioned lay barge that would have little or no effect on the seafloor. Plowing the pipeline trench would result in some turbidity in the water column during active construction. Turbidity plume models usually indicate that increases in turbidity would be greatest near the bottom. It is further expected that the increase in turbidity in surface waters would be in compliance with water quality standards and that turbidity levels would dissipate within approximately 12 hours of sediment disturbance.

Prediction of Impact

- The overall construction is required to handle LNG safely throughout the year. The Tie-in site has a sandy shore and is classified as a low eroding site. Littoral transport is negligible and thus shoreline changes will be negligible.
- Capital dredging might not be required to handle deeper draught vessels in protected areas
- Maintenance dredging expected to be insignificant and has to be confirmed with model studies.
- Land reclamation / filling and dumping may cause impacts on water/sediment quality.
- The proposed construction of the LNG facility is not in close proximity to any existing facilities, but the land in and around the Tie-in point is currently under different private & public ownership and thus any impact shall be incremental on existing conditions. Till date, though not much EIA have been done in the vicinity, the environmental quality has not indicated any significant change
- Proposed LNG operations will require a risk assessment, while operations with adequate safety measures, inspection, maintenance, procedures and onsite /offsite EMP;
- Transportation of construction materials to be done with adequate EMPs in place to prevent impacts on transport route
- Construction activities causing air quality impacts are temporary, intermittent and reversible;
- Impacts on noise quality from piling and dredging operations, if any, shall be temporary and limited to the project site
- There are no resettlement issues. Land acquisition is limited to 144 acres.

6.4.1 Seabed Disturbance

During Project construction, the primary impacts would be associated with installation of some 3-8 km long sub sea pipeline, including physical disturbance of the seafloor / benthic habitat and temporary turbidity and sedimentation associated with the seafloor disturbance. It is presumed that Project construction would disturb a few hundreds of acres and most disturbances would be caused by anchor cable sweep. Hence, if mid-line buoys are used on all anchors of the construction barges, cable sweep impacts would be substantially reduced and the total seafloor impacts would be reduced thereby or alternatively, use a dynamically positioned lay barge that would have little or no effect on the seafloor. Plowing the pipeline trench would result in some turbidity in the water column during active construction. Turbidity plume models usually indicate that increases in turbidity would be greatest near the bottom. It is further expected that the increase in turbidity in surface waters would be in compliance with

water quality standards and that turbidity levels would dissipate within approximately 12 hours of sediment disturbance.

6.4.2 Impact of Pilling Discharge

Construction of the mooring system would include pile driving, with the specific methods to be used to be determined after completion of detailed geotechnical surveys. It has been recommended that pile driving is limited to seasons when nationally listed species are virtually absent (December 1 through March 31) and that other activities are coordinated to determine the appropriate measures to avoid and minimize noise impacts of pile driving and other construction and operation activities on biological resources. Additional recommendations have also been included to avoid and minimize potential construction impacts.

6.4.3 Impact Potential Impact on Air Quality

Potential impact on ambient quality could arise due to:

- Site development;
- Operation of vehicles and construction machinery;
- Construction material transport, storage, handling and construction waste disposal;
- Operation of diesel generator (DG) sets.

6.4.4 Impact of Underwater Noise on Marine Fauna

The potential impacts on underwater noise generation on marine fauna will be due to piles driving for development of foundation of jetty. The sound pressure level (SPL) and sound exposure levels (SEL) expected during piles driving will be impulsive type that are likely to prevail for ~90 milliseconds with single strike per second in the shallow water of ~15 m depth. During construction phase, there will be potential impact on marine fauna due to underwater noise generation mainly during pile driving activities for jetty construction at ~1.5 km from the shore. The sound energy generated from source of pile driving due to hammering of piles into seabed propagates compression and transverse waves along the length of the piles into seabed through marine water column. The proposed mitigation measures are as follows:

- Generate low intensity impulsive noise prior to start of pile driving activities and ensure that any visible marine fauna moves away from the underwater noise source.
- Use of Big bubble curtain (BBC) -freely rising bubbles injected by
- perforated pipes encircling the pipe reduces underwater noise propagation;
- Using High frequency -low energy piling technology

6.4.5 Potential Impacts on Ground Water Quality

The spillage and seepage of chemical, oil and lubricants from storage area, waste handling area and generation of domestic waste/wastewater from construction labour camp may adversely affect ground water quality.

6.4.6 Potential Impact on Surface Water Quality

Potential impact on surface water quality could arise due to:

- Surface runoff from construction site;
- Generation and disposal of domestic waste water from construction camp;
- Use of biocides;
- Discharge of hydro-testing water.

6.4.7 Impact of Discharge of Industrial & Domestic Wastewaters

Impact Assessment: Surface run off from oil storage waste handling unit (waste oil, used oil, etc.) may lead to the pollution of receiving water bodies. The surface run off may contain oil and lubricant, in case there is spillage from above mentioned areas. However, taking into account the provision of onsite drainage system with sedimentation tank, oil filters, etc., the pollution load is not expected to be significant.

The grey water, black water, ballast water and bilge water will be discharged into the Chittagong Port facility. There will be no direct discharge into the sea. The impact on surface water quality is assessed to be minor.

Mitigation Measures: The mitigation measures are as follows:

Channelize all surface runoff from through storm water drainage system and provide adequate size double chambered sedimentation tank

Impact	Surface water quality impact due to operational activities			
Impact Nature	Negative	Positive Neutral		
ImpactType	Direct	Indirect	Induced	
ImpactDuration	ShortTerm	Medium Term	LongTerm	
ImpactExtent	Local	Regional	National	
Impact Scale	Low	Medium	High	
ImpactMagnitude	Negligible	Small	Medium	Large
Resource/Receptor Sensitivity	Low	Medium	High	
	Negligible	Minor	Moderate	Major
Impact Significance (WithoutMitigations)	SignificanceofimpactisconsideredMinor			
ImpactMagnitude (WithMitigations)	Negligible	Small	Medium	Large
Impact Significance (WithMitigations)	Significance of impactisconsideredMinor.			

Residual Impact: Considering the implementation of above mentioned mitigation measures, the significance of residual impact on surface water quality during operation phase is assessed as Minor.

6.6 Operation Stage Impact

Impacts associated with operation of the proposed Project, including the impacts of LNG carriers in transit and at berth, are summarized below.

Prediction of Impact

In general, the use of carriers to ship LNG to the Project would result in a minimal increase in overall commercial shipping in the Bay of Bengal. Since the carriers would transit deepwater areas, normal LNG carrier operation would have little impact on offshore or near shore resources such as bottom sediments and bottom dwelling biota, or on the shoreline and onshore resources such as shoreline erosion, wildlife, wetlands, threatened and endangered species, cultural resources, residences, and land use.

Impacts to water resources would primarily be associated with the intake and discharge of seawater by the FSRU and LNG carriers. Most of the water taken in by the FSRU would be used for ballast when discharging vaporized LNG. When taking on LNG from the carriers, the ballast water in the FSRU would be returned to the sea. LNG carriers would take on water primarily for use in cooling and for ballast when LNG is being unloaded. The cooling water would be returned and the carriers would depart with ballast water that was taken on. The LNG carriers would not be allowed to discharge any ballast water in the Project Waterway.

Typically, usual annual water intake of the FSRU averages approximately 5.5 million gallons per day, with a 50 % additional maximum daily intake during periods of peak gas send out. Assuming that an average of 118 LNG carriers would deliver LNG to the FSRU each year, the carriers' average daily water intake of water would be approximately 22.7 million gallons per

day, including ballast and cooling water. This total represents about 0.005 percent of the total daily seawater inflow.

6.6.1 Impact Potential Impact on Air Quality

The sources of air emission in the offshore region include a) natural gas combustion pollutants from gas turbines (1 operating + 1 standby) onboard FSRU of 10 MW capacity and captive power generation facility at site with natural gas as primary fuel and HSD as a secondary fuel.

6.6.2 Potential Impacts on Ground Water Quality

Ground water may be contaminated from the operational area due to spillage of oil & lubricant or hazardous waste. The mitigation measures and impact will be same as in construction phase.

6.5.3 Potential Impact on Surface Water Quality

- Generation and discharge of grey & black water from the FSRU;
- Discharge of ballast water and bilge water from LNG carrier;
- Surface runoff from the land based facility;
- Generation and disposal of domestic waste water from the land based facility
- Cold water and Machine cooling water discharges from FSRU
- vaporization of LNG

6.6.4 Potential Impact on Noise

Ambient noise during operation phase will be primarily generated from operation onboard FSRU from power generation unit, pumps and compressors. The location of the FSRU is proposed to be located more than 10-15 km away from any nearest settlement at Moheshkhali Island, the likely impact of ambient noise on human receptors is likely to remain within the existing ambient noise conditions.

6.6.5 Impact of LNG Vaporizer Cold Water & Machine Cooling Water Discharge

Impact Sources: During operation phase, the FSRU option would involve use of sea water for vaporisation in the re-gasification process and for engine cooling. The intake point will be located on the eastern side of the FSRU while the discharge point will be located on the western side of the FSRU in open sea. There will be cold water discharge (maximum of 15,000 m³/ hour) at 7 degrees Celsius less than ambient temperature and machine cooling water (maximum 3000 m³/hour) at 4 degree Celsius more than ambient will be discharged from engine room.

Both cold water and machine cooling water will be discharged offshore to allow maximum mixing of the thermal plume to ensure that the temperature is within 3 degrees Celsius of ambient temperature at the edge of the mixing zone as required under the International norms.

A) LNG Vaporizer Cold Water Discharge

- Discharge rate of 15,000m³/hour, 4.17m³/sec with drop of 7°C temperature below the ambient from single outfall pipe with assumed diameter of 1.5m
- Horizontal discharge at 90° to the hull from 4 m above water surface;
- Considered discharge salinity the same as that of ambient salinity
- Average wind speed of 5m/sec; and
- Ambient currents perpendicular to the discharge direction

B) Machine Cooling Hot Water

- Discharge rate of 3,000 m³/hour, (0.833 m³/sec) with increase of 4°C temperature above ambient from single outfall pipe with assumed diameter of 1.5 m
- Horizontal discharge at 90 to the hull from 4 m above water surface;
- Considered discharge salinity the same as that of ambient salinity

- Average wind speed of 5 m/sec;
- Ambient currents perpendicular to the discharge direction; and
- Heat loss coefficient of 64.4 and 100 W/m²/°C used for ambient water temperature of 18 °C and 30 °C, respectively

The significance of impact of cold water and machine cooling water will be **Minor**.

Impact	Impact of LNG Vaporizer Cold Water and Machine Cooling Water Discharge on Marine Biota.			
Impact Nature	Negative		Positive	
Impact Type	Direct		Indirect	Neutral
Impact Duration	Short Term		Medium Term	Long Term
Impact Extent	Local		Regional	National
Impact Scale	Low		Medium	High
Impact Magnitude	Negligible	Small	Medium	Large
Resource/Receptor Sensitivity	Low		Medium	High
Impact Significance (Without Mitigations)	Negligible	Minor	Moderate	Major
Impact Magnitude (With Mitigations)	Significance of impact is considered Minor			
Impact Significance (With Mitigations)	Negligible	Small	Medium	Large
Impact Significance (With Mitigations)	Significance of impact is considered Minor .			

Residual Impact: Considering the implementation of above mentioned mitigation measures, the significance of residual impact of LNG Vaporizer cold water and machine cooling water on marine biota during operation phase is assessed as Minor.

6.6.6 Impacts from atmospheric Emissions

The project itself, principally through combustion on the FSRU, will emit small amounts of pollutants that have the potential to effect human health. However, the offshore location of the FSRU reduces the potential for its emissions to cause potential human health impacts. Current study and other LNG project experience indicate that the worst-case operational scenario of the FSRU along with LNG carriers and tug is unlikely to result in exceeding the air quality standards and guidelines.

6.6.7 Wastes

The potential environmental impacts of wastes resulting from the proposed Project would be largely limited to the immediate vicinity of the proposed FSRU and pipeline during construction and the FSRU location during operation. Few impacts would be associated with use of the existing onshore office, warehouse and along the LNG carrier transit routes.

The quantities of solid waste generated from the operation of the FSRU are likely to be small and consist mainly of batteries, waste oil, grease and oil filters and containers such as paint, aerosols and solvents. Solid waste will be sorted and transported to shore for recycling or disposal. No hazardous waste is likely to be produced from the operation of the FSRU.

Thus, the proposed Project, under normal operating conditions, would not be expected to impact sensitive onshore or near shore resources such as wetlands, terrestrial wildlife and birds, fisheries, shellfish beds.

The Marine and terrestrial survey undertaken in October-November-2017 for the project showed no evidence of any disturbance to the project immediate area due to any planned development activities. In fact survey of 5 km area surrounding the onshore tie-in point depicted some forestry but did not reveal any residences or human habitation except the wetlands, which are being used for prawn cultivation in wet season and salt cultivation in the

dry season every year and there is no residences, businesses, or county, state, or national parks nor there is any historical heritage.

This has prompted to develop the proposed sitting and planned for design, as well as the construction and operation methods and procedures, in an effort to reduce the potential impacts of the proposed Project. In addition, measures have been recommended to avoid or further minimize potential impacts due to wastes to the environment.

6.6.8 Potential impacts of physical structure at sea

The primary impact of physical structures at sea to biological resources during operation would be the impingement / entrainment of ichthyoplankton (the eggs and larvae of fish drifting in the water column) due to the intake of water from the ground. Based on the water depth of the FSRU intake structures and the low intake velocity, the actual impingement/entrainment would be considerably less than the average densities incorporated into usual loss estimates. As a result, there would be a negligible long-term impact to ichthyoplankton and, therefore, on the general fisheries resources.

6.6.9 Impacts of Abandonment or Suspension

At the end of its useful life or suspension of operation, the FSRU will be decommissioned by disconnecting the gas loading arms and mooring lines, and it will then either stay duly anchored or leave the port. Consideration will be given to the potential reuse of the jetty. A Decommissioning Plan will be prepared before decommissioning operations commence to determine the potential health, safety and environmental impacts that the removal of the jetty, piles and pipelines may have. Potential impacts from decommissioning activity will depend on the final option selected.

6.7 Accidental Events

6.7.1 Hydrocarbon spills

The likely credible scenario from a LNG tanker spill is spill of the entire quantity of LNG from one of the compartments of the LNG carrier. Estimated maximum distance to LFL concentration of 44000 ppm under certain weather condition is 327m from the point of release; In that case dispersion occurs within the jetty area. The risk for radiation intensities due to fire ball is likely to occur if there is an ignition source.

The Port operator shall deploy trained manpower for managing the waterfront activities. The waste management plan shall be compliant with requisite standards. The Port Operator will be entrusted with the responsibility and cargo transfer procedures as per guidelines of international bodies for vessels and shore facilities for Pollution control. Additionally port operator shall completely control and verify compliance with the checklist before unloading operation bunkering operation and compliance with rules and guidelines specified by International Maritime Organization. Roles and responsibilities of the various agencies involved in combating oil pollution in the event of spillage include provision of anti-pollution equipment and material for prevention management application at any time of such spillage. One Tugboat shall be fitted with anti pollution equipment. This Tugboat shall also be fitted With two four hundred meters of oil trapping boom designed for sea; six (6) mooring buoys for the oil trapping boom; two pumps designed to pump very heavy and viscous oil. Two of the four tugboats shall be classified for handling liquids of the following characteristics:

- Freshwater
- Fuel oil
- ME Lube oil
- Foam and
- Detergent

The tugboats shall be equipped with 8 fire extinguishers, 2 fire pumps, 8 life buoys, and 12 jackets and gas detection meter etc.

The Coast Guard or the Fire Brigade Commander is also to keep equipment and personnel in constant readiness, Coordination of activities, receive reports of oil pollution and mobilize Coast Guard resources to support the On Scene Commander (OSC) action at spill area of the LNG Import Terminal. There will be provision of administrative and infrastructure to the Regional Communication Center (RCC) to conduct and maintain a list and assess available resources including local, regional, national and International groups, and the scale of spillage at which they should be contacted. Conducting periodical exercises of combating oil pollution, Maintaining and updating inventory on anti-pollution drive and provide assistance to local groups in implementation of Local Action Plan are other essential elements of mitigating measures in such situations of Hydrocarbon spills.

6.7.2 Large Scale Gas Release

Unplanned and accidental Release of gas in large scale is a potential cause of exceptional risks associated with the project were assessed. This is one of the potential adverse impacts were identified as a result of accident scenarios associated with the construction and operational phases of the project. These included which some time assessed to be the impacts of low, medium and high significance.

However, with the implementation of mitigation measures the majority of such impacts including accidental release of gas in large scale could be reduced to low significance provided the proponents are committed to working with the FSRU operators, LNG carriers and the Port Authorities to ensure that suitable-emergency response procedures and equipment are in place to minimize the effects of such incidents.

Contingency plans prepared meeting this accidental release of gas in large scale should be backed up by adequate and well established procedures, necessary supplies of personal protective equipment and personnel trained to deal with are essential to ensure an effective response. Well defined roles and responsibilities of the various agencies involved in meeting such emergencies includes but not limited to Identifying releases: its location, size, source and intimate site main controller and also to Inform statutory bodies for immediate external support is needed, if any.

6.7.3 Fire and explosions

The Risk Assessment study reveals that Lower Flammability Limit is located within the premises of the proposed terminal for the most probable scenarios. The Operating personnel have to be extensively trained in fire fighting at LNG terminals in operation elsewhere. Fire has to be controlled professionally without attempting to put it out. The choice of withdrawal of emergency response personnel will depend on the accident assessment and the Materials involved. Putting out the fire could sometimes prefer to let the fire burn, thus limiting the exposure of personnel. The duties of the fire and rescue team leader include: Inform the Main Controller if external fire tender/fire fighting equipment/materials/Mutual Aid is required. Liaise with the utilities and arrange for external water supply/diesel for hydrant pump etc including Maintaining adequate supplies for fire fighting equipment and facilities.

6.8 Summary of Potential Impacts and Mitigation Measures

The main effects of the regasification project activities and Potential adverse impacts resulting from construction and operational activities were assessed as having either low or medium significance, with no potential impacts of high significance identified. The Table-6.2 below provides a summary of the Impact of activities on different environmental parameters

Table-6.2: Impact of Activities on Environmental Parameters

Activities for future proposals	Environmental Parameter						
	Air	Noise	Land	Water	Sediment	Ecology	Socio-Economics
Proposed capital dredging activities							
Capital Dredging, if any	√	√		√	√	√	
Land reclamation			√			√	
Maintenance Dredging	√		√			√	
Proposed construction activities							
Construction material handling /transportation of Construction material	√	√	√		√		
Breakwater Construction material including Quarry	√	√			√	√	√
Labor Force			√	√			√
Construction of jetty on piles, if any	√	√		√		√	
Operation of container on terminals							
Operation for handling LNG	√	√		√			√
Ship operation	√			√			

It is in practice to backfill approximately 10 percent of the pipeline trench and allows the rest of the trench to fill naturally. Results from other similar linear projects indicate that the success and timing of natural backfilling are uncertain. To minimize the potential for impacts of an open trench on the benthic habitat and associated biological resources, it is recommended that the entire trench is backfilled immediately after pipeline installation.

These recommended measures are: conducting geotechnical investigations; using Environmental Inspectors; minimizing substrate conversion; avoiding the use of toxic paint; developing appropriate plans for utility crossings if any, lighting, and spill control; and, if warranted, developing contingency methods for crossing Shoals and disposing of associated dredge material.

Those adverse impacts assessed as having medium significance (in the absence of mitigation) included underwater noise from pile driving using a hammer causing potential impacts on turtles and marine mammals, and construction activities potentially resulting in temporary adverse health and wellbeing impacts on construction workers in the event that labor conditions are not adequately managed. However, with the implementation of appropriate mitigation measures the significance of these impacts is minimized to low significance.

In fine, as a result of the mitigation measures proposed thereof along with additional recommendations and regulatory controls, construction of the proposed Project would not result in a significant impact to the environment.

- and limited to the project site
- There are no resettlement issues. Land acquisition is limited to 144 acres.

6.9 Evaluation of Impacts

Evaluation of significance of an impact is assessed by ascertaining a) magnitude and b) sensitivity/vulnerability/importance of resource/receptor likely to be impacted as defined in the following description:

a) Determining Magnitude of an Impact

Magnitude, i.e. severity of an impact or degree of change caused by a project activity is a

function of interaction characteristics of Scale, Extent and Duration. The criteria that have been evolved for each of these key elements resulting in degree of change with corresponding ranking/level of impacts (low, medium and high) on the environmental component are presented in Table-6.3

Table-6.3: Impact Prediction Criteria

Impact Elements	Criteria	Ranking
Scale: Degree of damage that may be caused to the environmental components concerned	<ul style="list-style-type: none"> Irreversible damage to natural environment and/or likely difficult or may not to revert back to earlier stage with mitigation; Major changes in comparison to baseline conditions and/or likely to regularly or continually exceed the standard; 	High
	<ul style="list-style-type: none"> Reversible damage to natural environment but likely to easily revert back to earlier stage with mitigation; Perceptible change from baseline conditions but well within acceptable norms. 	Medium
	<ul style="list-style-type: none"> Effect is within the normal range of natural variation; No perceptible or readily measurable change from baseline conditions; 	Low
Extent: Spatial or geographical extent of impact due to project and related activities	Project site and the entire study area i.e. beyond Project influence area (10.0km from Project components in this case FSRU, gas spur pipeline and land based CTMS facility)	National
	Project site & its surroundings (2.0km from Project components FSRU, gas spur pipeline and land based CTMS facility)	Regional
	Project site & its immediate vicinity (0.5km from Project components FSRU, gas spur and CTMS facility)	Local
Duration: Temporal scale of the impact in terms of how long it is expected to last	Spread beyond the life cycle of the project	Long term
	Spread across several phases of the project life cycle	Medium term
	Only during particular activities or phase of the project life cycle	Short term

Magnitude essentially describes the intensity of the change that is predicted to occur in the resource/receptor as a result of the impact. The magnitude combines the impact characteristics of Extent, Duration and Scale and is a multiplicative factor of these three criteria set. Based on the above understanding magnitude of impact is assessed as per the Table-6.4.

Table-6.4: Assessing Magnitude of Impact

Scale	Extent	Duration	Magnitude	
Low	Local	Short Term	Negligible	
Low	Regional	Short Term		
Low	Local	Medium term		
Medium	Local	Short Term		
Low	National	Short Term		
Low	Local	Long term		
High	Local	Short Term		
Low	Regional	Medium term		Small
Medium	Regional	Short Term		
Medium	Local	Medium term		
Low	National	Medium term		
Medium	National	Short Term		
Low	Regional	Long term		

Scale	Extent	Duration	Magnitude
High	Regional	ShortTerm	Medium
Medium	Local	Longterm	
High	Local	Medium term	
Medium	Regional	Medium term	
Low	National	Longterm	
High	National	ShortTerm	
High	Local	Longterm	
Medium	National	Medium term	Large
Medium	Regional	Longterm	
High	Regional	Medium term	
Medium	National	Longterm	
High	National	Medium term	
High	Regional	Longterm	
High	National	Longterm	

Magnitude of impact is assessed as negligible only when no discernible impact is assessed.

Determining Sensitivity/ Importance/ Vulnerability of Receptor

In addition to ascertaining magnitude of impact, the other principal step necessary to assign significance for an impact is to define the sensitivity/ vulnerability/ importance of the impacted resources/ receptor. There are a range of factors to be taken into account when defining the sensitivity/ vulnerability/ importance of the resource/ receptor, which may be physical, biological, cultural or human as per the following understanding:

- Where the resource is physical (for example, fresh water body) its quality, sensitivity to change and importance (on a local, regional, national importance) are considered;
- Where the resources/ receptor is biological or cultural (for example, sea turtle habitat and nesting site), its importance (for example local, regional or national importance) and its sensitivity to the specific type of impact are considered;
- Where the receptor is human, the vulnerability of the individual, community or wider societal group is considered.

Definition as defined in Table-6.5 has been adopted to determine sensitivity/importance/vulnerability of environmental resources or receptor.

Table-6.5: Sensitivity/Importance/Vulnerability Criteria

Sensitivity	Contributing Criteria
High	<ul style="list-style-type: none"> • Existing physical environment quality is already under stress; • Ecologically sensitive/protected area, provides habitat for globally protected species; • Profound or multiple levels of vulnerability that undermine the ability to adapt to changes brought by the project. • Human receptors/ vulnerable community are located within the project footprint and directly affected by the project • Resource exclusive for community use
Medium	<ul style="list-style-type: none"> • Existing physical environment quality shows some sign of stress; which is sensitive to change in quality or physical disturbance; • Natural habitat provides habitat for wildlife, which are protected under National regulations; • Some, but few areas of vulnerability; still retaining an ability to at least in part adapt to change brought by the project. • Human receptors/ vulnerable community are located adjacent the project site and likely to be affected by the project

Sensitivity	Contributing Criteria
	<ul style="list-style-type: none"> Alternative resource available with community
Low	<ul style="list-style-type: none"> Existing physical environment quality is good; Modified habitat provides habitat for common species; Human receptors are relocated away and are not likely to be affected due to the project related activities

Evaluating Significance of Impacts

Based on interaction of magnitude of impact and sensitivity/ vulnerability/ importance of resource/ receptor likely to be impacted, the significance of impact is assigned for each impact using the matrix shown in Figure-6.2. The context of various impact significance ratings is defined. The context of various impact significance ratings is defined.

		Sensitivity/Vulnerability/ Important Resource/ Receptor		
		Low	Medium	High
Magnitude of Impact	Negligible	Negligible	Negligible	Negligible
	Small	Negligible	Minor	Moderate
	Medium	Minor	Moderate	Major
	Large	Moderate	Major	Major

Figure-6.2: Assessing Significance of Impact due to Proposed Project Related Activities

CHAPTER-7: MITIGATION PLAN/ MEASURES

7.1 Introduction

This chapter has been arranged in accordance with the adverse impacts for the interventions as identified in the concerned sections of the preceding chapter on identification & evaluation of Potential Impacts. Efforts have also been made to include the mitigation measures with implementation plan in the designated sections of this chapter hereunder.

Each aspect of the project activities has the potential to impact the environment. Most of the potential adverse impacts can be reduced or even eliminated when appropriate mitigation measures are implemented. Chapter-6 has identified and evaluated the potential impacts this Chapter-7 further assesses the potential positive and negative impacts which may arise from the project construction & operational activities including deliniating appropriate measures to mitigate or avoid the potential negative impacts too. With the proper application of mitigation methods Table-7.1 and best management practices, most if not all of the potential impacts can be eliminated or mitigated to insignificant levels.

Table-7.1: Hierarchy of Environmental Mitigations for due Environmental Management

Mitigation Method	Definition
Avoid the impact.	To "avoid" means to be able to change some aspect of the design, construction, or operation such that the impact no longer occurs.
Reduce the impact.	To "reduce" means to implement measures that will lower the level of impact to an acceptable-levels (e.g., ensuring that construction equipment meets noise emission standards).
Rectify the impact.	To "rectify" means to allow an impact to occur, then take measures to rehabilitate the environment to a level whereby the impact is within acceptable-limits afterwards (e.g., erecting the construction campsite but then reclaiming the site after construction activity is complete).
Compensate for the impact.	To "compensate" means to allow the impact to occur, then provide non-monetary compensation (first priority) or monetary compensation (second priority) for losses created by the impact afterwards (e.g., if a farmer must be resettled, the first compensation priority is to provide replacement land and housing. If replacement land and housing cannot be provided, the replacement value of losses must be calculated and provided to the farmer).

The mitigations proposed herein represent a range of actions that are considered to be the most appropriate, either singularly or in combination with other proposed mitigation measures, to address the range of environmental conditions that are apt to be encountered in the field. The Project Developer shall exercise judgment and choose among them to design a mitigation program that reduces the impact to the desired level. The Project Developer r may need to implement one or all of the proposed mitigations. The conditions at the time of the construction and operational activities of the project will determine which are implemented.

7.2 Environmental Management Procedures

The EMP is intended as an adaptive, practical guide to the routine implementation of the environmental and social mitigation measures described in the EIA. It sets out the finer details of what is required 'on the ground', and forms the primary mechanism for management,

accountability and reporting on the Project's environmental and social performance.

This EMP has been prepared in accordance with the requirements of the DOE's EIA guidelines (1997) and international best practice, to meet GTCL's high standards of project implementation. The overarching principles of the EMP are to:

- Integrate environmental protection and management into Project activities; and
- Consider and address, if appropriate, the concerns and interests of stakeholders during the planning, operation, demobilization and rehabilitation phases of the Project.

The EMP addresses management plans for the following areas:

- Damage minimization
- Air quality
- Water
- Soil (erosion and sediment control)
- Noise and vibration
- Biodiversity
- Waste
- Hazardous materials
- Emergency response and disaster
- Socio-economic impact
- Archaeological and cultural sites
- Site rehabilitation
- Project monitoring and feedback

In fact, an EMP is intended as a practical guide to the implementation of the environmental and social mitigation and forms the primary mechanism for management, accountability and reporting on the project's social and environmental performance.

The main goals of the EMP for this project are that:

- Impacts arising as a result of project activities are appropriately managed and reduced to an acceptable-level in terms of their biophysical and social impact;
- Environmental and socio-economic management and rehabilitation are maintained as integral to day-to-day operations; and
- The concerns and interests of the community potentially affected by the activities are recognized in all phases of the project's execution and operational phases.
- Efforts are maintained to enhance the positive impacts of the project in terms of local employment, community relationships and other socio-economic parameters.

This chapter has incorporated the details technical and financial proposal for developing an in-house Environmental Monitoring System to be operated by the proponents own resources equipment and strengthening its essential expertise.

7.3 Potential Impacts

7.3.1 Construction

7.3.1.1 Mitigation Measures

It is in practice to backfill approximately 10 percent of the pipeline trench and allows the rest of the trench to fill naturally. Results from other similar linear projects indicate that the success and timing of natural backfilling are uncertain. To minimize the potential for impacts of an open trench on the benthic habitat and associated biological resources, it is recommended that the entire trench is backfilled immediately after pipeline installation.

Construction of the mooring system would include pile driving, with the specific methods to be used to be determined after completion of detailed geotechnical surveys. It has been recommended that pile driving is limited to seasons when nationally listed species are virtually absent (December 1 through March 31) and that other activities are coordinated to determine the appropriate measures to avoid and minimize noise impacts of pile driving and other construction and operation activities on biological resources. Additional recommendations have also been included to avoid and minimize potential construction impacts. These recommended measures are: conducting geotechnical investigations; using Environmental Inspectors; minimizing substrate conversion; avoiding the use of toxic paint; developing appropriate plans for utility crossings if any, lighting, and spill control; and, if warranted, developing contingency methods for crossing Shoals and disposing of associated dredge material.

As a result of the mitigation measures proposed thereof along with additional recommendations and regulatory controls, construction of the proposed Project would not result in a significant impact to the environment.

7.3.2 Operation

Impacts associated with operation of the proposed Project, including the impacts of LNG carriers in transit and at berth, are summarized below.

7.3.2.2 Mitigation Measures

As a part of usual mitigation measures narrated earlier, certain contingency plans are required to be adopted and such plans should be backed up by adequate and well established procedures, necessary supplies of products for treatment, and personnel trained to deal with spills are essential to ensure an effective response.

In view of the main effects of the Operation of the Regasification Project and LNG Characteristics, the roles and responsibilities of the various agencies involved in combating oil pollution due to spillage in the event of a disaster and similar other accidental events have to be well defined, appropriately administered and duly monitored by the operators and this should serve as a prime mechanism of the mitigation measures incorporated in further details in the environment management plan in the succeeding chapter.

In fact, consequence analysis conducted in similar other projects has indicated that there has not been any major marine accident worldwide due to observance of LNG safety standards wherein operating personnel are undergoing rigorous training & studies and are adequately equipped with requisite equipments and accessories for safe & environment-friendly operations.

7.4 Suggested Mitigation Measures for Specific Parameters

7.4.1 Air Quality Mitigation

Pre Construction Phase

- selecting short and direct routes for all traffic;
- wetting onsite areas
- vegetation clearance during dry weather periods;
- maintaining generator engines and other heavy duty engines in good repair, to reduce exhaust emissions;
- good housekeeping (i.e., strict fuel/chemical inventory and minimization of spillages, to reduce fugitive vapor emissions)

Construction phase

During construction, the principal air quality impacts will arise from dust generation from excavation of soil, pipe laying and vehicle movement. Heavy vehicles may cause smoke emissions, but these impacts are local and temporary.

- maintaining generator engines and other heavy duty engines in good condition, to reduce exhaust emissions;
- Good housekeeping (i.e., strict fuel/chemical inventory and minimization of spillages, to reduce fugitive vapor emissions).

Operation & Maintenance Phase

- Check leakage and reduce fugitive emission of gas from the pipeline system.
- Exercise careful and minimum venting & purging of gas
- Maintain generator and other machine and equipment in good condition to operate with low exhaust particularly at the Regulating & Metering Station locations.

7.4.2 Mitigation Plan for Land Use

Pre Construction Phase

Survey

A soil and land use survey including final route marking should be carried out at an appropriate level of detail along the proposed route of pipeline during the project planning phase, and an appropriate soil conservation plan developed. The survey is also aimed to identify wildlife passage ways which cross the proposed pipeline alignment.

Planning and Design

Pipelines should be designed to cause the minimum possible dislocation of services and loss of productive land area. Careful delineation of the selected route should also aim to avoid sensitive locations, if any and to cross services without causing a loss of utility.

Construction phase

- Restoration of disturbed soil to its original use or to an approved use;
- Installing and maintaining for the duration of the grading, trenching, dredging along the ROW and horizontal directional drilling operation at river crossings etc. adequate alternative pathways and drainage / irrigation canals to reduce inconvenience to the PAP and members of the locality.
- Good housekeeping during mixing of mud chemicals;
- Effluent discharges, particularly during pigging , purging dewatering and Testing from the worksites should be carefully monitored to prevent polluting the runoff drainage channels and to prevent flooding, inundation and silting;
- Adequate provision has to be retained in the scope of works of the contractor for such mitigation measures at required locations of the rural roads, canals and river crossing as indicated in the segment wise maps and Table-s placed in the baseline condition capter-4.

Operational Phase

Monitoring routine discharges from the pipeline and the Metering and regulating stations are to be ensured conformance with Bangladesh standards.

The facilities shall be designed and operated to ensure that the risks of accidental releases and spills of environmentally hazardous compounds are minimized.

Maintenance Phase

Adherence to good maintenance practice will minimize losses through leakage from transmission pipelines.

A specified safety zone in either side of the pipeline is required under the Bangladesh Mineral, gas safety rules to be kept free of residences.

7.4.3 Mitigation plan for Noise and Vibration

The movement of vehicles, Lorries, and construction equipment will produce noise and vibration during the construction stage. This impact will be minor and of short duration at any particular location along the route.

Mitigation

- Selecting 'quiet' working methods and use of low noise equipment must be specified in construction contract tender documents;
- Construction activities should not take place at nighttimes. If this is absolutely unavoidable, the contractor shall advise/ consult with local community leaders, and
- Local community should be consulted beforehand and reach an agreement over appropriate timing for noisy activities.
- Equipment will be maintained in good working order and, where appropriate, acoustic hoods will be provided;

7.4.4 Soil Erosion and Fertility Control Plan

Mitigation

- For mitigation measures to be effective, technical specifications as well as management procedures for their design, implementation, supervision and checking must be in place prior to commencement of onsite works;
- Develop an appropriate and comprehensive reinstatement and site clearance plan ;
- Strict supervision shall be maintained to ensure that a minimum area required for construction activities are cleared;
- Avoid earth work during rainy season, as appropriate;
- Clearing operations shall not interfere or obstruct natural watercourses and man-made drainage systems;
- During construction, excavated soil should be stored in designated areas. Topsoil shall be stored separately, and
- In case of following the existing road, the road has to be strengthened where necessary.

Pre Construction phase

- Appropriate engineering of slopes to prevent slumping, slippage and erosion;
- Restoration of disturbed soil to its original use or to an approved use;
- Adopting erosion control and soil stabilization measures;
- Installing adequate run-on and runoff drainage channels to prevent flooding, inundation and silting;

Construction phase

Construction of a gas transmission pipeline requires trench digging along ROW, grading of roads and land. The impact of such changes, if not appropriately mitigated, could result in severe erosion, silting and impairment of water quality in nearby drainage channels and waterways, fragmenting of habitat and loss of existing ecological resources.

- Grading shall be limited as much as possible to minimize disturbing vegetated areas and subject them to potential erosion.
- Contractor shall install erosion controls on all disturbed critical areas,
- Trenches shall be backfilled as soon as possible to minimize erosion potential
- Spoil piles shall not be placed on slopes greater than 5% or adjacent to water bodies where they may be washed away by high water or run-off. The upper 30 cm fertile soil level shall be conserved by segregating fertile spoil piles from common fill spoil piles.
- Erosion of soil takes place at a high rate in areas where vegetation has been disturbed. Disturbed slopes greater than 30 percent shall be stabilized with sand bags, slopes between 5 and 30 percent seeded and stabilized with jute mats anchored with stakes.
- The discharge flow shall be controlled to prevent washout of the vegetation and subsequent erosion.

7.4.5 Stream Crossing

It is expected that the number of necessary stream crossings throughout the site will not be high. Still then, the following preliminary mitigations are proposed to reduce the potential for impacts on the local waterways:

- Bridges are to be used for all crossings wherever possible;
- When bridges are not available staff are not to cross at a single defined point, so as to reduce the potential for erosion and the subsequent diffuse pollution;
- Any structures built to cross water bodies will be removed upon completion of the work; and Further, Trenching and backfilling operations at stream crossings shall be conducted during the dry season when river elevations and flow are at their lowest. Work shall be scheduled so that trenching and backfilling is completed in the shortest possible time. Spoil shall be placed on a level surface high enough to prevent washout in the event the river level rises. The contractor shall provide drains protected with silt fences, jute mats or sand bags if necessary to trap sediment and drain excess water from the spoil area while minimizing erosion.

7.4.6 Surface and Ground Water-Mitigation Plans

PoTable-water

Water provided at the site for workers installing the pipeline and for the engineers and administrative support must meet the drinking water standards established by DOE. If local ground water is the source of drinking water, it shall have to be chlorinated.

Oil Spill Plan

Equipment maintenance areas shall have proper house cleaning procedures. Oil, grease, and chemical spill shall be cleaned up as they occur. An area specified for oil, lubricants and chemicals shall be set aside.

Waste Disposal Plan

Used oil and spilled oil shall be collected and recycled. Contaminated soils, paints, solvent or other chemicals etc. shall be collected and disposed of in an approved waste disposal site. Solid waste shall be collected and disposed of in an approved solid waste facility.

Sanitary latrines shall be provided at each construction camp and waste disposed of through designing and constructing an appropriate septic system.

Similarly appropriate waste disposal plan has to be drawn and implemented for the FSRU Complex Crew in Offshore establishment of the project.

7.4.7 Potential Impacts and Mitigation Measures

As established in the foregoing chapters, the estuarine and marine portions of the study site have a high biodiversity value. This is largely due to the combination of a range of protected and threatened species occurrences and the importance of these areas to local fishery industries. As such it is vital that these areas are given the utmost priority for protection from potential impacts arising out of the Project.

Potential impacts of the proposed seismic survey have been identified in Chapter 7, with mitigation measures for these listed in Chapter 8. These are summarized in Table-7.2 below:

Table-7.2: Potential impacts and their proposed mitigation measures for noise and vibration in non-forested areas

Project activity	Potential Impact	Mitigation Measure
• Survey & Pipeline Construction	• Disturbance to local fauna from field team	• No new roads are to be cut and constructed during the course of the Project;

Project activity	Potential Impact	Mitigation Measure
operation	movements including vehicle movements	<ul style="list-style-type: none"> • Vehicles shall not be driven cross-country but will remain on existing roads, preferably sealed; and • The use of vehicle air horns to be limited to emergency situations whilst near colonies of birds or other wildlife.
	<ul style="list-style-type: none"> • Disruption to local fauna from noise 	<ul style="list-style-type: none"> • No night works without prior consultation with local community • Use of acoustic hoods and mufflers as appropriate; • EMR to instate appropriate buffers around significant habitat areas • The impacts of construction operations on wildlife within the area shall be monitored regularly by the EMR.
	<ul style="list-style-type: none"> • Removal of vegetation cover from pipe laying & plant erection t areas 	<ul style="list-style-type: none"> • Trenches are to be restored to pre-construction states after the works; • Erosion and sediment controls are to be installed as appropriate during construction and after restoration works.
	<ul style="list-style-type: none"> • Disturbance of mangrove plantations 	<ul style="list-style-type: none"> • construction will be restricted to clearings in mangrove areas and no trees are to be removed for the project activities in these locations
	<ul style="list-style-type: none"> • Disruption to invertebrate fauna 	<ul style="list-style-type: none"> • None required due to low potential impacts.
	<ul style="list-style-type: none"> • Disturbance to fauna as a result of construction operations 	<ul style="list-style-type: none"> • The impacts of construction operations on wildlife within the area shall be monitored regularly by the EMR.
<ul style="list-style-type: none"> • Field camp establishment 	<ul style="list-style-type: none"> • Inappropriate establishment of field camps and associated noise generation 	<ul style="list-style-type: none"> • Field camps shall only be established in previously disturbed areas, such as a school ground; • No vegetation shall be removed during the establishment of the campsite or during the course of field operations; • The field camp shall be returned to its pre-existing state upon the completion of campsite demobilization; and • Wildlife or local livestock will not be harassed, captured, hunted, fed or killed during the course of the field operations, particularly in and around the camp areas.
Aquatic Surveys		
<ul style="list-style-type: none"> • Bathymetric survey 	<ul style="list-style-type: none"> • Noise impacts on marine fauna 	<ul style="list-style-type: none"> • Ensure that the sonar device used is of the minimum power required to get the necessary results; and • Sonar to be switched off when not being used for bathymetric survey.
<ul style="list-style-type: none"> • Sea Bed Pipe laying & construction and operation of the FSRU Complex 	<ul style="list-style-type: none"> • Pipe laying on seabed may impact on benthic fauna 	<ul style="list-style-type: none"> • None required due to low potential impacts.
	<ul style="list-style-type: none"> • Increase in boat traffic 	<ul style="list-style-type: none"> • Minimize the amount of boat traffic required for the project activities as appropriate.
	<ul style="list-style-type: none"> • Damage of shoreline environments from inappropriate mooring of boats and crew movements 	<ul style="list-style-type: none"> • Boats are to be moored away from mangrove areas or any areas being utilized by local wildlife (e.g. migratory bird staging grounds); and • Work crews only to disembark from boats in sTable-areas such as jetties.
	<ul style="list-style-type: none"> • Boat strike and tangling of aquatic fauna during pipe laying activities 	<ul style="list-style-type: none"> • EMR to visually observe for the occurrence of significant species and efforts should be made to avoid individuals.
	<ul style="list-style-type: none"> • Disturbance to migrating and breeding aquatic fauna 	<ul style="list-style-type: none"> • Known breeding and migrating areas to be avoided during these times by the pipe laying activities where practicable; and • If Hilsha migration routes cannot be avoided during sanctuary times, works will be completed as quickly as possible to reduce the duration of potential impacts and subject to permission from appropriate authorities.
	<ul style="list-style-type: none"> • Behavioral and physiological impacts on sensitive aquatic fauna species 	<ul style="list-style-type: none"> • A pre-start visual survey for sensitive species will be undertaken prior to pipe laying operation. All sensitive species are to be outside the safety radius before the activity commences; • A safety radius of 500 m will be visually monitored by a designated and trained observer at all times during the project activity for the occurrence of sensitive species;

Project activity	Potential Impact	Mitigation Measure
		<ul style="list-style-type: none"> • If sensitive species come into or are considered likely to come into the safety radius area, the vessel's speed or course should be altered to avoid the animal; activity will not be resumed until the animal has cleared the safety radius or has not been sighted for 15 minutes; • and • Where possible, equipment should be modified to exclude sensitive species becoming entrapped.

Table-7.3 summarizes specific mitigation measures for potential negative impacts as a result of the construction of the proposed gas pipeline project.

Table-7.3 - Analysis and Description Mitigation Measures

Source of Impacts	Type of Impacts	Mitigation Measures
Pre Construction Activities		
<ul style="list-style-type: none"> • Clearing vegetation • Excavation of earth • Filling lowlands • Land occupation • Sewage of kitchen waste disposal • Movement of heavy vehicles • Non-routine accidental spillages 	Air <ul style="list-style-type: none"> • Emission of dust • Emission of greenhouse gas • Emission of heat 	<ul style="list-style-type: none"> • selecting short and direct routes for all traffic; • wetting onsite areas • vegetation clearance during dry weather periods; • maintaining generator engines and other heavy duty engines in good repair, to reduce exhaust emissions; • Good housekeeping (i.e., strict fuel/chemical inventory and minimization of spillages, to reduce fugitive vapor emissions).
	Noise and Vibration <ul style="list-style-type: none"> • Disturbance to general amenity • Disturbance to religious performance 	<ul style="list-style-type: none"> • traffic to and from the site to be controlled with respect to routing of vehicles and timing of vehicle movements (i.e. working hours); • site activities during Pre Construction works will, to the extent practicable, be limited to day time working • equipment will be maintained in good working order and, where appropriate, acoustic hoods will be provided; • Taking maximum advantage of shielding provided by onsite structures and offsite natural features (trees, etc) to minimize noise levels at offsite receptor locations.
	Land <ul style="list-style-type: none"> • Change in land use • Soil erosion and sedimentation • Soil stability and compactness • Loss of soil fertility 	<ul style="list-style-type: none"> • appropriate engineering of slopes to prevent slumping, slippage and erosion; • restoration of disturbed soil to its original use or to an approved use; • re-vegetation of barren surfaces; • adopting erosion control and soil stabilization measures; • Installing adequate runoff channels and careful monitoring should be there to prevent polluting the local drainage channels and to prevent flooding, inundation and silting.
	Ground water <ul style="list-style-type: none"> • Reduction in recharge potential • Contamination 	<ul style="list-style-type: none"> • Domestic sewage will be treated in a septic tank and the treated effluent will be released into an adjoining leach field. • Environment friendly treatment facilities should be there to contain potentially contaminated surface drainage if any, for on-site treatment prior to offsite discharge. • Surface drains will be adequately graded, kept debris-free and will be routed to a suitable location so as to prevent silting, flooding and inundation. • Preparation of a waste management plan to achieve reuse, reclamation and recycling of materials as far as practicable.
	Biodiversity <ul style="list-style-type: none"> • Loss of species diversity • Increase in poaching • Loss of species due to disposal of petroleum oil 	<ul style="list-style-type: none"> • vegetation clearance will be minimized; • the site will be fenced and site access will be strictly controlled; • Damage to habitat in non-work areas will be encouraged to re-grow to as near as possible its original condition.

Source of Impacts	Type of Impacts	Mitigation Measures
	lubricants and toxic refuse	
	Socio-Economic <ul style="list-style-type: none"> • Resource use • Employment • Income • Property value • Induced development • Traffic movement • Health 	<ul style="list-style-type: none"> • employment of local labor as much as possible; • planning adequate drinking water and sanitary facilities to meet the needs of the labor force (while ensuring that established resources are adequately preserved for local communities); • providing adequate sewage treatment, drainage control and effluent disposal facilities so as not to impair local surface water bodies and groundwater resources; • safe traffic movement to avoid accidents: introducing appropriate traffic signs and markers; • Providing sufficient notification to nearby villages of the intended onset of pipeline testing operations.
Construction Phase:		
Pipeline Construction Special Crossing: Streams, and Canals Sea Bed Pipe Laying Control Stations (VS, CGS and RMS) Waste materials from FSRU operations		
<ul style="list-style-type: none"> • Physical presence of FSRU Complex • Atmosphere emissions • Noise from generators • Chemical spills • Fire and explosion • Surface drainage 	Air <ul style="list-style-type: none"> • Emission of dust • Emission of heat 	<ul style="list-style-type: none"> • maintaining generator engines and other heavy duty engines in good condition, to reduce exhaust emissions; • Good housekeeping (i.e., strict fuel/chemical inventory and minimization of spillages, to reduce fugitive vapor emissions).
	Noise and Vibration <ul style="list-style-type: none"> • Disturbance to general amenity • Disturbance to religious performance 	<ul style="list-style-type: none"> • equipment will be maintained in good working order and, where appropriate, acoustic hoods will be provided; • Taking maximum advantage of shielding provided by onsite structures and offsite natural features (trees, etc) to minimize noise levels at offsite receptor locations.
	Land <ul style="list-style-type: none"> • Change in land use • Soil erosion and sedimentation • Soil stability and compactness • Loss of soil fertility • Loss of land for salt and Shrimp Cultivation/ Production 	<ul style="list-style-type: none"> • restoration of disturbed soil to its original use or to an approved use; • installing adequate run-on and runoff drainage channels to prevent flooding, inundation and silting; • good housekeeping during mixing of mud chemicals; • Provision of a test separator and flare system sufficient to prevent accidental releases during pipeline pigging, purging test and commissioning etc. • restoration of disturbed soil to its original use or to an approved use;
	Groundwater <ul style="list-style-type: none"> • Reduction in recharge potential • Contamination 	<ul style="list-style-type: none"> • Chemicals used will be managed through bioremediation and applied to irrigable land; • Monitoring routine discharges to ensure conformance with Bangladesh standards. • The facilities shall be designed and operated to ensure that the risks of accidental releases and spills of environmentally hazardous compounds are minimized.
	Biodiversity <ul style="list-style-type: none"> • Loss of Species diversity • Damage to habitat • Loss of species due to disposal of petroleum oil lubricants and toxic refuse 	<ul style="list-style-type: none"> • vegetation clearance will be minimized; • the site will be fenced and site access will be strictly controlled; • Damage to habitat in non-work areas will be encouraged to re-grow to as near as possible its original condition.
	Socio-Economic <ul style="list-style-type: none"> • Resource use • Income • Property value • Induced development 	<ul style="list-style-type: none"> • employment of local people as much as possible; • Providing adequate fencing to safeguard communities from risks posed by project activities; • Public relations programs with local communities should be continually maintained to advise on risks and safety • High standards of project operation, environmental impact

Source of Impacts	Type of Impacts	Mitigation Measures
		mitigation measures and safety procedures must be maintained at all times • Establish good relationships with local communities and help to support their community activities.
	Cultural and Archeological Sites • Religious and Cultural sites • Recreation and aesthetic	• Local community should be consulted beforehand and reach an agreement over appropriate timing for noisy activities • Will be protected by working on the existing ROW or if necessary by acquiring temporarily working space on the opposite side of the ROW.
Operation Phase	• Variety of adverse effects • Long term national environmental and economic • Hazardous type wastes can pose serious environmental and health / safety hazards	• High standards of project operation, environmental impact mitigation measures and safety procedures must be maintained at all times • During operation some problem may occur. So, necessary precautionary measures are required for protection • Ensure that air emissions from the project site comply with standards • Ensure that the noise level around the project complies with standards • An inspection and maintenance (I&M) program should be implemented • Hazardous wastes shall be managed in accordance with the requirements of the concerned authority as stated above.

7.4.8 Mitigation plan for Historical and Archaeological Resources

No mosques, temples, graves and graveyards have been identified during will be protected by working on the existing ROW or if necessary by acquiring temporarily working space on the opposite side of the ROW. Equipment operators will be instructed to be especially careful not to damage the mosques, temples, graves and graveyards.

7.4.9 Mitigation plan for Socioeconomic Impact

In view of the fact that permanent acquisition of land and securing / ensuring a minimum safe distance is essentially required for laying the gas pipeline and sitting the metering and control stations as per Gas and Mineral Safety Rules (1991 as amended 2003) and Acquisition & Requisition of Immoveable Property Ordinance of 1982 of the country, it is unavoidable that the project execution has to cause an impact on the people, trees & structures falling on the alignment.

The basic and primary socio-economic impact of execution of the project as such, is the one to be felt by the PAP, whose land, homestead, trees, structures and / or job/business is either temporarily or permanently affected and there fore may call for due compensation / resettlement as a measure for mitigation. Similarly, its socio-economic impact will also be felt at the local and national level. Successful construction of gas transmission pipeline through the designated area and at the Ti-in Point site will contribute significantly to the economic growth at the national level.

In fact, some shrimp culture & salt farms has been identified on the route, and due compensation will be made to the PAP and since the pipeline will be laid in the dry season, the pipeline construction activities will not impact the fish breeding environment. Further, some impact is expected on the sea navigation due to movement of project transportation like LNG carriers, tugs, barges & speed boat etc. during construction of the sub sea pipeline and the FSRU. This disturbance, though in a lesser degree, will continue for the operational purpose of the FSRU complex.

The potential impact on the socio-economic condition at the local level will generate primarily

from the employment of labor during construction activities. The Developer / Construction companies will engage several local people, thus creating employment opportunities as well as business opportunities for their goods and services.

On the other hand, the influx of outsiders may also cause some disruption to the social structure of the local people. GTCL will seek to minimize this impact by introducing a Code of Behavior (to be agreed with the local communities). Potential impacts will be temporary and minor. Increased spending in the local economy by outsiders will be a positive impact, although for a period of short duration only.

In depth discussion of these issues and mitigation/ compensation/ re-settlement measures as per GOB regulations and guidelines have been recorded at this report prepared for GTCL.

7.4.10 Mitigation Procedures for Socioeconomic Impact

- Procedures for liaison with local people to be established before commencement of the construction work. GTCL must clearly explain to local people about the need for the project for both the country and regional contexts;
- GTCL must reassure the public about compliance with environmental impact mitigation measures and safety measures prepared for local communities;
- Local communities must be consulted before commencing any future development projects in or near their community;
- Large concentrations of housing for construction laborers should be avoided;
- Staff to be recruited locally where feasible. GTCL shall encourage contractor to employ local people during construction work.
- Public relations programs with local communities should be continually maintained to advise on risks and safety;
- High standards of project operation, environmental impact mitigation measures and safety procedures must be maintained at all times;
- Establish good relationships with local communities and help support their community activities;
- To ensure adequate compensation to the project affected people as per the law of the country.
- Representatives from local communities should be allowed to join the committee to ensure justice and transparency.
- Pipeline construction activities will be during dry season to avoid any impact on agriculture or fish farming and fish breeding.
- Stream crossings and laying of sub sea pipeline will be done by application of highly sophisticated technology and tall necessary mitigation measures method so that there is hardly any potential impact on the navigation issues.

7.4.11 Mitigation Measures for Socioeconomic Impact

- **Compensation:** Following completion of pipeline construction, the land owners normally regain the use of the land for agriculture, although it remains the property of the GTCL. The compensation payment which the land owners receive is thus an additional benefit, or positive impact, although they have lost the asset value of the land.
- **Loss of Land:** compensation for property is a common measure and GTCL has to implement a RAP as per provision of the GOB rules.
- **Loss of Income:** Mitigation Measures for the families affected by income loss due to gas development projects are usually entitled to have credit, training and necessary market assistance to start alternative income generating activities. But it has been observed that a very few number of the PAP would be losing any significant percentage of their landed properties along a strip alignment and none of them are tenants as would hardly be needing relocation. Only some salt cultivation & shrimps farms being

affected; their owners will be duly compensated. Similarly, the casual labors so affected during implementation of the project shall be paid for their loss of earning.

- **Adverse impact on the poor**—Usually, the mitigating measures include training in skills, access to credit assistance with market intelligence and marketing. However, it has appeared from the RAP study that the number of seriously affected households, women headed households etc are so nominal in the area surrounding the project site that special grants during continuation of the project in addition to the compensation payment by the CDC, would perhaps help them restoring their lively hood.

7.5 Identification of Immitigable Impact and Environmental Mitigation Proposal

7.5.1 Potential Impact on Aesthetics & Visual Quality

During construction and after completion of the project the aesthetic and visual impacts can identify as below:

Construction Phase

Impact Sources: The sources of aesthetics and visual impacts can result from:

- Grading of land at site for Tie-in-point;
- Storage of construction materials;
- Storage and disposal of construction waste, municipal waste;
- Physical presence of labour camp; and
- Earth work along the spur pipeline route.

Operational Phase

Impact Sources: The sources of aesthetics and visual impacts can result from:

- Physical presence of the Tie-in-point at kalirdiar Char.
- Visible FSRU in the deep sea

7.5.2 Accidental Death of Birds

Operation Phase:

Some accidental death of sea birds may be occurred during FSRU Operation, Ship to Ship transfer (STS) time and even some unwanted accident occur during there is any tower in operation.

7.5.3 Accidental emission Obnoxious Gas

Operation Phase:

During Operation of FSRU sometimes emission of obnoxious gas (within allowable limit) may be occurring.

7.5.4 Residual Noise within Limit

During construction phase, there will be potential impact on marine fauna due to underwater noise generation mainly during pile driving activities for jetty construction at ~1.5 km from the shore. The sound energy generated from source of pile driving due to hammering of piles into seabed propagates compression and transverse waves along the length of the piles into seabed through marine water column. Noise produced is typically broadband noise, with some low tonal peaks.

7.5.5 Residual Discharge within Limit

Spillage/ leakage of fuel and lube oil from the FSRU, bunkering of marine gas oil by support vessels, discharge of cold water from FSRU operation etc may cause impact on marine fish—Knife tooth sawfish, Olive Ridley Turtle, marine mammals Irrawaddy Dolphin and Indo-Pacific Finless Porpoise. There is likelihood of mortality/injury of these species during operation phase due to vessel movement surrounding the jetty area

7.5.6 Social Impact with Infectious Disease

It's natural that working crew from within and outside the country would assemble and reside in the camps to be located in the vicinity of the work sites mostly in and around the community habitats.

Even though strict medical examinations would be specified in the EPC contractors HSE provisions in the contract, the chances of spreading Infectious Diseases are there through any one or more of them among the members of the existing social communities nearby.

This is more obvious due to the fact that there would be continuous inter-mixing of the outsiders in the common places like markets, shopping centers and mosques etc. So, appropriate management plan has to be there to prevent any potential impact at the first instance and then due mitigation measures are to be ensured, if and when turns essential.

7.6 Analysis of Impacts and Development of a Comprehensive Mitigation Plan

The operation of the project will have a number of both positive and negative impacts. The predominant positive impacts include:

- A reduction in further degradation of local air quality resulting from the fuel switch from burning gas as opposed to diesel fuel
- The potential saving of approximately 5 million tones of CO₂ emissions also resulting from the fuel-switch to burning gas; and
- The potential to influence a move towards more efficient technologies (such as combined cycle gas turbine generation).

Impacts on air & noise quality due to construction activities shall be of short-term and would cease to exist after construction is completed. The coastline is sandy and is not a high erosion site, as revealed during field inspection. Similarly operational activities when conducted with due diligence and caution, the predicted impacts can be considered insignificant, yet assessments are required to be done to obtain a quantitative estimate and development of a comprehensive mitigation plan as such.

CHAPTER 08: ENVIRONMENTAL MANAGEMENT PLAN

8.1 Implementation of the Environmental Management Plan

8.1.1 Environment Safety Management System Process

Besides defining management's requirements regarding Environmental Specialist, the GTCL's Environment and Safety Management System (ESMS) establishes processes to apply the system to their operations. These processes include steps to clarify accountability. These steps are listed as follows:

8.1.2 Specific Activities and Responsibilities

The first step is to clearly assign responsibility to meet each Environment & Safety (ES) requirement at all levels of the organization. This process begins at the top of management and continues down through each level of the organization, so that until each affected person understands his/her, Environmental Specialist responsibility. Managers and supervisors at every level of Company organization review each procedure and then make one of three choices:

1. Determines that accountability for fulfilling a particular procedure more appropriately belongs to a higher management level; or
2. Assumes personal responsibility either by (a) taking personal responsibility for fulfilling the procedure or b) delegating responsibility for fulfilling the procedure to others in the organizations; or
3. Pass the procedure along to those that report to him or her, who will then decide which ones to keep and which to pass on.

This process will continue in organization until all procedures have an assigned responsible person who will assure that the procedure is implemented. In many cases, several people will be accountable for implementation of a procedure. For example, at the offshore FSRU and onshore Tie-in Point sites and at supporting field camps more than one person would be responsible for fulfilling the procedure regarding correct waste management.

8.1.3 Implement the System

In the implementation step, all of those responsible for implementing each Environmental Specialist procedure will develop the approach and the systems needed for procedure implementation. Clearly defined roles and responsibilities are critical, along with the necessary training, to support implementation.

The existing organizational set-up of GTCL is given in Figure-8.1 and based on the same, the institutional arrangement designed for EMP of the FSRU and Gas Transmission Pipeline activities project has been shown in Figure-6.1 reflecting the inter-linkages between GTCL Technical Staff, the Project Developer and the Environmental Specialist of the client/contractor so far as implementation, supervision and monitoring of the EAS issues are concerned.

**Bangladesh Oil, Gas & Mineral Corporation (Petrobangla)
Organization Extract**

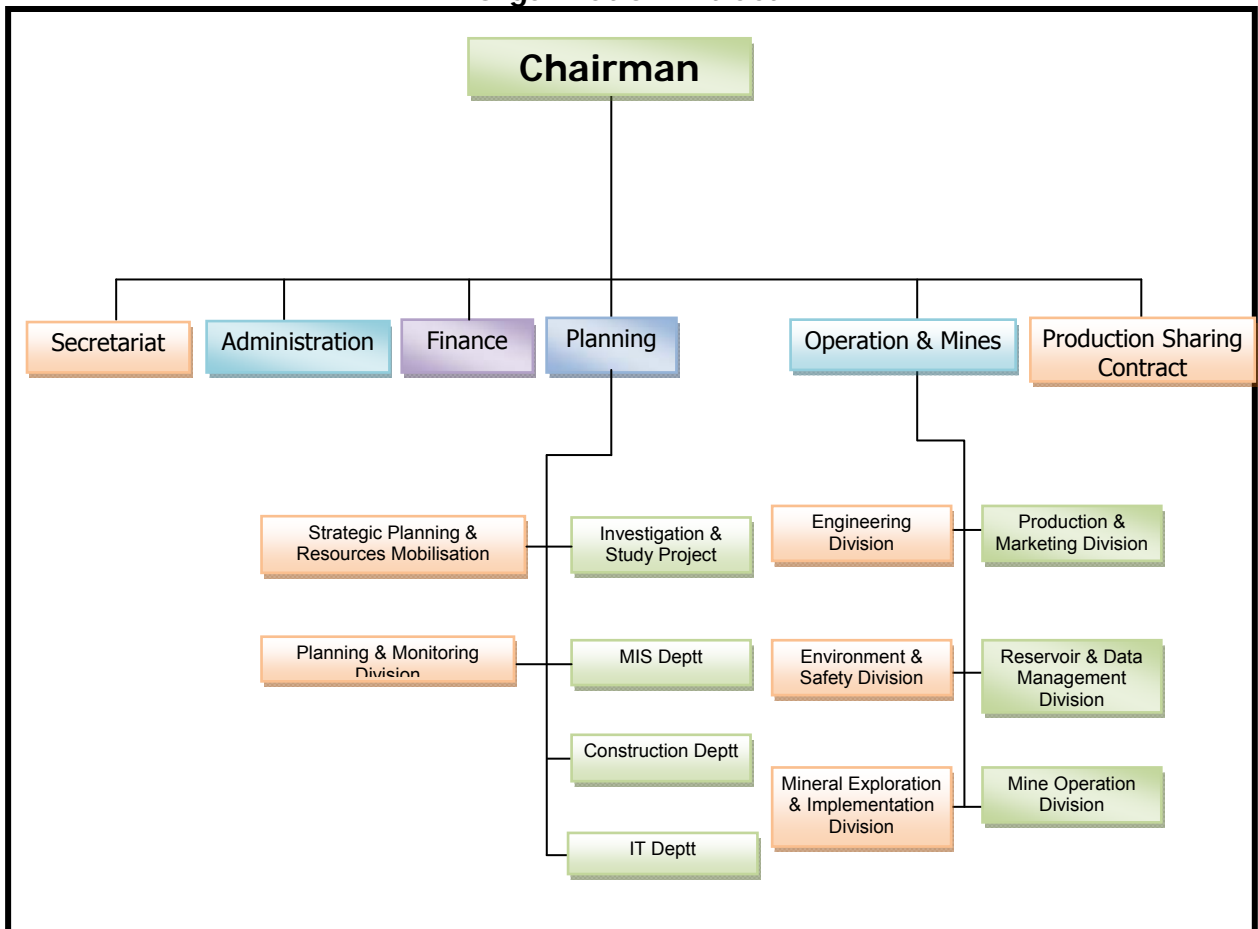


Figure-8.1: Petrobangla Organization Extract

8.2 Mitigation Measures of Project Impacts

8.2.1 Mitigation/Beneficial Enhancement Measures

For effective and environment friendly operation of the gas industry, a set of guideline tools and suggestions are necessary which need to be followed at various stages of exploration, drilling, work over, pipeline and plant installation, operation and maintenance. It is equally applicable for this particular Offshore FSRU, Sub Sea Gas Pipeline and Onshore Tie-in Point Activities project.

This plan generally has various components of management depending on the type of the activity and types of operation, discharge and their pollution potential. The EMP once prepared forms the basic of environmental management actions from the part of the FSRU plants & Gas Pipeline authority and often may need modification or up-gradation because of changes in the plant operation or factual pollution load / environmental problems detected afterwards. The plant and facilities authority may also need fleshing out the suggested outline of the EMP laid down in this report.

The Environmental Management Plan will be implemented according to the following Management action and responsibility parameters, mentioned in Table-8.1. A comprehensive summary of the main environmental and social issues related to the project has been considered in this Table-and has been placed below:

Table-8.1: Management Actions and Responsibilities

Potential Impacts	Benefit enhancement/ mitigation measures	Management actions	Executive responsibilities
Pre-Construction phase			
<ul style="list-style-type: none"> Environmental degradation arising from impacts which were not identified during this stage of project preparation 	<ul style="list-style-type: none"> Additional environmental investigations during the detail stage of project preparation 	<ul style="list-style-type: none"> Scoping studies to be carried out for all sub-projects prior to launching of the activities 	<ul style="list-style-type: none"> Study and Design Consultant/ Developer (SDCD)
<ul style="list-style-type: none"> Agricultural, homestead and commercial land acquisition 	<ul style="list-style-type: none"> Permanent loss of land and crop production Physiological stress Increase of land value 	<ul style="list-style-type: none"> Land acquisition notice should be served to the owners well ahead of time. Provide adequate quick and fair compensation to the real land owners in accordance with applicable laws of GOB for land loss 	<ul style="list-style-type: none"> Petrobangla and local authorities
<ul style="list-style-type: none"> Local population suffers uncertainties concerning land & other asset acquisition arising from survey team activities, and subsequently by commencement of land acquisition procedures 	<ul style="list-style-type: none"> Provision of full and timely information regarding the project & its implications in terms of land & property acquisition 	<ul style="list-style-type: none"> Establishment of procedures and organizational arrangements for official promulgation of information to affected communities. Briefing of survey teams on how to answer simple questions & which questions must be addressed to the appropriate authorities. Resettlement Action Plan (RAP) / Land Acquisition Action Plan (LAP) to include an effective information dissemination programme, which is fully implemented when land acquisition commences for any expansion / new development program 	<ul style="list-style-type: none"> Petrobangla and local authorities SDCD Consultant appointed for RAP/LAP preparation / Petrobangla
<ul style="list-style-type: none"> Financial hardship associated with inadequate compensation for land, property & loss of business, employment etc. 	<ul style="list-style-type: none"> Payment of full and fair compensation to all affected parties 	<ul style="list-style-type: none"> Identification of land & property acquisition etc. requirements Authorities to ensure proper assessment and timely payment of compensation, prior to commencement of any activities Preparation of detailed RAP / LAP covering all necessary aspects, by NGO appointed by Petrobangla (PB) 	<ul style="list-style-type: none"> SDCD to prepare site plans, Petrobangla to prepare Mouza plans Petrobangla /Deputy Commissioner / Ministry of Land Consultant appointed by Petrobangla
<ul style="list-style-type: none"> Delays in project implementation and thus benefit lag associated with fraudulent compensation claims 	<ul style="list-style-type: none"> Preparation of a complete record of existing properties immediately prior to commencement of the land acquisition process 	<ul style="list-style-type: none"> Preparation of a dated video recording, taken from a moving vehicle, which show both road margins and all nearby structures Advice to local communities of the existence of the video, that any work over started after the date of the recording may not be covered by the compensation process, and that fraudulent compensation claims will be appropriately dealt with by the authorities 	<ul style="list-style-type: none"> Consultant Local authorities
Construction Phase			
<ul style="list-style-type: none"> General adverse impacts of onshore pipeline construction & tie-in activities 	<ul style="list-style-type: none"> Contractors/Developers to behave in an environmentally responsive manner 	<ul style="list-style-type: none"> Description of the works to indicate that the PB / GTCL view environmental matters to be of considerable importance and that the contract will be administered accordingly Briefing of appointed contractors on 	<ul style="list-style-type: none"> SDCD

Potential Impacts	Benefit enhancement/mitigation measures	Management actions	Executive responsibilities
		mobilization, regarding sensitive environmental matters and reinforcement of advice regarding contract administration; contracts to be administered accordingly.	<ul style="list-style-type: none"> The Engineer
<ul style="list-style-type: none"> Increased employment opportunities for the local population 	<ul style="list-style-type: none"> Construction contracts to require maximum use of local labor, contractors to take positive steps to recruit women, the destitute and landless, with a minimum of 30% of the workforce to be female, and at least 25% of works to be carried out by labor, so far as practicable. 	<ul style="list-style-type: none"> Inclusion of appropriate clauses in work over contracts. Monitoring of compliance during construction and appropriate administration of the contracts. 	<ul style="list-style-type: none"> SDCD The Engineer Work over Supervision and Monitoring Consultant
<ul style="list-style-type: none"> Loss of houses or other permanent structures/trees associated with construction of any subprojects 	<ul style="list-style-type: none"> Options for reducing tree felling to be investigated, including widening of premises and raising without felling Alignment to be adjusted to avoid permanent houses or significant trees wherever this is feasible. Work over contracts to make provision for penalty for damages of the above. 	<ul style="list-style-type: none"> Appropriate designs to be prepared which minimize the need for tree felling All large trees, or those of religious or cultural significance lying on the premises or within 10m of the toe of the premises, which are not to be felled or damaged to be identified on site plans. Trees not to be felled or damaged to be clearly marked Inclusion of appropriate clause in work over contracts Monitoring of compliance during construction and appropriate administration of contracts. Detailed replanting Programme to be prepared and implemented outside the civil works contracts, under the management of an experienced NGO appointed by PB / GTCL. if required. 	<ul style="list-style-type: none"> SDCD SDCD CSMC SDCD The Engineer SDCD to prepare programme. NGO to manage implementation.
<ul style="list-style-type: none"> Erosion of pipeline / plant site borrow pit leading to deterioration of the surrounding land with long-term adverse effects on economic benefits 	<ul style="list-style-type: none"> Earthworks specifications and Bill of quantities (BOQ) to include provision for placing grass turfs on all earthworks slopes, and refilling the borrow pit as soon as possible after the work is completed. 	<ul style="list-style-type: none"> Inclusion of appropriate items in BOQ etc. Monitoring of compliance during construction and appropriate administration of contracts. Sensitive sites to be identified; options for protection measures to be investigated and suitable-measures to be incorporated in project designs, specifications etc. Adequate maintenance budgets to be made available and local Contracting Societies to be established to carry out routine maintenance of slopes / embankments. 	<ul style="list-style-type: none"> SDCD The Engineer SDCD Consultant Petrobangla with NGO assistance, if required
<ul style="list-style-type: none"> Contractor's workforce presence increasing pressure on already strained local medical facilities 	<ul style="list-style-type: none"> Contractors to provide own suitably equipped and staffed site / emergency medical facilities 	<ul style="list-style-type: none"> Inclusion of appropriate clause in work over contracts BOQ to include item for provision of medical facilities. Monitoring of compliance during 	<ul style="list-style-type: none"> SDCD SDCD

Potential Impacts	Benefit enhancement/mitigation measures	Management actions	Executive responsibilities
		construction and appropriate administration of contracts	<ul style="list-style-type: none"> • Consultant • The Engineer
<ul style="list-style-type: none"> • Incomplete post-use clearance and reinstatement of base camp and other temporary work sites, leading to loss of land productivity or additional costs for landowners to reinstate land 	<ul style="list-style-type: none"> • Contractor to prepare site restoration plans for approval, prior to abandonment, and to implement such plans fully 	<ul style="list-style-type: none"> • Inclusion of appropriate clause in construction contracts • All temporary works sites to be notified by the contractor, prior to use. All sites to be photographed to provide a record of pre-use state • BOQ to include nominated lump sums for reinstatement of temporary sites. Monitoring of compliance during construction and appropriate administration of contracts 	<ul style="list-style-type: none"> • SDCD • Consultant • SDCD • The Engineer
<ul style="list-style-type: none"> • Pollution of land, groundwater and surface water arising from sanitary and other wastes and spillages 	<ul style="list-style-type: none"> • Contractors to prepare for approval detailed site environmental plans for the base camps and other work sites, which make adequate provision for safe disposal of all wastes, and prevention of spillages, leakage of polluting materials etc. • Contractor is to be required to pay all costs associated with cleaning up any pollution caused by his activities and to pay full compensation to those affected. 	<ul style="list-style-type: none"> • Inclusion of appropriate clauses in work over contracts. • Monitoring of compliance during construction and appropriate administration of contracts. • • • 	<ul style="list-style-type: none"> • SDCD • Department of Environment (DOE) • The Engineer • Consultant
Operation & Maintenance Phase			
<ul style="list-style-type: none"> • Pollution of land, and surface water arising from discharge of wastes and spillages from Tie-in & scraper traps and valve stations etc • Pollution of sea water at FSRU site and sea bed pipeline sites. 	<ul style="list-style-type: none"> • Proper mitigation's plans are to be developed by GTCL for each of the subprojects to handle the various discharges 	<ul style="list-style-type: none"> • Effective monitoring during operation 	<ul style="list-style-type: none"> • Petrobangla / SDCD/ DOE
<ul style="list-style-type: none"> • Humansafety 	<ul style="list-style-type: none"> • Proper restrictive measures have to be taken for movement of people, navigation and the working crew in and around the work sites both offshore & onshore to prevent any accident causing injury or loss of life. 	<ul style="list-style-type: none"> • Human safety is an important issue and has to be monitored in all stages of operation. 	<ul style="list-style-type: none"> • Petrobangla / SDCD
<ul style="list-style-type: none"> • Effects on human hearing: Potential to cause hearing impairment from the use of air horns, vehicles, and other equipment 	<ul style="list-style-type: none"> • Equipment should be selected on a low noise basis operation of noisy equipment should be minimized all appropriate personal protective equipment 		<ul style="list-style-type: none"> • Petrobangla / SDCD

Potential Impacts	Benefit enhancement/ mitigation measures	Management actions	Executive responsibilities
	(PPE) to be used		
<ul style="list-style-type: none"> • Handling, storage or transport of all hazardous materials have impact to soils or ground / surface water as a result of leakages or spills during use. 	<ul style="list-style-type: none"> • Hazardous materials to be only transported in suitable-vehicles equipped with appropriate emergency equipment 	<ul style="list-style-type: none"> • Stringent monitoring has to be exercised in Handling, storage or transport of all hazardous materials. 	<ul style="list-style-type: none"> • Petrobangla / DOE
<ul style="list-style-type: none"> • Potentials for impact to safety or human health as a result of contact, ingestion or inhalation of hazardous materials 	<ul style="list-style-type: none"> • Relevant staff to be appropriately trained on the use, storage, handling and transport of hazardous materials. • First aid facilities to be available on site, at FSRU and with field teams at all times. 	<ul style="list-style-type: none"> • Safety management procedure and guide lines and manuals to be present and accessible to all staff. All staff to be formally notified of their location and use. 	<ul style="list-style-type: none"> • Petrobangla / SDCD / DOE
<ul style="list-style-type: none"> • Risk to the biophysical environment due to contact with hazardous materials or arising from habitat contamination 	<ul style="list-style-type: none"> • Storage facilities to be of an appropriate standard for the level of hazard presented by substance. This includes appropriate access control. 	<ul style="list-style-type: none"> • Records to be kept of all hazardous materials present on site at all times. • Appropriate emergency response equipment to be available wherever hazardous materials are used. 	<ul style="list-style-type: none"> • Petrobangla / SDCD / DOE
<ul style="list-style-type: none"> • Potential to cause hearing impairment from the use of air horns, vehicles, explosives and other equipment. 	<ul style="list-style-type: none"> • Equipment to be selected on a low noise basis. Operation of noisy equipment should be minimized. 	<ul style="list-style-type: none"> • Effects on human hearing should be kept at minimum. Appropriate personnel protective equipment (PPE) has to be provided and use of same has to be ensured. 	<ul style="list-style-type: none"> • Petrobangla / SDCD
<ul style="list-style-type: none"> • Occupational injuries/ traffic emissions 	<ul style="list-style-type: none"> • Potential to cause injuries through the operation of vehicles and equipment. • Education of all staff members on risks in and around the project site • All appropriate personnel protective equipment (PPE) to be used 	<ul style="list-style-type: none"> • First aid kit to be kept with staff in the field and trained personnel to be on hand • PPE should be provided at all work places and usability has to be inspected for replacement when felt necessary. • Training to be organized for proper use and maintenance of PPE 	<ul style="list-style-type: none"> • Petrobangla / SDCD
<ul style="list-style-type: none"> • Air pollution and chemical emissions 	<ul style="list-style-type: none"> • Potential for air quality impacts in the local area that may affect the health of workers and local residents 	<ul style="list-style-type: none"> • Equipment should be selected on a low emissions basis • Operation of vehicles that may disturb dust should be minimized. • A project speed limit should be applied to reduce dust disturbance 	<ul style="list-style-type: none"> • Petrobangla / SDCD / DOE
<ul style="list-style-type: none"> • Impacts created through the presence of migrant workers 	<ul style="list-style-type: none"> • Appropriate actions should be taken to reduce the impact of increased stress on local food and clean water supplies as well as increased chance of cultural conflict with possible potential for the influx of sex workers. 	<ul style="list-style-type: none"> • External workers should have medical checkups prior to commencing work to minimize the prevalence or potential for introduction of any communicable disease to the local area. 	<ul style="list-style-type: none"> • Petrobangla / SDCD
<ul style="list-style-type: none"> • Psychological impact 	<ul style="list-style-type: none"> • Potential for panic in cases of unusual flaring 	<ul style="list-style-type: none"> • Community to be adequately informed of what should be expected 	<ul style="list-style-type: none"> • Petrobangla / SDCD

Potential Impacts	Benefit enhancement/ mitigation measures	Management actions	Executive responsibilities
	or uncontrolled release of gaseous emissions mistaken for accidental fire / explosion / blow out or earthquake	as a result of the operational activities before hand.	

8.3 GTCL's Environmental Policy Statement

GTCL is committed to the protection of the environment and will conduct its operations in compliance with all relevant local, national and international environmental legislation and standards.

GTCL will Endeavour to ensure the protection of human health and the environment by complying with the letter and spirit of the national environmental policy, environmental legislation, and promulgate (Gazette) environmental rules and regulations of the GOB and international treaties and conventions accepted by the government.

8.3.1 Prevention, Control and Mitigation Plan

Safety is only a precautionary measure. Incidents and accidents cannot be entirely avoided or prevented. There is also no guarantee that an accident will not happen even if all measures are taken to stop the incident or accident. Specific mitigation and preventive measures would depend on the particular types of hazards expected to happen in a given work situation. Table-8.2 lists some preventive and mitigation measures:

Table-8.2: Safety Hazard Presentation-Control Mitigation Measures

SN	Event	Prevention, Control and Mitigation Measures	
1.	General Instruction for Workers	1.	Personal and continuous visual supervision of the worker who is not competent to perform the job
		2.	Workers to be conversant on the general safety procedures
		3.	Workers must be confident that they have adequate training on handling unsafe or hazardous material
2.	Maintenance of Equipment	1.	Employer shall ensure that all equipment used on a work site is maintained in standard condition
		2.	Will perform the function for which it is intended or was designed
		3.	Is of adequate strength for that purpose
		4.	Is free from potential defects
3.	Traffic Hazard	1.	Where there is a danger to workers from traffic, GTCL shall take appropriate measures to ensure that the workers are protected from traffic hazards
		2.	Ensure that workers who are on foot and who are exposed to traffic hazards on traveled rural roads wear reflective vests or alternative clothing that is cleanly distinguished
		3.	Where the operator of vehicle do not have a clear view of the path to be traveled on a work site, he shall not proceed until he receives a signal from a designated signaler who has a clear view of the path to be traveled
4.	Illumination	1.	Ensure that illumination at a work site is sufficient to enable work to be done safely
		2.	Where failure of the normal lighting system would endanger workers, the employer shall ensure that emergency lighting is available that will generate sufficient dependable illumination to enable the workers to: <ul style="list-style-type: none"> ➤ Leave the work site in safety; ➤ Initiate emergency shut down procedures; and ➤ Restore normal lighting.
5.	Housekeeping	1.	Ensure that each work site is clean and free from stepping and tripping hazards
		2.	Waste and other debris or materials do not accumulate around equipment, endangering workers

SN	Event	Prevention, Control and Mitigation Measures	
6.	Falling Hazards	1.	Ensure that where it is possible for a worker to fall through a vertical distance, the worker is protected from the falling by: <ul style="list-style-type: none"> ➤ A guard rail around the work area; ➤ A safety net; or ➤ A fall arresting device.
7.	Overhead Power Lines	1.	Ensure that no worker approaches, no equipment is operated and no worker shall approach or operate equipment under a live overhead power line
8.	Sanitary Facilities & Drinking Water	1.	Ensure that an adequate supply of drinking fluids is available at the work site
		2.	Ensure that work site is provided with toilet facilities in accordance with the requirement of general health protection guidelines
9.	Wearing Proper Clothing	1.	Ensure that where there is a possibility that a worker or worker's clothing might come in to contact with moving parts of machinery, the worker: <ul style="list-style-type: none"> ➤ Wears close-fitting clothing; ➤ Confines or cuts short his head and facial hair; and ➤ Avoids wearing jewellery or other similar items.
10.	Head Protection	1.	Ensure that during the work process adequate alternative means of protecting the worker's head is in place
11.	Eye Protection	1.	Where there is a danger of injury to or irritation of a worker's eyes, his employer shall ensure that the worker wears properly fitting eye protective equipment
12.	Foot Protection	1.	Where there is a danger of injury to a worker's feet, ensure that the worker wears safety footwear that is appropriate to the nature of the hazard associated with particular work activities and conditions
13.	Respiratory Protective Equipment	1.	Where the worker is exposed to hazardous chemicals, gases, gums, vapors, or particulates, appropriate respiratory protective equipment have to be supplied
14.	Transportation of Worker	1.	A worker in a vehicle shall not allow any part of his body to protrude from the vehicle where this action creates or may create danger to the worker
		2.	A worker shall ensure that no equipment or materials for which he is responsible is carried in the compartment of a vehicle in which another worker is traveling unless it is so placed and secured as to prevent injury to himself and other workers
15.	Cranes and Similar Hoists	1.	Ensure that a crane is equipped with an effective warning device
		2.	Is readily accessible to the operator
		3.	When design or operation of a crane is such that the crane may fall or flip backwards because of the return movement of the boom, the crane must be fitted with: <ul style="list-style-type: none"> ➤ Positive boom stops in accordance with the manufacture's specifications; and ➤ A boom stop limit device to prevent the boom from being drawn back beyond a pre-determined safe boom angle.
16.	Excavations		Before the worker begins working in the trenches and closer to the wall or bank than the depth of the excavation, the employer shall ensure that the worker will be protected from cave ins or sliding materials by: <ul style="list-style-type: none"> ➤ The cutting back of the walls of the excavation to reduce the height of the remaining vertical walls; ➤ The installation of temporary protective structures (e.g. shoring); ➤ A combination of cutting back of the walls and the installation of temporary protective structures; ➤ The spoil earth is kept at a distance of at least 1m from the edge of the excavation; and ➤ When the workers are carrying out an excavation in the vicinity of an overhead power line, ensure that the work is carried out in a manner that will not reduce original support provided for the power line poles
17.	Trenching	1.	Ensure that proper shoring, stringers and bracing are used
		2.	Dewatering if water seeps or accumulates in the trench
		3.	Heavy equipment to be kept at a safe distance so that the trench does not collapse
18.	Welding	1.	Welding to be performed observing all requirement of API standard 1104

SN	Event	Prevention, Control and Mitigation Measures	
		2.	Although qualified through certification, all welders must undergo tests
19.	Work over/Testing & Commissioning	1.	Mobilize work over rig and its associated equipment & testing equipment to site exercising due caution.
		2.	Ensure that all these the test equipment are in good condition
		3.	Ensure other equipment and facility conforms to the approved specification of test.
		4.	Public notice to be served before testing/flaring & commissioning

8.4 Contingency Planning

The Risk Assessment study reveals that Lower Flammability Limit is located within the premises of the proposed terminal for the most probable scenarios. In addition, the overall safety record of the LNG industry needs to be recognized as there shipping and transfer, while 7 minor accidents have been reported by Lloyds. It is reported that the discussions with other LNG import operators in neighboring India also indicate that suppliers and LNG operators enforce strictly safe procedures before the plant is commissioned and operations can commence.

In addition, waves and currents were determined for various cyclone events and stressed for incorporating the layout to ensure that there is no sedimentation beyond the immediate vicinity of the proposed terminal. Multiple options for LNG import such as safety, cost, and existing operations at nearby Ports, shoreline erosion, sedimentation and environmental factors were needed to establish the terminal layout that would result in required wave tranquility of safe Navigation and operations,

The coldwater discharges with the warm water discharge from the power plant, thereby neutralizing any change in temperature. While this is considered to the best case for minimizing impacts on the environment, the worst case scenario of a direct discharge into the sea is also evaluated.

A surface discharge of the coldwater over a cascade/steps on the breakwater allows the Temperature to increase due to contact with air as well as creates sufficient diffusion to minimize the sinking the more dense coldwater discharge. In addition to ensure residual chlorine is limited to 1 mg/L at the discharge point, pulse chlorination is also recommended minimizing any impacts to marine biology.

Based on the above assessment and suggested mitigation measures, the Environmental Management Plan and Disaster Management practices as drawn in these respective sections should be there to minimize waste generation, emissions and effluents. Further, support from the concerned agencies, the safety measures and training of local people in the actions to be taken during a disaster would play an important role, even though the LNG industry has an excellent safety track record.

8.4.1 Roles and Responsibilities for Contingency plans

Contingency plans should be backed up by adequate and well established procedures, necessary supplies of products for treatment, and personnel trained to deal with spills are essential to ensure an effective response. The following section defines the Roles and responsibilities of the various agencies involved in combating oil pollution in the event of spillage in the event of a disaster. Consequence analysis indicated that there has not been any major marine accident worldwide due to observance of LNG safety standards and personnel are to undergo rigorous training & studies for safe & environment-friendly operations.

8.5 Emergency Response Plan and Disaster Management Plan

For this project an emergency response systems should be in place to deal with Catastrophic failure of one of the unloading arms, Spill of LNG from one of the unloading arms, Spill from the pipeline due to line rupture, Release of natural gas from pipeline leading to vapor cloud dispersion / explosion, Release of Boil off Gas (BOG) from FSRU, Release from a hole in the LNG carrier tank, natural calamities, fires and burns & injuries There are to be trained emergency response teams with specific contingency plans and incidence specific equipment packages in place to cope with these types of an emergency. Should an incident occur immediate action must be taken to mitigate the impacts.

In order to minimize the possibility of injury to the responders and others it is important that emergency responders follow a specific sequence of actions as stepped out in the preceding paragraphs. Figure-8.2 placed below illustrates an example of a system approach to the FSRU and Gas Transmission Pipeline Activities so far as construction and operations are concerned.

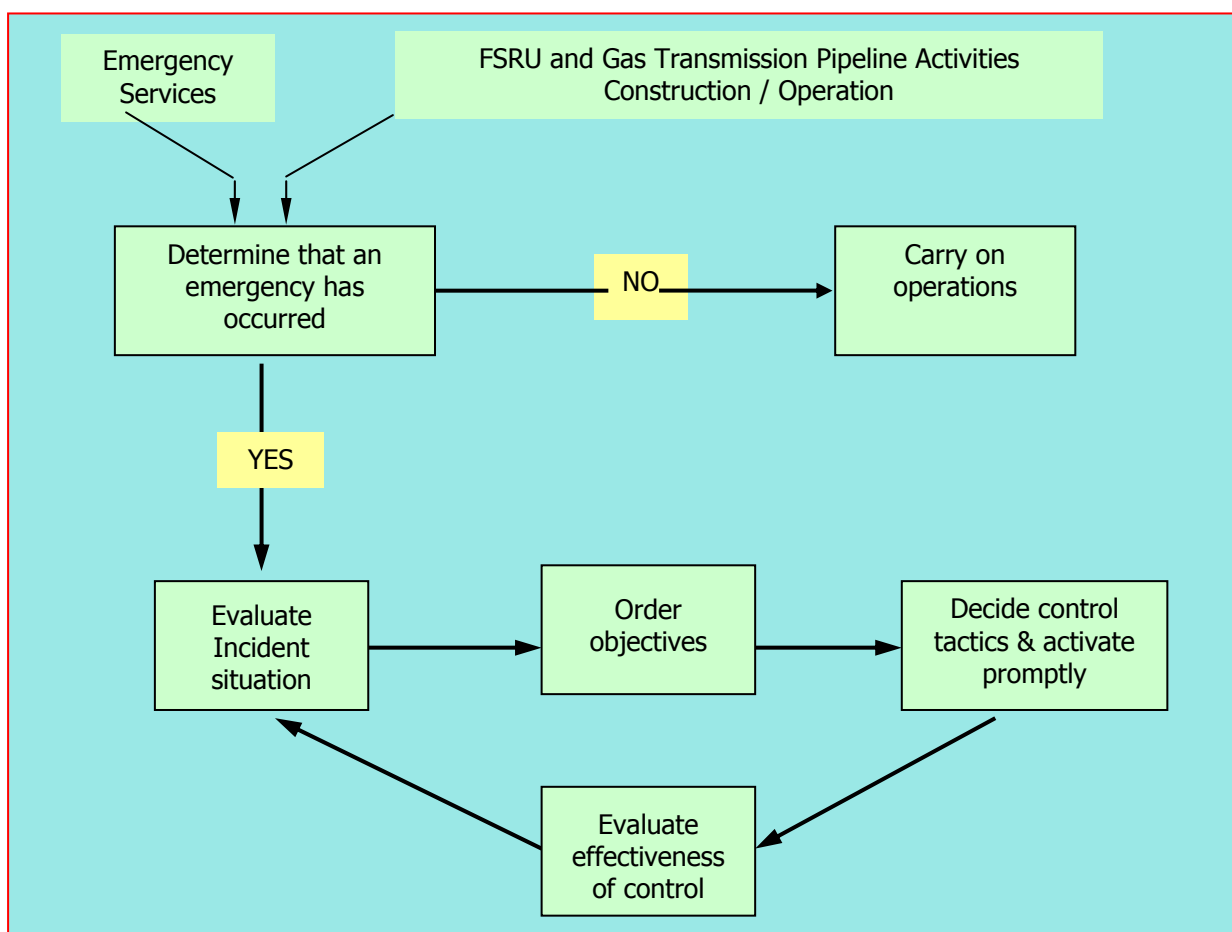


Figure-8.2: Example of a system Approach

8.5.1 Measure, Assess and Audit Progress

Measuring ESMS progress is critical to improving performance. A successful ESMS must be a continually improving process. The company ESMS includes several ways that this measuring can be done:

1. Co-worker assessment-this is an evaluation, conducted by a trained co-worker, of how well each requirement/procedure is being fulfilled by the responsible person. Trained co-workers from the same or other facilities with the same or similar responsibilities would conduct the co-worker assessment.
2. Self assessment-each responsible person assesses his/her own progress.

In this assessment, a simple, three-point scale will be used to score performance in implementing the ESMS:

1. No evidence that the procedure is being implemented
2. Procedure is partially implemented
3. Procedure is fully implemented
4. Best practice (the absolutely exemplary performance of procedure implementation) to be held up as a model for others to emulate.
5. Another way of measuring ESMS performance is monitoring by the Company Environmental Specialist Manager.

8.5.2 Incidents/Accident Investigation & Reporting System

Major disasters are often preceded by a string of minor incidents which are ignored, neglected or not fully understood. Therefore, a routine system should be enforced to ensure that all accidents are investigated and reported to the plant supervisors in a specified format such as the following:

- Description of incident or episode;
- Immediate cause;
- Background on the factors that might have made the incident possible;
- What form of energy release or toxic substance was involved?
- What was done to prevent accident (who responded and how)

- What effect did it produce on the immediate and surrounding environment?
- What repercussions did the incident have (loss of life damage to equipment and buildings) and
- Cost estimates of damage done and repairs needed.

Registers of all incidents should be kept and should be analyzed on a regular basis (at least monthly) to identify trends or patterns in incident occurrence. In particular cases this may prevent significant chronic incidents or single-event events that are the result of an accumulation of either physically hazardous materials or substances, or operational complacency.

8.5.3 Preparedness

Having taken all the preventative measures, a Disaster Management Team (DMT) should be established which would be responsible for preparing a specific Disaster Management Plan for the project. The team should meet at regular intervals to update the Disaster Management Plan based on accident data and any changes to support agencies. The team should also undertake trial runs in order to be fully prepared and to improve upon the communication links, response time and other critical factors.

8.6 Disaster Management Planning (DMP)

The initial response to a disastrous incident is a critical step in the overall emergency response. The responders often have minimal information and must make rapid decisions to ensure safety of the public and the response teams themselves. As a general rule the initial response is guided by three priorities. Ranked in importance these priorities are:

- People
- Property
- Environment

Keeping these priorities in mind, the six steps described below constitute most of the emergency response phases. It is important to realize that although the six discrete steps have been identified, several of the steps may be activated simultaneously.

The emergency procedures identify 'who does what and when' in the event of an emergency. Responsibility for who is in charge and their coordination of emergency actions shall be identified. The following are important events that require emergency procedures at any given time or may be occurring all at once.

It is also important to remember that emergency response must be adapted to individual circumstances and may require inventive, adaptive or creative solutions to difficult problems with very little time for planning or debate. Further, to improve the response capabilities, cooperative arrangements and organizations must be established for providing the appropriate equipment and expertise.

Nature of Emergency and Hazardous Situations may happen with any or combination of one or more of the following categories: relating to this project so far as its construction, testing, commissioning and operation of both the FSRU complex at the terminal location and the pipeline installation and control station at the Tie-in point.

i. Emergency

- Fire,
- Blow-out / Explosion,
- Medical emergency,
- Leaks and other releases of hazardous substances,
- Spillage of toxic chemical, and electrocution.

ii. Natural Disasters

- Flood,
- Earthquake/ cyclone,
- Storm/ typhoon/ tornados, and
- Cloud burst lightning.

iii. External Factors

- Food poisoning/water poisoning,
- Sabotage, and
- War.

8.6.1 Six Steps in Emergency Response

- Step-1:** a) Determine the potential hazards associated with the incident, substance or circumstances and take appropriate action identify the type and qualities of dangerous goods involved and any known associated hazards.
b) Determine potential hazards stemming from local conditions such as inclement weather water bodies etc and ensure that the initial response team is aware of these conditions.
- Step-2 :** Determine the source/ cause of the event resulting to the emergency and prevent further losses.
- Step-3 :** Conduct an assessment of the incident site for any further information on hazards or remedies.
- Step-4 :** Initiate redress procedures.
- Step-5 :** Report the incidence its nature cause impact applied redress procedures and any further assistance required etc. to the appropriate company, government and/or land owner.
- Step-6 :** Take appropriate steps with respect to hazards to wildlife, other resources and addressing public and media concerns and issues, as applicable. Response priorities are to protect human lives, property and the environment.

8.6.2 Guidelines for Disaster Management

8.6.2.1 Introduction

Disaster management is a four step exercise:

- The design and planning stage,
- The plant operating stage,
- The short and important stage when disaster actually occurs, and
- The recovery stage.

It is imperative that all safety precautions are rigorously implemented so as to avoid any kind of accidental occurrence in the first place. At the design stage, this includes incorporating items of basic engineering planning and design for safety into all processes and providing suitable safety margins for equipment as per the various safety codes and standards in practice.

At the operation stage, disaster management is mainly preventative in nature, through the use of appropriate personal protective equipment and safe work procedures.

The disaster stage has the greatest potential for being mismanaged due to the typically somewhat chaotic and unplanned nature of the event. It is at this stage that pre-planning becomes critical.

8.6.2.2 Preparedness

Having taken all the preventative measures, a Disaster Management Team (DMT) should be established which would be responsible for preparing a specific Disaster Management Plan for the project. The team should meet at regular intervals to update the Disaster Management Plan based on accident data and any changes to support agencies. The team should also undertake trial runs in order to be fully prepared and to improve upon the communication links, response time and other critical factors.

8.6.2.3 Level of Incidents

In the event of a disaster at any location within the workplace, the area affected can be classified in the following four classes:

Level-I	Operator level
Level-II	Local/community level
Level-III	Regional/National level
Level-IV	International level

Only Level-I and Level-II class of incidents or accidents will be applicable within the proposed Gas pipeline Project. Level-I, disasters may be the result of fires, explosions, oil spillages and spontaneous ignition of inflammable materials. This may affect persons working in and around moving machinery, other plant and various sites which have been mentioned as potential hazard areas.

Level-II disasters may happen due to sabotage or complete failure of all automatic control/warning systems, catastrophic failure of fuel oil storage tanks, chemical release or explosion. Transportation (road and rail) accidents could occur anywhere within or outside the complex and thus present additional problems of access and loss of time in taking remedial measures.

8.6.2.4 Categories of Emergencies

There are broadly 3 Categories of emergencies which are likely to happen as narrated below:

- Level 1 Emergency is a MINOR EMERGENCY, which can be controlled entirely by personnel and facilities, located within the immediate vicinity of the accident/incident site. LEVEL-1 Emergencies are those which cause minor property or equipment damage

that are non-disruptive to operations, and do not pose a safety risk to personnel or property outside of the boundaries of Company property.

- Level 2 Emergency is a SERIOUS EMERGENCY, which is disruptive but not extensive, and forces a portion of the Company operation to be temporarily suspended or shut down. Events or conditions which describe LEVEL 2 Emergencies are accidents/incidents that endanger the safety of personnel or the public outside of the boundaries of Company property, or have the potential to endanger the safety of personnel or the public outside of the boundaries of Company property, and would require the notification of external support services.
- Level 3 Emergency is a DISASTER EMERGENCY that forces the indefinite shut down of Company operations, or a sector of Company operations. Safe operating control has been lost, causing or having to cause; serious injuries or fatalities among employees, contractors or the public; extensive damage to company property or equipment; or serious harm to the environment

8.6.2.5 Incidents/Accident Investigation & Reporting System

Major disasters are often preceded by a string of minor incidents which are ignored, neglected or not fully understood. Therefore, a routine system should be enforced to ensure that all accidents are investigated and reported to the plant supervisors in a specified format such as the following:

- Description of incident or episode;
- Immediate cause;
- Background on the factors that might have made the incident possible;
- What form of energy release or toxic substance was involved?
- What was done to prevent accident (who responded and how)
- What effect did it produce on the immediate and surrounding environment?
- What repercussions did the incident have (loss of life damage to equipment and buildings) and
- Cost estimates of damage done and repairs needed.

Registers of all incidents should be kept and should be analyzed on a regular basis (at least monthly) to identify trends or patterns in incident occurrence. In particular cases this may prevent significant chronic incidents or single-event events that are the result of an accumulation of either physically hazardous materials or substances, or operational complacency.

8.6.2.6 Response

i. Set up Disaster Control Room

In the unlikely event of a disaster a Disaster Control Room (DCR) should be set up. The responsible officers of Disaster Control Group will assemble in the DCR and formulate control procedures as part of the contingency plans.

The DCR should have links with all site operations and an officer should maintain the DCR at all times. On receiving information about an accident, the officer should inform the Disaster Controller (DC) and/or other coordinators immediately.

ii. Casualty Services

The Head of casualty services will be the Medical Officer who will secure and provide First Aid service to first aid patients on the spot.

8.6.2.7 Emergency Response Plans for Disaster Management

The disaster emergency response management plans should include the following:

- Establish a Disaster Management Plan (DMP) in place that is addressed & duly weighed.
- Engage an experienced Port Operator to provide various services that include Hazard

Prevention, and, Health, Safety & Environment services on the waterfront.

- Take care of HSE & Hazard prevention in the waterfront with the assistance of Port Operator.
- Make it fully effective for preventing and managing any incidents or accidents in and around the LNG import terminal and the waterfront and for ensuring their safety.
- Establish and maintain suitable systems, and employ / contract Skilled and trained Personnel, necessary and efficient communication equipment and all other equipment and facilities for prompt application for Disaster Prevention
- Organize periodic exercises and simulations with Port Operator and the LNG Tanker's/vessel's owner in accordance with simulated accident scenario.
- Deploy qualified HSE manager for overseeing and ensuring overall implementation of policy as regards Health, Safety and Environment Plan for the port.
- The Operating personnel have to be extensively trained in fire fighting at LNG terminals in operation elsewhere.
- The Port operator shall also deploy trained manpower for managing the waterfront activities.
- The waste management plan shall be compliant with requisite standards.
- The Port Operator will be entrusted with the responsibility and cargo transfer procedures as per guidelines of international bodies for vessels and shore facilities for Pollution control.
- Additionally port operator shall completely control and verify compliance with the checklist before unloading operation bunkering operation and compliance with rules and guidelines specified by International Maritime Organization
- The Port Operator shall deploy, operate and maintain one (1) pilot boat; and two (2) jetty mooring boats for the LNG Import Terminal for routine and operational tasks at sea
- Provide anti-pollution equipment and material for prevention management application at any time of the DMP procedures.
- Supply and deployment of fleet of at least four (4) harbor Tugboats, for safe navigational operations at the LNG terminal.
- Professionally control the fire without attempting to put it out
- The choice of Withdrawal of emergency response personnel will depend on the accident assessment and the Materials involved. Putting out the fire could sometimes prefer to let the fire burn, thus limiting the exposure of personnel.
- The duties of the fire and rescue team leader include: Inform the Main Controller if external fire tender/fire fighting equipment/materials/Mutual Aid is required.
- Liaise with the utilities and arrange for external water supply/diesel for hydrant pump etc.
- Maintaining adequate supplies for fire fighting equipment and facilities.

8.7 Biodiversity Management Plan

8.7.1 Overview

This Biodiversity Management Plan has been prepared to document a summary of potential impacts and mitigation measures associated with the development of this Project, and associated management actions. It is also intended to provide the outline of an appropriate monitoring program to be implemented prior to and during project construction & operation activities.

8.8 Occupational Health and Safety Management Plan

The FSRU project itself along with its associated facilities including onshore and sub sea gas pipeline has to be designed to avoid or minimize impacts on the environment wherever practicable. GTCL would ensure implementation of mitigation measures to reduce negative environmental impacts on Health, Environment and Safety, and would ensure protection of health and safety of not only its own operating personnel but also for that of the developer and its 3rd party service contractors as well as members of the neighboring public. A well designed

Operation Management System (OMS) inbuilt in the organizational set up of GTCL has provided a consistent delivery mechanism to address potential adverse impacts, to enhance project benefits and to introduce standards of good practice to be adopted for project activities.

8.8.1 Contingency Plans for FSRU Complex, Offshore and Onshore Field Facilities

A site specific Contingency Plans has to be developed to cover specific details for those emergencies which may be encountered during construction and operation of FSRU complex, sea bed pipeline, tie-in point and onshore field camp facilities. This ERP has been organized such that each of the anticipated emergencies has an organization plan, a list of responsibilities and a list of duties.

FSRU Supervisor have overall operational responsibility on the FSRU with his assistants. He will be notified as soon as the emergency reaches Level 2 and will assume overall responsibility and coordinate closely with the designated persons and agencies concerned . Similarly, sea bed pipeline in charge and the tie-in point and onshore field camp facilities Supervisor will have to be notified and action should follow immediately to respond accordingly. All operating personnel, included contractors, must become familiar with site specific plans and duties. Supervisory personnel shall know and understand the entire Emergency Response Plan and their responsibilities and duties.

8.8.2 Port Operator

Provision of safety and security zones for LNG carriers to reduce the likelihood of Collisions or the need for an LNG vessel to try to avoid other in and out bound shipping line traffic

- Identify releases: Location, size, source and intimate site main controller at SEL
- Inform statutory bodies
- Establish crisis management group and define roles and responsibilities
- Coordinate quick and safe handling of tankers
- Provide essential equipment and accessories including training of personnel involved in operations
- Organization of periodic exercise and mock drills.

8.8.3 Coast Guard

The Coast Guard Commander isto keep equipment and personnel in constant readiness and see that the following details are duly monitored:

- Identification of suiTable-means for treatment and disposal of debris, emulsions etc.
- Regional Coast Guard Commanders are on due surveillance
- Coordination of activities of all concerned agencies and operators
- Receive reports of oil pollution, if any, and mobilize Coast Guard resources to support the On
- Scene Commander (OSC) action at spill area of the LNG Import Terminal
- Provision of administrative and infrastructure to the Regional Communication Center (RCC) to perform their activities
- Assess available resources and maintain a list of local, regional, national and International groups according to the scale of spillage at which they should be contacted
- Conduct periodical exercises of combating oil pollution and following other accidental situations:
 - Catastrophic failure of one of the unloading arms
 - Spill of LNG from one of the unloading arms
 - Spill from the pipeline due to line rupture.
 - Release of natural gas from pipeline leading to vapor cloud dispersion / explosion
 - Release of Boil off Gas (BOG) from FSRU
 - Release from a hole in the LNG carrier tank
 - Worst Weather Case with high wind speeds

- Maintain and update inventory on anti-pollution drive
- Provide assistance to local groups in implementation of Local Action Plan

8.8.4 Offsite Emergency Response Plans (OERP)

8.8.4.1 Specialized Equipment

Preparation of any OERP involving nearby communities and settlements will include training and awareness, alarms, procedures for evacuation, fire fighting, emergency communication systems, first aid, etc. Procedures are to be established for large emergency with district and state authorities, coast guard, etc. One Tugboat shall be fitted with anti pollution equipment. This Tugboat shall also be fitted With two four hundred meters of oil trapping boom designed for sea; six (6) mooring buoys for the oil trapping boom; two pumps designed to pump very heavy and viscous oil. Two of the four tugboats shall be classified for handling liquids of the following characteristics:

- Freshwater
- Fuel oil
- ME Lube oil
- Foam and
- Detergent

The tugboats shall be equipped with 8 fire extinguishers, 2 fire pumps, 8 life buoys, and 12 jackets and gas detection meter etc.

All relevant emergency equipment should be maintained on site throughout the project. Apart from the items mentioned above, this includes items such as fire extinguishers/hoses self-contained breathing apparatus (SCBA) and personal protective gear etc.

The hazardous materials section of the local fire brigade has emergency response units with specialized equipment that would be appropriate for an explosion incident response. All local brigades should be checked for their ability to respond to certain incidents and should be notified of the operations taking place.

8.8.4.2 Training

It is critical that emergency responders have a clear understanding of the potential problems that exist as a result of an emergency situation, that they pre-plan for such an event, and have hands-on training prior to initial response to an actual incident. In-house training programs should be held by the company and designated first responders to test their capabilities. Response teams have to be assembled, both on a company and community cooperative basis to deal with potential emergency situations. A duly scheduled training program that includes at least two field exercises would be effective for the attendees to gain hands-on training in coping with incidents typical of this FSRU complex, sea bed pipeline, tie-in point, field camp facilities and onshore gas pipeline construction and operations.

8.8.4.3 Safety Orientation

Initial safety orientation is one of the most important aspects of any safety program. Employees, developers and contractors must receive some level of basic training, specific to the facility and nature of the job. It must be ensured that appropriate orientation is given to all employees, developers, contractors, sub-contractors and visitors.

The orientation shall also include a review of the following:

- Company safety policy and procedures;
- Specific job hazards;
- Safety precautions;
- Job responsibilities;

- Regulatory requirements;
- Company enforcement policy; and
- Worker's right-to-know and authority to refuse unsafe work.

8.9 Responsibility of the Contractor / Developer

Potential impacts could originate from developer/contractor's activities. Therefore, GTCL shall ensure that Contractors take due responsibility to mitigate these negative impacts. Particularly GTCL will ensure that the Contractor:

- Takes reasonable steps to protect the environment and avoid damage and nuisance arising from their activities and operations.
- Complies with statutes and regulations concerning the execution of work.
- Familiarizes with legislation and regulations relating to environmental protection that is relevant to their activities.
- Refers to national environmental quality guidelines.
- Be responsible for the costs of cleaning up any environmental pollution resulting from their activities, if methods for doing so are available and effective.
- Maintains sites under their control in a clean and tidy condition and shall provide appropriate and adequate facilities for the temporary storage of wastes before disposal.
- Shall not allow used oil or other petroleum wastes to be used as dust suppressants and reasonable precautions shall be taken to control and prevent accidental blow off of gas and/or spillage of petroleum products or discharge into atmosphere or water courses.
- Be responsible for the provision of adequate sanitary facilities for the construction workforce (including those employed under sub-contracts) at construction and camp sites. Vehicles operated by the Contractor (including sub-contractors) shall be maintained according to the original manufacturer's specifications and manuals with particular regard to the control of noise and/or smoke emissions.
- Takes reasonable measures to minimize dust-blow arising from sites under their control by regular watering of soil stockpiles, bare soil, haul roads, non surfaced traffic areas and sources of fugitive dust, when conditions require dust suppression.
- Be responsible to pay compensation upon the appropriate monetary evaluation applicable to the local market if any damage is incurred to agricultural land or surrounding homesteads outside of the requisitioned land.
- Precautionary signboards/ danger signals/ propitiatory billboards shall be placed in appropriate places to notify people about the possible dangers particularly in the eve of non destructive testing inspections involving radiations and including but not limited to hydrostatic testing & commissioning of the pipeline system.
- No pollution materials will be discharged to sea water without treatment
- Removes equipment, surplus material, rubbish and temporary works and leave the offshore & onshore sites in a clean condition to the satisfaction of the company's representatives after completion of construction activities.

CHAPTER-9: RISK MANAGEMENT

9.1 Introduction

The overall objective of this risk assessment management with respect to the proposed LNG Project involves identification and evaluation of major risks, prioritizing risks identified based on their hazard consequences and using the outcome to guide development of Emergency Response Disaster Management Plan (ERDMP). Hence in order to ensure effective management of any emergency situations that may arise during the operation of the floating LNG storage unit (FSRU); transport of RLNG via offshore HP gas subsea pipeline of 3-8 km followed by onshore/subsea pipeline of 7 km up to the CTMS at Dholghata. Additionally, the results of the risk assessment can also provide valuable inputs for keeping risk at As Low as Reasonably Practicable (ALARP) and arriving at decisions for mitigation of high risk events.

9.2 Risk Assessment

The Risk Assessment (RA) aims to provide a systematic analysis of the major risks that may arise as a result of the operation of the proposed LNG storage and regasification facility (FSRU facility) located in Bay of Bengal 3-8 km to the west off Moheshkhali Island in Cox's Bazar District of Bangladesh. The RA process outlines rational evaluations of the identified risks based on their significance and provides the outline for appropriate preventive and risk mitigation measures. The output from the risk assessment will contribute towards strengthening of the Emergency Response Disaster Management Plan (ERDMP) in order to prevent damage to personnel, infrastructure and receptors in the immediate vicinity of the plant. Yet, as in practice, the following issues stand out to be of significance for taking in to consideration in averting any risk and hazard during different phases of construction and operation of the project.

- Identify potential risk scenarios that may arise due to unloading of LNG from carrier to the FSRU, transportation of natural gas through pipeline and storage of LNG in FSRU;
- Review existing information and historical databases to arrive at possible likelihood of such risk scenarios;
- predict the consequences of such potential risk scenarios and if consequences are observed to be high, establish the same through application of quantitative simulations;
- *Dredging and disposal
- * Impacts on benthic ecology at disposal site and inter-tidal flora/fauna
- *Cold water discharge
- Recommend feasible preventive and risk mitigation measures as well as provide inputs for developing ERDMP.

9.2.1 Risk Assessment Methodology

The risk assessment process is primarily based on likelihood of occurrence of the risks identified and their possible hazard consequences particularly being evaluated through hypothetical accident scenarios. With respect to the proposed Project, major risks viz. leaks and rupture of storage tanks and pipeline have been assessed and evaluated through a risk matrix generated to combine the risk severity and likelihood factor. Risk associated with the proposed Project have been determined semi-quantitatively as the product of likelihood (probability) and severity (consequence) factors by using order of magnitude data [$\text{risk ranking} = \text{severity}(\text{consequence}) \text{ factor} \times \text{likelihood} (\text{probability factor})$]. Significance of Project related risks was then established through their classification as high, medium, low, very low depending upon risk ranking.

The risk matrix is widely accepted as standardized method of risk assessment and is preferred over purely quantitative methods, given that its inherent limitations to define a risk event is certain. Application of this tool has resulted in the prioritization of the ntial risks associated with the proposed Project thus providing the basis for drawing up risk mitigation measures and leading to formulation of plans for risk and emergency management. The overall approach is summarized below in Figure-9.1.

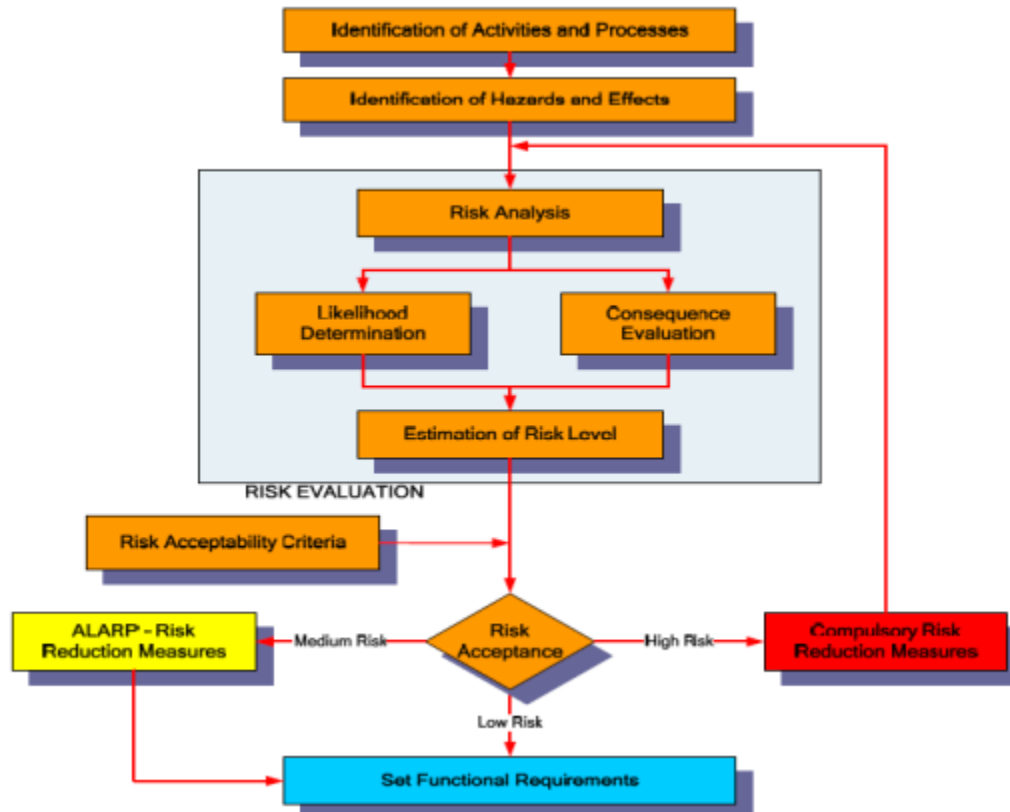


Figure-9.1 : Risk Assessment Methodology

9.2.2 Safety and Security Risk & Hazard Assessment

It is pertinent that appropriate assessment of Safety and Security Risk & Hazard is duly recognized and thus it is recommended that a detail assessment of safety and security of the Project is made before launching its execution in consultation with the national and local agencies. This has to be based on a systematic assessment of potential risks to navigation safety and maritime security associated with the proposed Project.

- The assessment of potential risks has to be evaluated in terms of the components of risk: threats, vulnerabilities, and consequences.
- The assessment may lead to the preliminary determination that additional measures would be necessary to make the Project suitable for LNG carrier traffic and identified additional measures that would provide for the safety and security of the proposed FSRU and LNG carriers;
- Those measures would be considered by the concerned agencies during its review of the proposed Project.
- It may be mentioned here that there are currently no known, credible threats against the proposed facilities, although periodic threat assessments must be conducted to ensure that the security measures are in place remain appropriate to address unknown threats.
- There are many significant safety and security benefits associated with the location of the FSRU, especially with respect to threat and consequence since it would be remote

from population centers.

- It can be stated that this remoteness would serve to reduce the attractiveness of the FSRU as a target, but the location would create some law enforcement challenges.
- Additional security resources would be needed to mitigate safety and security risks associated with the proposed Project, particularly trained law enforcement personnel and well equipped petrol boats.
- Further, additional marine firefighting resources may be required to mitigate fire risks associated with the Project.
- If the concerned agency concludes that the needed resources are not available prior to initiation of operation, they would not provide the project proponent with final approval to operate the Project.

9.2.3 Weather Guidelines

- For STS operations, due consideration has been given to the environmental forces on conventional LNG vessels that are not equipped with reinforced containment systems and their restricted ability to withstand sloshing loads for filling levels between 10 percent of tank length (converted to image) and 70-80 percent of the tank height.
- Therefore, based on the recommendations contained within the BV Operational Manual for Partial Filling the maximum 'operating conditions are deemed as follows:
 - a) Pitch amplitude shall not be allowed to exceed 1.5 degrees, particularly for:
 - i. Wave peak-periods beyond 8 seconds
 - ii. Relative wave headings in the range of 45 to 70 degrees and 110 to 135 degrees.
 - b) Roll amplitude shall not be allowed to exceed 2 degrees particularly for,
 - i. Wave peak periods beyond 8 seconds
 - ii. Relative wave headings in the range of 30 to 150 degrees
- In terms of wind speed, the above is approximated to be equivalent to Beaufort Force 5 (17 to 21 knots a significant wave height of approximately <2.0m.
- Weather forecasts and predictions will be monitored closely during the STS operation. FSRU and vessel are equipped with 'Met-manager' which is capable of giving early warnings of poor weather. In addition provision shall be made for advance weather monitoring.
- The monitoring of the wind speed and motion between the vessels shall also take into account any sloshing concerns on the LNGC. In the end, the risk of sloshing damage remains greater for the LNGC and therefore the weather limitations of the LNGC shall prevail as the permissible extreme.
- Note: In the event that the vessels must separate in order to prevent the LNGC from operating outside of the allowable maximum operating conditions, the maximum time required for internal cargo transfer to bring loads within acceptable-sloshing limits starting from the worst possible conditions is 5 to 9 hours. Therefore plans for separation should take into account the time required by the STBL to return to an acceptable-condition for the expected sea state.
- When lightning is present during the course of an STS transfer, the flow of cargo between the vessels shall be suspended. Cargo lines may be kept cooled by use of a spray pump.

9.2.4 General Approach to Risk Assessment

The objective of any chemical hazard management plan is to ensure safety for both the local community and the environment in general. So, any plan would aim to reduce risks of emergencies related to hazardous material use, handling, storage or disposal.

The principal approach to risk assessment is obviously based on the postulation of: a certain probability of major accidents occurring at a specific site and an estimate of potential damage to the population and the environment around the site

Probability of risk within any identification framework for various scenarios of chemical emergency during pipeline operation is usually derived from statistical data. The probability of a major accident depends on the failure ratio of technical installations, the frequency of hazardous goods transports etc. The damage assessment depends on various factors such as amounts of chemicals stored or transported, dispersion distances for different chemical substances, toxic properties of chemical substances, population density, etc.

The resulting risk is presented as an expectation value (mathematically a multiplication of probability and damage) or as a cumulative risk curve. These calculations are carried out separately for human and environmental damages and for all relevant risk sources.

The employment of Geographic Information Systems (GIS) methods allows one to visualize the risk levels and to assign them to specific geographical areas. Furthermore, GIS facilitates the interpretation of data and of the final results. The accumulated risk layers lead to interesting, sometimes surprising results, because several minor events accumulated at the same geographical site might result in a significant total risk.

In the foregoing context, anticipated major risk assessment problem to be faced by GTCL may include the possible increase in conflicts between risk-inducing activities and land-use planning, more intensely used emerging built-up areas and increasing redevelopment of sub-urban sites close to its pipeline system into areas of industrial and mixed use ones, producing new risk exposure situations.

9.3 Identification of Hazards

9.3.1 Causes of Hazards

Hazard identification for the purposes of risk assessment involves the qualitative review of the Project design and operations including relevant information provided by Summit LNG Co. Available literature related to LNG terminal and pipeline risk assessment worldwide, terminal design, pipeline route and configuration, work procedures were reviewed in light of the proposed Project activities. Hazards are associated with a large release of LNG from the Project which should be duly calculated for determining the hazard zones as part of assessing the suitability of the Project Waterway for LNG carrier traffic and the suitability of the proposed location of the FSRU. In addition, separate calculations and risk-based analyses should be used for determining the size and shape of the proposed safety and security zones around the FSRU and the LNG carriers. Some of these could result from the following:

- Accidental release of LNG resulting from the FSRU moving outside the
- Operational reach of the unloading arms or the failure of a cargo transfer hose during the transfer process;
- Catastrophic failure of one of the unloading arms
- Spill of LNG from one of the unloading arms
- Spill from the pipeline due to line rupture.
- Release of natural gas from pipeline leading to vapor cloud dispersion / explosion
- Release of Boil off Gas (BOG) from FSRU
- Release from a hole in the LNG carrier tank
- Worst Weather Case with high wind speeds
- Spillage of fuel oil during bunkering of FSRU; and
- Spillage of fuel oil due to FSRU fuel tank integrity failure or external damage.

9.3.2 Hazards from LNG

LNG is an extremely cold, non-toxic, non-corrosive and flammable substance. If LNG is accidentally released from a temperature-controlled container, it is likely to contact warm surfaces and air that transfer heat into the liquid. The heat input begins to vaporise some of

the liquid, returning the liquid to the gaseous phase. The relative proportions of liquid and gaseous phases immediately following a release depend on the release conditions. The liquid phase will form an LNG pool on the ground which will begin to "boil", due to heat input from the surrounding environment. Immediately following vaporisation, the gas is colder and heavier than the surrounding air and forms a vapour cloud. As the gas disperses, it mixes with the surrounding air and warms up. The vapour cloud will only ignite if it encounters an ignition source while concentrated within its flammability range.

Downstream of the vaporisers the natural gas will be in the gas phase. A release from piping and equipment will result in a gaseous phase release directly.

The hazards effects of LNG in the event of an accidental release from tanks, piping or equipment, including the characteristics of the possible hazardous effects have been described below.

9.3.3 Cryogenic Burns

LNG can cause frosting if it comes in contact with skin of personnel handling it. LNG vapours upon LNG evaporation being cold; it may cause frosting of lungs, though chemically it does not react with lungs. The process equipment and pipeline are well designed and thermally insulated with mitigations in place to prevent any leakage.

9.3.4 Toxicity & Asphyxiation

No occupational exposure limit is prescribed for methane. It is an asphyxiate gas which displaces oxygen when there is a high concentration of methane in air. High concentration of methane in air normally occurs very close to the leakage source. Risk of asphyxiation increases as methane is an odourless gas. Recommended concentration is 19.5% of oxygen (v/v) in air.

9.3.5 Fire Hazards

LNG vaporises quickly as it absorbs heat from the surroundings. Methane vapours are flammable between concentration of lower flammability limit of 5 % (v/v) and higher flammability limit of 15% (v/v). LNG at its boiling point of -162°C is denser than air (at ambient temperature of 25°C) while it becomes lighter as it mixes with air.

Jet Fire

Jet fires result from ignited releases of pressurized flammable gas or superheated/pressurized liquid through a hole from a pipeline or storage tank. The momentum of the release carries the material forward in a long plume entraining air to give a flammable mixture. Jet fires only occur where the LNG is being handled under pressure or when handled in gas phase as unobstructed release. Jet fire is destructive to anything which falls within its ambit and causes convective heating which spreads around the jet.

Flash Fire

Following an LNG release, a large proportion of the liquid will evaporate immediately to form a cloud of methane, initially located around the release point. If this cloud is not ignited immediately, it will move with the wind and be diluted as a result of air entrainment. Similarly, a gas release may not be ignited immediately and will disperse in the air.

The dispersing vapour cloud may subsequently come in contact with an ignition source and burn rapidly with a sudden flash. If the source of material which created the cloud is still present, then the fire will flash back to the source giving a pool fire or, if under pressure, a jet fire. Direct contact with the burning vapours may cause fatalities but the short duration of the flash fire means that thermal radiation effects are not significant outside the cloud and thus no fatalities are expected outside of the flash fire envelope.

Vapour Cloud Explosion

A flash fire is the most likely outcome upon ignition of a dispersing vapour cloud from an LNG release. If ignited in open areas (i.e. unconfined conditions), pure methane is not known to generate damaging overpressures (explosion). However, if the gas is ignited in areas where there is significant degree of confinement and congestion an explosion may result.

Pool Fire

A pool fire occurs when a flammable liquid is released from a pipeline or storage tank onto the ground and ignited. A pool formed from the release of liquid LNG will initially spread due to the gravitational and surface tension forces acting on it. As the pool spreads, it will absorb heat from its surroundings causing evaporation from the pool surface. Ignition of this vapor leads to a pool fire.

Fireball

Immediate ignition of releases caused by a rupture in a gas piping may give rise to a fireball upon ignition. Fireballs have very high thermal radiation, similar to jet fires although the duration of the event is short.

To summarize, a liquid phase release may result in a flash fire, vapour cloud explosion, pool fire or jet fire. A gas phase release can result in a flash fire, fireball or jet fire.

9.4 Who Might Be Harmed and How

None of the hazard zones around the FSRU extend to a population center due to the minimum 3-8 km distance between the FSRU and land. The Hazard Zones to be finally determined would also not extend to the shore associated with transiting LNG carriers. Yet under emergent situations the different categories of operating personnel, developer / contractor employees, visitors including members of the public might be affected and harmed depending on the nature and magnitude of the situation arising from any one or more of the hazardous emergencies identified in the foregoing section-9.3.

9.5 Evaluation of Risks

An EMP has been prepared to aid delivery of the project’s environmental social and health commitments identified through the EIA process. The commitments on mitigation from the EIA have been captured in an action tracking register. In parallel with the frequency analysis, hazard prediction / consequence analysis exercises were undertaken to assess the likely impact due to Project related risks on onsite personnel, infrastructure and environment. Overall, the consequence analysis takes into account the following aspects:

- a) Nature of impact on environment and community;
- b) Occupational health and safety;
- c) Asset and property damage;
- d) Corporate image; and
- e) Timeline for restoration of property damage.

The following criteria for consequence rankings (Refer) have been drawn up in context of the possible consequences of the risk events that may occur during the proposed Project operations:

Table-9.1: Severity Categories & Criteria

Consequence	Ranking	CriteriaDefinition
Catastrophic	5	<ul style="list-style-type: none"> Leads to irreversible damage to marine and coastal ecological habitat. Permanent loss of economic livelihood

Consequence	Ranking	Criteria Definition
		<ul style="list-style-type: none"> Multiple fatalities/permanent total disability to more than 50 persons. International media coverage Loss of corporate image and reputation
Major	4	<ul style="list-style-type: none"> Temporary loss of economic livelihood Restoration of wildlife and ecological habitat within 5-10 years. Single fatality/permanent total disability to one or more persons National stakeholder concern and media coverage.
Moderate	3	<ul style="list-style-type: none"> Restoration of wildlife and ecological habitat within 2-5 years Short term hospitalization & rehabilitation leading to recovery State wide media coverage
Minor	2	<ul style="list-style-type: none"> Restoration of wildlife and ecological habitat 1-2 years. Medical treatment injuries Local stakeholder concern and public attention
Insignificant	1	<ul style="list-style-type: none"> Restoration of wildlife and ecological habitat in less than 1 year. First Aid treatment No media coverage

Based on ranking of likelihood and frequencies, each identified hazard has been evaluated based on the likelihood of occurrence and the magnitude of consequences. The significance of the risk is expressed as the product of likelihood and the consequence of the risk event, expressed as follows:

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

The below illustrates all possible product results for the five likelihood and consequence categories while the assigns risk significance criteria in three regions that identify the limit of risk acceptability. Depending on the position of the intersection of a column with a row in the risk matrix, hazard prone activities have been classified as low, medium and high thereby qualifying for a set of risk reduction / mitigation strategies.

Table-9.2: Risk Matrix

			Likelihood →				
			Frequent	Probable	Unlikely	Remote	Improbable
			5	4	3	2	1
Consequence ↑	Catastrophic	5	25	20	15	10	5
	Major	4	20	16	12	8	4
	Moderate	3	15	12	9	6	3
	Minor	2	10	8	6	4	2
	Insignificant	1	5	4	3	2	1

Table-9.3: Risk Evaluation Criteria & Action Requirements

S.N.	Risk Significance	Criteria Definition & Action Requirements
1	High (16-25)	"Risk requires attention" – Project HSE Management needs to ensure that necessary mitigation are adopted to ensure that possible risk remains within acceptable limits.
2	Medium (10-15)	"Risk is tolerable" – Project HSE Management needs to adopt necessary measures to prevent any change/modification of existing risk controls and ensure implementation of all practicable controls.
3	Low (5-9)	"Risk is acceptable" – Project related risks are managed by well-established controls and routine processes/procedures. Implementation of additional controls can be considered.

S.N.	RiskSignificance	CriteriaDefinition& ActionRequirements
4	VeryLow(1-4)	"Risakis accepTable-"--All risks aremanaged by well-established controlsand routineprocesses/procedures.Additionalrisk controls neednot tobeconsidered

Table-9.4: Risk Ranking–LNG Piping

Likelihoodranking	1	Consequenceranking	3(moderate)
RiskRanking&Significance=3i.e. "Low"i.e.Risakis AccepTable-and aremanagedby well-establishedcontrolsandroutineprocesses			

Table-9.5: Risk Ranking–Unloading Arm Rupture (Worst Case Scenario)

Likelihoodranking	2	Consequenceranking	2
RiskRanking&Significance=4i.e. "Low"i.e.Allrisks aremanagedby well-established controls androutine processes/procedures			

Table-9.6: Risk Ranking–High Pressure Gas Pipeline Rupture (Worst Case Scenario)

Likelihoodranking	3	Consequenceranking	5
RiskRanking&Significance=15i.e."Medium"i.e.RisakisTolerable andcanbemanaged throughadoption ofnecessarycontrols.			

Petrobangla and GTCL are committed to working with the FSRU operators, LNG carriers and the Shipping Authorities to ensure that suitable-emergency response procedures and equipment are in place to minimize the effects of an incident.

9.6 Risk Of Property In Case Of Blowout

9.6.1 Causes of Risk of Property

Given the knowledge of the project setting, present environmental conditions and baseline status of the study area through previous investigations, the following assessments have been considered significant to cause Risk of Property in case of Blowout and are required to be assessed.

- Risk assessment of LNG operations
- Impacts on fisheries and marine fauna
- Impacts on hydrodynamics and sediment transport
- Impacts on adjacent shoreline and neighboring port facilities
- Impacts on water quality from rupture of sea bed pipeline and construction
- Impacts on benthic ecology and inter-tidal flora and fauna
- Impacts due to oil spill

9.6.2 Compensation Management Plan

Given the high incidence of salt cultivation, agricultural and commercial fishing activities within the Project area it may be necessary in discreet cases to remove, alter or damage crops or reduce fishing activities in certain areas. These are subjected to usual compensation payment to be made to the individuals affected as per system of valuation of environment and property damage and damage compensation issues in practice. But damage to persons & property due to accidental emergencies including cost of medical treatment etc has to go through an identical but a rapid process to be handled by the Developer/ Contractor & GTCL in consultation with local administration.

Any compensation valuation and payment schedule is set by the Deputy Commissioner's Office. In order to administer an appropriate compensation program GTCL will meet with the local

government administration and local people who may be affected by the FSRU & Pipeline System operation.

Compensation for any financial loss associated with the FSRU & Pipeline System operation will be made by GTCL as per the government provisions. Payments will be made directly to the effected stakeholder. Disputes are to be settled by negotiations involving GTCL staff and the Upazila administration officers through a grievance redress mechanism to be established by GTCL in collaboration with the Moheshkhali Upazila administration, local Community Liaison and if necessary with an out sourcing support from any NGO operating in the locality.

9.7 Emergency Response Planning

This section outlines the procedure for the management of emergencies and evacuation plans during the operations phase. The main objective of the Emergency Response Plan (ERP) is to ensure that activities are carried out to the following priorities:

- Safeguard lives;
- Protect the environment;
- Provide response to emergency situations using an effective communication network and organized procedures;
- Protect the company or Third Party assets
- Maintain the company image/reputation
- Resume normal activities

Personnel involved in dealing with emergency situations shall follow these priorities while making decisions and developing strategies.

9.7.1 Natural Hazards

Natural hazards which may impair the safety of the Project include the following:

- Severe weather conditions; and
- Earthquake or ground movement;

Extreme weather conditions are primarily lightening, cyclones and high winds and heavy rains. Cyclones and high winds may damage the FSRU and land based structures. Potential hazards to workers is anticipated from direct impact of the structure i.e. falling equipment and any subsequent hydrocarbon releases viz. LNG caused by equipment and pipeline damage. The Moheshkhali Upazila of Cox's Bazar District where the proposed Project is located, is one of the most vulnerable and risk prone Upazila's to disaster and climate change.

9.7.2 Cyclones

Cyclone and tidal surge are the most common hazard of the Upazila. In the last decade 29 April 1991, 2 May 1994, 16 May 1997 and 20 May 1998, and 2001, 15 May, 2004, 14 May, 2007 cyclone hit in the Upazila. Most of cyclones were speeded at least 160 km/hour and the areas had been over flooded with tidal surge. Almost all 5 unions affected by the cyclone and highest water inundation were up to 20 feet high in the Upazila; sometimes the water logging lasted for 72 hours maximum in low lying areas.

9.7.3 Scope

The ERP covers the emergency response that needs to be applied to both offshore (including FSRU) and onshore elements of the Project. Emergency response at the FSRU shall be managed through a separate document therefore only the framework is covered in this section. For the FSRU, a HSSE bridging document shall be developed to be used in conjunction with this document, as well as the Emergency Response Plan of the FSRU.

9.7.4 Activation of Emergency Response Team

The emergency response onsite will be mediated by SUMMIT through two dedicated team's viz. the First Intervention Team (FIT) and Emergency Response Team (ERT). The roles and responsibilities of key team members have been outlined below.

Incident Controller

The shift operation supervisor is the incident controller and will be leading the response team until the emergency is totally brought under control. The incident controller takes control of an incident and manages directly or appoints personnel to positions. He assumes control of the organization and maintains command with site personnel.

- Assess the situation;
- Appoint, brief and task personnel;
- Establish Incident control point (ICP);
- Initiate Incident action plan (IAP);
- Manage emergency operations at the incident site;
- Plan, execute, review and re-assess fire-fighting operations continuously;
- Maintain safe environment; and
- Record actions taken during course of incident control

Field Operators

Shift Field Operators are part of the First Intervention Team (FIT) and will act in emergency response operations as per instructions of the incident controller. They will act in ensuring

- Timely alert;
- Isolation of release;
- Evacuation of personnel;
- Rescue and relief work; and
- Fire-fighting operations, where instructed

Panel Operator

The Panel Operator also has a role on the FIT with the responsibility to maintain:

- Prompt isolation of effected area of the operations on-board FSRU and CTMS;
- Maintaining internal communication with emergency site, Duty Manager, port control room etc.; and
- Acting on incident controller's instructions

In case of an emergency, the Shift Security supervisor will report to the Shift Operation supervisor immediately together with the Shift Security guards, as an Auxiliary Support Team.

Emergency Response Team

In case of prolonged or serious emergencies, Reliance shall have a strong back up team. The ERT will be assisting the FIT in the following areas:

- Handle communication both Internal/External;
- Devise strategies to control the emergency situation-plan, organise, implement via incident controller and evaluate the results;
- Read drawings, issue guidelines to incident controller; • Arrange logistics; identify potential needs, suppliers of service, material.
- Secure agreements, resource hiring etc.;
- Food, transport, replacement of site personnel, alternate duty roster in case of prolonged emergencies;
- Handling of journalists, media, public (in line with protocol with the Reliance);
- Implement the plan jointly as supporting team, external aid arrangements;
- Maintain a log of events and recording the sequence of actions taken; and
- Inform and Coordinate with Country Crisis Management Team (CCMT)

The minimum composition of the ERT is at least one manager, one discipline engineer (duty engineer), one technician from all disciplines and one administration co-coordinator. The following functions are the responsibility of the ERT:

- *Planning/Intelligence*: Gathers all information regarding the incident, any impact on other parts of the process and possible evolution;
- *Incident Operation*: Manages the practical aspects of incident control, implements the action plan, provides a practical input to it, establishes a structure of factors, identifies additional practical resources, relays current information regarding the incident back to the Incident Manager;
- *Safety Advice*: Evaluates the adequacy of response to incident, advises the Incident Controller about response strategy and tactics; and
- *Logistics support*: Provides and maintains personnel, materials, facilities and services as and when requested by Incident Controller.

Responsibilities of FSRU crew

The shift pilots, teams at FSRU, CTMS facility with the support of district administration and human resources from onshore will be responsible for executing emergency plan in the event of emergency situation.

Public Relations and Emergency Coordination with Local Government

SUMMIT shall have designated and trained site personnel who will interact with press, public, govt. and media briefing during any emergency. No employee or contractor would interact directly with above agencies without permission of Emergency Response Controller (ERC).

Country Crisis Management Team (CCMT)

Country crisis management team of SUMMIT will also provide support to ERT at site.

Mutual Aid / External Help Arrangements

As part of mutual aid scheme, SUMMIT will explore possibility of sharing of information and resources with GTCL in case of serious crisis. However, the decision of seeking external assistance will be taken by duty manager on advice of ERT.

9.7.5 Emergency Alert Process

For an alert or emergency, the list of all authorities/ parties and resources to be immediately informed (including the Control Room at the Company) will be listed. If an alert is initiated by a third party, control room of the Company to be informed and actions coordinated with those serving as experts. The emergency notification and response process has been presented in Figure-9.2.

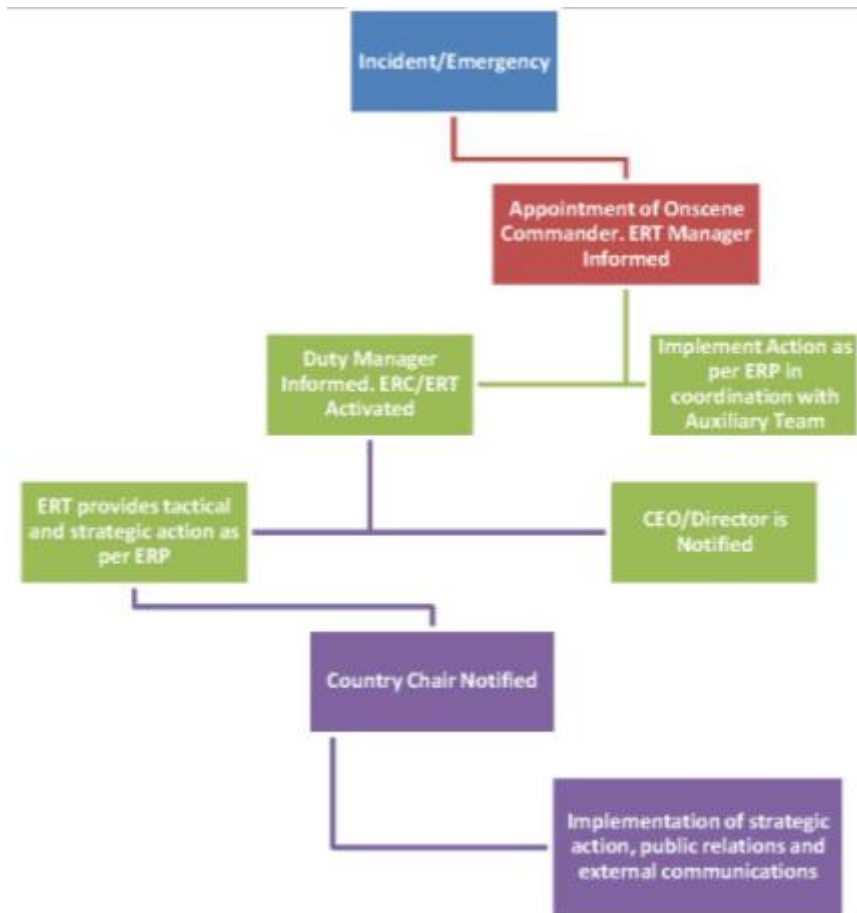


Figure-9.2 Emergency notification and response process

9.7.6 Emergency response System

The Emergency Response System & Procedure including Prevention, Control and Mitigation Plan for Safety Hazard, Specialized Equipment, Training and Safety Orientation including Responsibility of the Developer / Contractor for Presentation-Control Mitigation Measures have been duly focused in the preceding chapter on EMP. Further, a schematic presentation of the Event / scenario, impact & risk involved in FSRU & Gas Pipeline Construction & Operations Emergency has been worked out in Figure-9.3 as placed below:

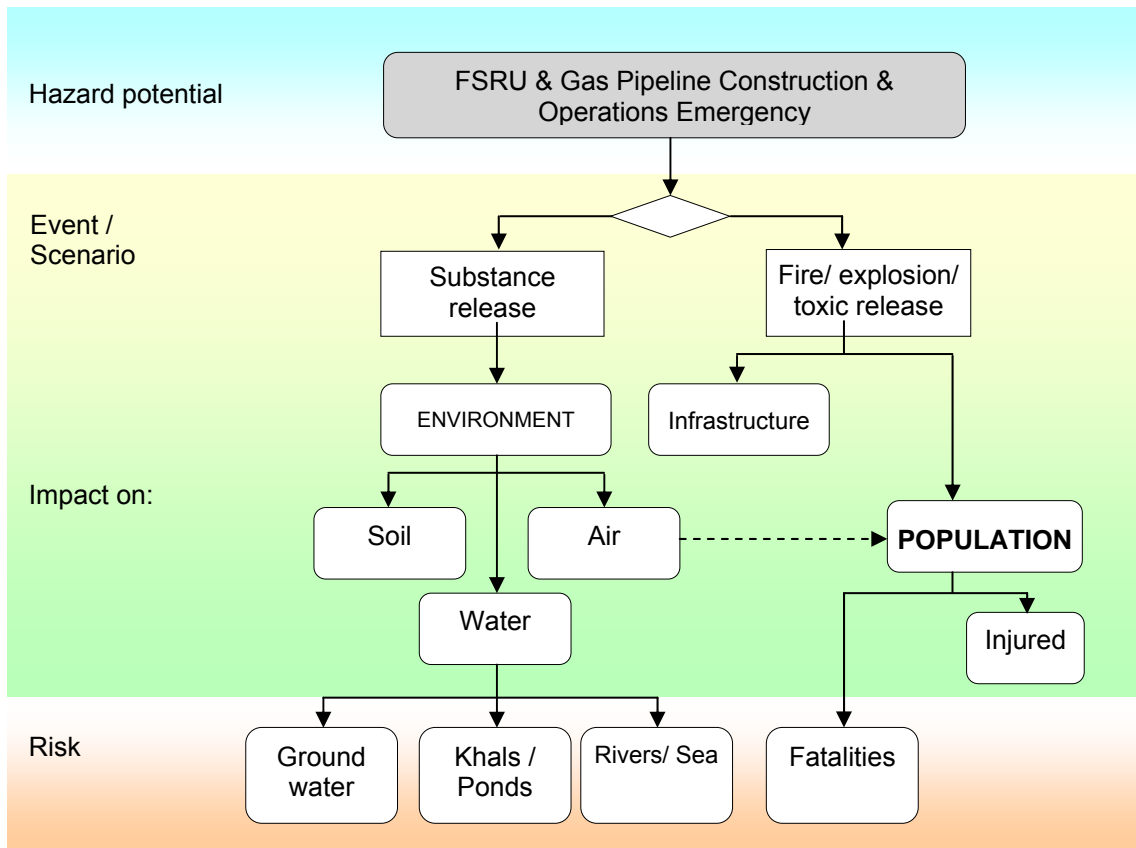


Figure-9.3: Event/scenario, impact & risk involved in FSRU & Gas Pipeline Construction & Operations Emergency

9.8 Operations Specific Emergencies

It is the responsibility of the emergency site commander to take situational decision. Each vessel involved in the STS transfer operations shall have an emergency shutdown (ESD) system which enables a rapid and controlled means of stopping the cargo transfer in the event of an emergency. Modified arrangements may be required for vessels engaged in a STS cargo transfer in order that both ESO systems are compatible. This shall be addressed in a compatibility study of STS system. This guideline is in addition to the vessel's Emergency Procedure Manual. In any emergency event the first action shall be to stop all cargo transfer operations. Each vessel shall have its own contingency plan. Contingency plans should be addressed during the vessel compatibility study.

CHAPTER-10: ENVIRONMENTAL MONITORING PROGRAM FOR PERFORMANCE EVALUATION

10.1 Technical Aspects

The technical aspects include the parameters to be monitored, methods of measurement, location or area to be covered and frequency and duration of monitoring. The parameters and selected indicators must cover the potential impacts identified in the environmental studies. The methods to be chosen for monitoring parameters should be standard statistical, analytical or relevant cost effective methods for measurement of impacts. The location, frequency and duration of measurements should be such that the data obtained are representative and sufficient to arrive at a definite conclusion regarding magnitude and trend of impacts.

10.2 Environmental Monitoring Program

The environmental monitoring programme has been devised with the following objectives:

- To evaluate the effectiveness of the proposed mitigation measures and the protection of the ambient environment as per prescribed/ applicable standards for the Project;
- To identify the need for improvements in the management plans;
- To verify compliance with statutory and community obligations; and
- To allow comparison against baseline conditions and assess the changes in environmental quality in the Project area.

Prediction of impacts can be made only on the basis of the knowledge of the baseline environmental parameters at the project location. Table-10.1 gives the baseline measurements made which were based on the requirements for prediction.

Table-10.1 Baseline Parameters

Activity	Environmental Parameters						
	Air	Noise	Land	Water	Sediment	Ecology	Socio-Economics
Construction material handing/ transportation of raw materials	SPM (PM10) SO2	Noise Levels					
Construction activities	SPM (PM10)	Noise Levels		TSS, Water Source & availability			
Labour force			Aesthetics	BOD, Nutrients, Faecal coliforms, Water source			Availability of Local labour
Capital dredging		Noise levels		Hydrodynamics DO, TSS, Nutrients	Faecal coliforms, heavy metals	Benthos, flora & fauna	Fisheries data
Land reclamation	SPM (PM10)		Land use map, Soil details			Intertidal flora & fauna	
Construction of jetty on piles		Noise levels		TSS		Benthos flora & fauna	
Construction of	SPM (PM 10)	Noise				Benthos	

Activity	Environmental Parameters						
	Air	Noise	Land	Water	Sediment	Ecology	Socio-Economics
breakwater		levels				flora & fauna	
Handing of LNG and transfers	Met ocean parameters						Receptors within impact zone
Modeling	Waves, currents, tides, seabed sediment movement, dredging, dredge disposal, shoreline changes etc.						

10.3 Waste Management

Throughout the project, the emphasis will follow the principles of waste minimization in order to reduce the potential for waste impacts on the local and non-local environment. These principles are illustrated in Figure-10.1.

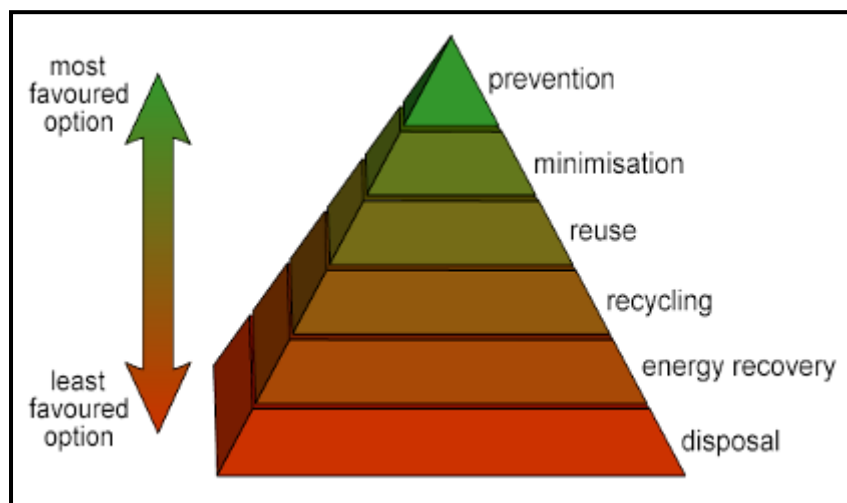


Figure-10.1: The waste hierarchy

Source: Wikipedia: http://en.wikipedia.org/wiki/Waste_hierarchy

The waste minimization hierarchy will be implemented in this project in a manner consistent with Table-10.2.

Table-10.2: Waste Management Objectives for the FSRU Complex and Related Offshore & Onshore Plants and Facilities

Principle	Application in this Project
Prevent	Products and services to be employed for this project will be assessed for their potential to generate waste. Those with a lower potential will be favored.
Minimize	If a product or service that produces more waste than is desirable must be used for particular reasons, than the use of that product or service will be minimized.
Reuse	No project materials with the potential to be reused will be disposed of after only single use.
Recycle	Where facilities are available, all recyclable domestic and industrial waste generated by this project will be recycled.
Recover	Creation of facilities for energy recovery from waste products including that for waste gas now being flared has to be encouraged. All other items that may be reused for energy or other purposes will be employed wherever possible.
Dispose	As a final resort waste will be disposed of. All waste disposed of will be done in responsible manner in approved landfills / due treatment and disposal sinks/sumps.

10.3.1 Waste Disposal Plan

Used oil and spilled oil shall be collected and recycled. Contaminated soils, paints, solvent or other chemicals etc. shall be collected and disposed of in an approved waste disposal site. Solid

waste shall be collected and disposed of in an approved solid waste facility.

Sanitary latrines shall be provided at each construction camp and waste disposed of through designing and constructing an appropriate septic system.

Similarly appropriate waste disposal plan has to be drawn and implemented for the FSRU Complex Crew in Offshore establishment of the project.

10.4 Health, Environment & Safety Management Plan

The work over project itself along with its associated facilities including gas gathering pipeline has to be designed to avoid or minimize impacts on the environment wherever practicable. RPGCL and SUMMIT LNG would ensure implementation of mitigation measures to reduce negative environmental impacts on Health, Environment and Safety, and would ensure protection of health and safety of not only its own operating personnel but also for that of the 3rd party service contractors as well as members of the neighboring public. A well designed Operation Management System (OMS) inbuilt in the organizational set up of RPGCL and SUMMIT LNG would provide a consistent delivery mechanism to address potential adverse impacts, to enhance project benefits and to introduce standards of good practice to be adopted for project activities.

10.5 Erosion

It was identified that unstable-slopes, particularly at the stream crossing earthen portion of RHD & LGED road, will have erosion and consequently increases sedimentation in the nearby wetlands. Careful monitoring will be required to estimate both erosion and silting impacts. Simultaneously, erosion of the sub sea pipeline covers and approach to Tie-in Point along the onshore coastline has to be continuously monitored and mitigation measures ensured.

10.6 Air Quality Monitoring

It was identified earlier that the negative impact on air quality would mostly come from dust emissions by the movement of heavy vehicles during construction and gaseous emissions during operations. Dust load on the nearby homesteads and plants is an indicator of dust pollution in the air. Mitigation measures suggested earlier will successfully offset these negative impacts. Monitoring suspended particles load and gaseous emissions in the atmosphere of the FSRU complex and the plant sites should be measured frequently to comply with the air quality standard.

10.7 Noise Monitoring

There shall be no use of high noise making equipment except the operational Drilling / work over rig, compressors, welding machine, small generators and movement of vehicles. Placement of power generator units inside soundproof rooms and regulating the use of hydraulic horns should be monitored for compliance.

10.8 Water Quality Monitoring

Onshore Groundwater & Offshore Seawater quality monitoring shall be done at regular basis. Periodic monitoring of surface water quality at upstream and downstream of nearby watercourse of the project sites shall be performed. Similarly, Seawater quality around FSRU complex monitoring shall be done at regular basis too.

10.9 Monitoring Implementation Schedule

The monitoring and evaluation of impacts would continue throughout implementation and subsequent operation of the project. SUMMIT LNG will implement the monitoring plan through reinforcement of its existing environmental monitoring setup.

10.10 Monitoring Parameters & Schedule

Besides the above specific monitoring aspects for operations, laboratory tests for specific sampling locations should be conducted. A tentative list of parameters to be measured, sample number, sampling frequency for a period of 1 dry and 1 monsoon seasons and approximate cost estimation is provided in Table-10.3.

Table-10.3: Environmental Monitoring Programme (Pre-Construction, Construction and Operation Phases)

Project Stage/ Affected Component	Potential Impact/ Mitigation	Parameters to be Monitored	Location	Measurements	Frequency	Responsibility
Ambient Air Quality	Air pollution	Respirable Particulate Matter (PM ₁₀ , PM _{2.5}), Sulphur Dioxide (SO ₂), Oxides of Nitrogen (NO _x) and Carbon Monoxide (CO), VOC	5 locations near the Tie-in-point	Standard analytical methods	2 weeks, at each location during pre-monsoon season for 01 month. CO will be monitored 8 hourly while the rest of the parameters will be monitored over 24 hours.	3rd Party Environmental Consultant.
Ambient Noise	Incremental noise levels	Noise levels. Results will be analysed to work out Leq hourly, Leq day and Leq night	4 locations near the Tie-in-point	Standard analytical methods	Once during pre-monsoon continuously for 24 hours	3rd Party Environmental Consultant
Soil Quality	Soil contamination	Particle size distribution, Texture, pH, salinity, SAR, electrical conductivity, organic carbon, NPK, TDS, Na, Mg, Ca, Chloride, Fluoride, Permeability, Porosity, Cation Exchange Capacity, Infiltration rate	Two locations in Kaladiar Char	Standard analytical methods	Once during pre-monsoon	3rd Party Environmental Consultant
Ground Water Quality	Groundwater contamination	Temperature, pH, TDS, EC, Salinity, Colour, Odour, Turbidity, Total Hardness (as CaCO ₃), Chloride (Cl), Sulphate Nitrate, Fluoride (F), Sodium (Na), Potassium (K), Arsenic (As), Cadmium (Cd), Chromium (Cr), Mercury (Hg), Lead (Pb), Iron (Fe), Nickel (Ni), Manganese (Mn), Copper (Cu), Zinc (Zn), Boron (B), Fecal Coliform, Total Coliform	4 locations (tube wells) within Kaladiar Char Union.	Standard analytical methods	Once during pre-monsoon	3rd Party Environmental Consultant

ProjectStage/ Affected Component	Potential Impact/ Mitigation	Parameterstobe Monitored	Location	Measurements	Frequency	Responsibility
MarineWater Quality	Water contamination	Temperature,pH, Electrical Conductivity, DissolvedOxygen, Turbidity,Salinity, TDS,Suspended Solids,Cadmium, Lead,Chromium, Zinc, Copper, Nickel	2samplestobeclected from BayofBengal 500m west towardsthesea from the Tie-in-pointpoint; 3 KMwest towardsthesea from theTie-in-pointpoint;	Standard analytical methods	Onceduringpre- monsoon	3rdParty Environmental Consultant
Marine Sediment	Sediment contamination	Sand,Silt,Clay, Texture,Dissolved Oxygen,pH,Organic Carbon,Total Sulphur,Cadmium, Lead,Chromium, Zinc,Copper,Nickel	2locationsinBayofBengal offKalirdiar Char.	Standard analytical methods	Onceduringpre- monsoon	3rdParty Environmental Consultant
OperationPhase						
General	Inspectionof mitigation compliance	Generalcompliance withmitigation measurespresented intheESMP and operationalmanual	Projectactivity areas	Visualinspection of allactive work areas	Daily	EHSTeam of GTCL and SLGCL
AirPollution	Ambientair quality	NOx,CO,PM10,SO2	3locationswithin2 km from theProject boundary	Standardmethods	Monthly	3rdParty Environmental Consultant
Noise	Noise generation byPlant equipment	SoundPressureLevel	1m from thenoise generatingequipment	Noisemonitoring	Monthly	3rdParty Environmental Consultant
	Ambientnoise	Ambientnoiselevels	At Project boundaryandat nearest NSRs in alldirection from thePlant	Noisemonitoring withdatalogger	24-hour observationswith hourlynoise levels,monthly once ateach location	3rdParty Environmental Consultant
Soil	Soil andSediment Contamination	pH,salinity,NH4 ⁺ , totalP, heavymetals, oil&grease	Accidentalspillagearea, wastestoragearea,andSea	Standard analytical methods	HalfYearly	3rdParty Environmental Consultant.
Water	Groundwater quality	Drinkingwater qualityparametersas perSchedule3of ECR 1997	Bore wellwatertobeused fordomestic purposesinthe nearest village	Standard analytical methods	Monthly	3rdParty Environmental Consultant.
	Wastewater	Temperature, chlorine,pH,BOD5, COD,oil&grease, heavymetals,total faecalcoliform	Outletofdischargechannel	Standardmethods	Monthly	3rdParty Environmental Consultant.

Project Stage / Affected Component	Potential Impact / Mitigation	Parameters to be Monitored	Location	Measurements	Frequency	Responsibility
	Surface water quality	Temperature, conductivity, pH, DO, TDS	03 points	Portable water quality analyser	Monthly Quarterly	3rd Party Environmental Consultant.
Occupational Health and Safety	Accidents or incidents due to operation and maintenance activities, workers' health	Near-misses, incidents, occupational diseases, dangerous occurrences	Project activity areas	As to be defined in the H&S Plan to be prepared by RBLTL for the Project	As defined in H&S Plan	EHS Team of RPGCL and SLNGCL.
Community Health and Safety	Community disturbance and potential safety hazard due to road traffic	Accidents, incidents and complaints	Newly constructed site approach road	Incidents, accidents and community complaints	Based on occurrence	EHS and/or Community Liaison Officer of RPGCL and SLNGCL
	Community disturbance and potential safety hazard due to waterway transportation	Accidents, incidents and complaints	Sea	Incidents, accidents and community complaints	Based on occurrence	EHS and/or Community Liaison Officer of GTCL and SLNGCL
	Public concerns	Complaints from community	Neighbouring communities around the Project activity areas	As per the grievance redress mechanism	Continuous	Community Liaison Officer of RPGCL/SLNGCL and Station Manager

Table-10.4 Ecological Monitoring Programme (Pre-construction, construction and operation phases)

Project Stage / Affected Component	Potential Impact / Mitigation	Parameters to be Monitored	Location	Measurements	Frequency	Responsibility
Pre-construction						
Marine Fish	Impact on fish species	Frequency of occurrence of Knifetooth sawfish in the area	FSRU, offshore pipeline area, ship movement areas	Visual inspection	Monthly	Biodiversity Expert/EPC Contractor

Project Stage / Affected Component	Potential Impact / Mitigation	Parameters to be Monitored	Location	Measurements	Frequency	Responsibility
MarineTurtles	Impactonturtle nesting	Nestingfrequency ofturtles	Near FSRU location	Frequencycount	Monthlyin nestingseasonforturtles	IUCNExpert/ EPC Contractor
	Impactonturtle species	Frequencyof occurrenceof matureolive ridley turtles	FRSU,offshore pipelinearea,ship movementareas	Visualinspection	Monthly	IUCNExpert Expert/EPC Contractor
MarineMammals	Impacton cetaceanspecies	Frequencyof occurrenceof dolphinsand porpoises	FRSU,offshore pipelinearea,ship movementareas	Visualinspection	Monthly	Biodiversity Expert/EPC Contractor
Construction						
Marine Fish	Fisheries	Visiblefishkills	FRSU,offshore pipelinearea,ship movementareas	Visualinspection	Sixmonthly	Biodiversity Expert of EPC Contractor/ IUCN Expert
MarineTurtles	Impactonturtle nestingsites	Nestinglocations andnumbersof nestsperseason	Near FSRU location	Visualinspection of allactive work areas	Monthlyduring nestingseason (December-March)	Biodiversity Expert of EPC Contractor
	Turtle mortality/injury	Turtlestranding, nestingactivities	FRSU,offshore pipelinearea,ship movementareas	Visualinspection	Monthlyin nestingseason	Biodiversity Expert of EPC Contractor
MarineMammals	Cetacean mortality/injury	Dolphin/porpoise stranding	FRSU,offshore pipelinearea,ship movementareas	Visual inspection	Sixmonthly	Biodiversity Expert of EPC Contractor
Operation						
Marine Fish	Fisheries	Visiblefishkills	FRSU,offshore pipelinearea,ship movementareas	Visualinspection	Sixmonthly	Biodiversity Expert/EHS Team ofRPGCLand SLNGCL

Project Stage / Affected Component	Potential Impact / Mitigation	Parameters to be Monitored	Location	Measurements	Frequency	Responsibility
MarineTurtles	Impactonturtle nestingsites	Nestinglocations andnumbersof nestspereason	Moheshkhali Island	Visualinspection of allactive work areas	Monthlyduring nestingseason	IUCNExpert Expert/EHS Team ofRPGCL and SLNGCL
	Turtle mortality/injury	Turtlestranding, nestingactivities	FRSU,offshore pipelinearea,ship movementareas	Visualinspection	Monthlyin nestingseason	IUCNExpert Expert/EHS Team ofRPGCL and SLNGCL
MarineMammals	Cetacean mortality/injury	Dolphin/porpoise stranding	FRSU,offshore pipelinearea,ship movementareas	Visualinspection	Sixmonthly	IUCNExpert Expert/EHS Team ofRPGCL and SLNGCL

10.11 Financial Aspects of Environmental Monitoring System

At this stage, a number of matters have not yet been resolved which have bearing on environmental management costs. These include:

- The precise nature and extent of work, and
- Nature and scope of institutional strengthening and environmental training.

These uncertainties will be resolved during the detailed planning and design of the operational aspects of the EMP on the basis of relevant tasks to be carried out through in-house and out sourcing as deemed fit by GTCL. However, it is expected that GTCL will implement the Environmental Management Plan under the project with a strengthened institutional frame work of the company as proposed at section 5.4.

ESMP Budget

SN.	Component	Parameters	Frequency	Cost inBDT (Lumpsum)
A.	BudgetforPre-ConstructionStage			
1.	EnvironmentalMonitoring			
(a)	Ambient AirQuality	RespirableParticulateMatter(PM10,PM2.5), SulphurDioxide(SO2), OxidesofNitrogen(NOx)and CarbonMonoxide(CO), VoC	2 weeks,onceamonth ateach locationduringPre-monsoon season CO will be monitored 8hourly while there stoftheparameters willbemonitoredover24hours.	BDT 80,000/-
(b)	Ambient Noise	Noiselevels.Resultswillbe analysedfortoworkoutLeq hourly,Leq dayandLeq night	Onceduringpre-monsoon continuouslyfor24hours at4 locations	BDT 16,000/-
(d)	SoilQuality	Particledistribution,Texture,pH,salinity, SAR, electricalconductivity,organiccarbon,NPK,TDS,Na,	Onceduringpre-monsoonat2 locations	BDT 50,000/-

SN.	Component	Parameters	Frequency	Cost inBDT (Lumpsum)
		Mg,Ca,Chloride,Fluoride,Permeability,Porosity,Cation ExchangeCapacity,Infiltration rate		
(e)	GroundWaterQuality	Temperature,pH,TDS,EC, Salinity,Colour,Odour, Turbidity,TotalHardness(asCaCO ₃),Alkalinity(HCO ₃), Chloride(Cl),Sulphate,Nitrate, Fluoride(F),Sodium (Na),Potassium (K),Arsenic (As),Cadmium (Cd), Chromium (Cr),Mercury(Hg),Lead(Pb),Iron(Fe), Nickel(Ni),Manganese(Mn),Copper(Cu),Zinc (Zn), Boron(B), FecalColiform,TotalColiform	Once during pre-monsoon at 4 locations	BDT 80,000/-
(f)	MarineWaterQuality	Temperature,pH,ElectricalConductivity,Dissolved Oxygen,Turbidity,Salinity,TDS,SuspendedSolids, Cadmium,Lead,Chromium,Zinc, Copper, Nickel	Once during pre-monsoon at 2 locations	BDT 50,000/-
(h)	MarineSediment	Sand,Silt,Clay,Texture,DissolvedOxygen,pH Organic Carbon,TotalSulphur,Cadmium,Lead, Chromium,Zinc,Copper,Nickel	Once during pre-monsoon at 2 locations	BDT 60,000/-
		Total (For Pre-Construction Stage – 1 Year)		BDT 336,000/-
B.	Budget for Construction Stage			
1.	Environmental Monitoring			
(a)	Ambient Air Quality	PM _{2.5} and PM ₁₀ , SO ₂ , NO _x and CO	Three sensitive receptors within 500m from the construction site; once every month for one year (12 Months)	BDT 360,000/-
(b)	Noise	Noise levels in Leq, Leq day, Leq night and hourly Leq	Ambient air quality and noise generation by plant equipment, Monthly monitoring for one year.	BDT 192,000/- (04 location for 01 year)
(d)	Soil (Contaminated)	pH, salinity, NH ₄ ⁺ , total P, heavy metals, oil & grease	Construction site or laydown area or spill area in the event of any leakage or spillage of hazardous substances, oil, or toxic chemicals, For half yearly monitoring.	BDT 100,000/-
(e)	Surface Water	Turbidity, pH, DO, Total dissolved solids, oil & grease, total coliform, heavy metals	Sea area (close to construction area) at 2 locations (upstream and downstream); monthly	BDT 600,000/-
(f)	Ground Water	Drinking water quality parameters as per Schedule 3 of ECR 1997	Groundwater Borewell in nearest village of the construction area; 02 nos sample for Monthly monitoring	BDT 144,000/-
2.	Marine Ecology			
(a)	Marine Fish/Mammals	Stranding of fish and marine mammals	Once per year by expert	BDT 200,000 x 3 years – BDT

SN.	Component	Parameters	Frequency	Cost inBDT (Lumpsum)
				600,000
(b)	MarineTurtles	Nestinglocationsand numbersof nestspereason Turtlestranding	Onceduring nestingseason by expert	BDT 200,000x3years–BDT 600,000
3.	StakeholderEngagement	Communityinteractionprograms, group meetings, informationsheetsdistribution,press releases,press conferences,printandradooadvertisingetc.	Annuallyfor3years	BDT 600,000
		Total(For ConstructionStage-1Years)		BDT3,192,000/-
C.	Budgetfor OperationStage			
1.	EnvironmentalMonitoring			
(b)	Ambient AirQuality	NOx,CO,PM10,SO2	3locationswithin2 km from the Project boundary;monthly	BDT 360,000/-
(c)	Ambient Noise	SoundPressureLevel	1m from thenoise generating equipment; monthly, at 04 locatopn	BDT 192,000/-
(e)	Soil	pH,salinity,NH4 ⁺ ,totalIP, heavymetals,oil&grease	Accidentalspillagearea,waste storagearea,and sea;half yearly	BDT 50,000/-
(f)	GroundWater	Drinkingwaterqualityparameters asperSchedule3of ECR 1997	Bore wellwatertobeusedfor domestic purposesin the nearest village;monthly	BDT 300,000/-
2.	MarineEcology			
(a)	Marine Fish/Mammals	Strandingoffishandmarinemammals	Onceperyearby IUCNexpert	BDT 200,000
(b)	MarineTurtles	Nestinglocationsand numbersof nestspereason Turtlestranding	Onceduring nestingseason by IUCNexpert	BDT 200,000
3.	StakeholderEngagement	Communityinteractionprograms, group meetings, informationsheetsdistribution,press releases,press conferences,printandradooadvertisingetc.	Annuallyfor1 year	BDT 215,000
		Total(For OperationStage–Per Year)		BDT1,517,000/-

10.12 Training of Environmental Professionals

It would be prudent to organize and implement basic and specialized training program for both efficient monitoring of potential environmental mitigation measures and responding to critical emergency situations . In view of criticality of the construction and operation of the different components typical of this FSRU complex, sea bed pipeline, tie-in point, field camp facilities and onshore gas pipeline construction and operations it stand pertinent that the environmental officials and technical staff of RPGCL and SUMMIT LNG Terminal Co. Ltd. be duly trained both at home and abroad to strengthen their capabilities in their respective positions and assignments. Estimated cost involved is placed in the Table-10.5 below:

Table-10.5: Proposed Training & Estimated Cost involvement

Position	Nature of Training	Place of Training	Duration	Amount Tk.
2 Senior Officials	Orientation	Overseas	2-3 weeks	7,00,000
3 Midlevel Officials	Specialization	Home & Overseas	2-3 Months	18,00,000
5 Technicians	Basics & Hand-on	Home	3-6 months	10,00,000
Total				35,00,000

It is expected that RPGCL and SUMMIT would plan ahead for these training program to take place in different phases of the project commencing right before fielding the same and thus to achieve maximum benefit in handling the mitigation measures of the potential impacts and coping with incidents typical of the FSRU and gas pipeline construction and operations.

CHAPTER 11: WORK SCHEDULE

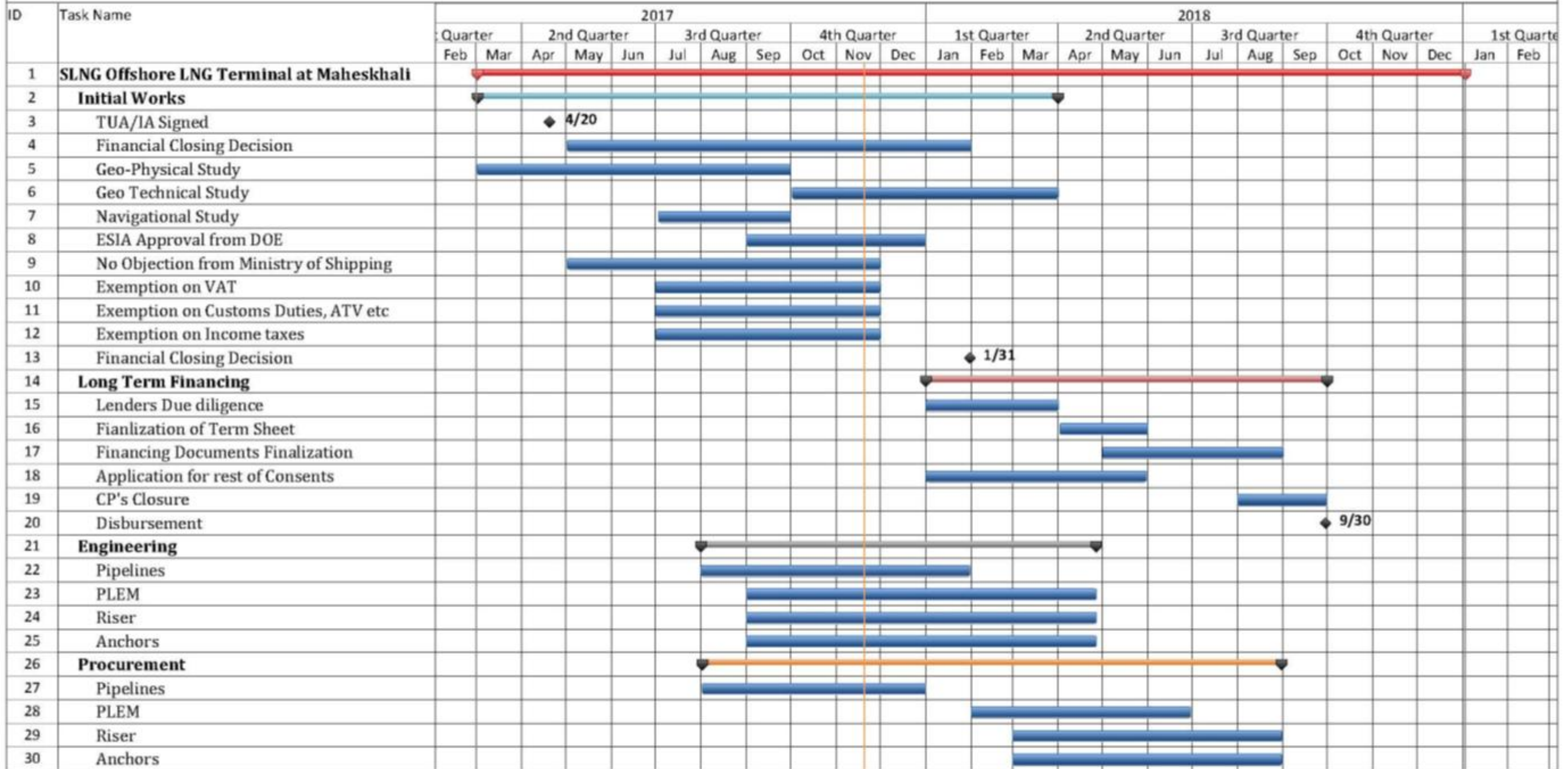
Project Schedule

The proposed Offshore LNG Terminal is a high priority project for Bangladesh. As a result, Petrobangla will pursue a fast-track schedule for awarding and developing the terminal. As per monthly progress report (Oct-Nov-2017) of SUMMIT LNG Terminal Co. Ltd. (SLNGL) the work schedule of project is given below:



SLNG PROJECT SCHEDULE

PRELIMINARY



Project: msproj11
Date: Mon 11/20/17

Task		External Tasks		Manual Task		Finish-only	
Split		External Milestone		Duration-only		Deadline	
Milestone		Inactive Task		Manual Summary Rollup		Progress	
Summary		Inactive Milestone		Manual Summary			
Project Summary		Inactive Summary		Start-only			

CHAPTER-12: BENEFICIAL IMPACTS

General: The current economy of Bangladesh is very fast growing. The country expects to become a middle income country within the year 2021. So, in focusing the vision 2021, its target is sustainable rapid industrialization. But, in achieving the targeted industrialization, its primary requirement is Energy Security. For generation of adequate electricity, the existing and upcoming plants have to be supplied with necessary primary fuels like indigenous natural gas or to import Coal or POL as other alternatives and these alternatives are not so acceptable for different reasons. On the face of these perspective, natural gas was found to be a better choice due to several reasons in general and environment friendliness in particular. But, as a matter of fact, Bangladesh is currently experiencing an acute shortage of natural gas that threatens to place serious constraints on continued industrialization and thus economic growth. In order to overcome that shortages, the present government has concentrated on importing LNG as a part of its efforts to provide adequate fuel to generate electricity for uninterrupted power supply to the industries.

Import of LNG: The process of importing LNG,, re-gasification and delivery to the gas grid constitutes certain interventions to the existing environment and socio-economic elements including risks and hazards as well. Still then its beneficial impacts have always been found to supersede the other ones. In fact, every development works should have some potential impacts on all aspects of environment, socio-economy, health and biodiversity. The impact assessment for this project included positive and negative, short term and long term including reversible and irreversible impacts on both social and environment. Based on the analysis of the study of some social and environmental impacts, the notable ones are found as below:

1. **Environmental Friendly LNG:** LNG is environmental friendly fuel in comparison to other equivalent gaseous ones. Existing gas pipeline will be used for LNG transfer to national grid line.
2. **Less Emission of Carbon:** In transport sector CNG is saving 50% fuel cost for the users. Moreover carbon emission by liquid fuel driven vehicles is very much harmful. That's why currently Government encourages using CNG in transport sector and CNG supply can be very much supported and enhanced through LNG regasification and supplying through pipelines and thus control carbon emission as well.
3. **Use in Industries:** Such use of LNG can promote natural gas and CNG in the industries.
4. **Less Risk for Transportation:** In respect of fuel transportation by carrier, there is no risk of transportation compared to liquid fuel and LPG.
5. **Less Price:** It is learned that government is exempting VAT & TAX from Re-gasified LNG (RLNG). In consequence average cost of RLNG will come down to USD 8/mcf instead of 12-14 usd/mcf. Secondly, the present average cost for supplied gas is Tk 7.50/cm and when 1000 mmcf RLNG will be mixed up with pipeline gas in 2018, the cost will rise up to 11.95/cm. This is not much if considered in view of industrialization of the country.
6. **Technology Transfer:** Summitt LNG Terminal Co. (Pvt.) is a private company which intends to construct own and operate this LNG receiving terminal located off Maheshkhali Island. During its construction, operation and maintenance period there is huge scope of knowledge and technology transfer between local agencies (GTCL, RPGCJL, and SLNGL) and foreign contractors, professionals.
7. **Development of Skilled Manpower:** Every steps of project period from development and planning, implementation and execution to project construction and finally operation, there is a vast opportunity to utilize skilled man power and have opportunity

to develop skill of local professionals. During this long period professionals and workers would get an opportunity to work together under same umbrella with foreign technical professionals and workers of this sector to develop their skill.

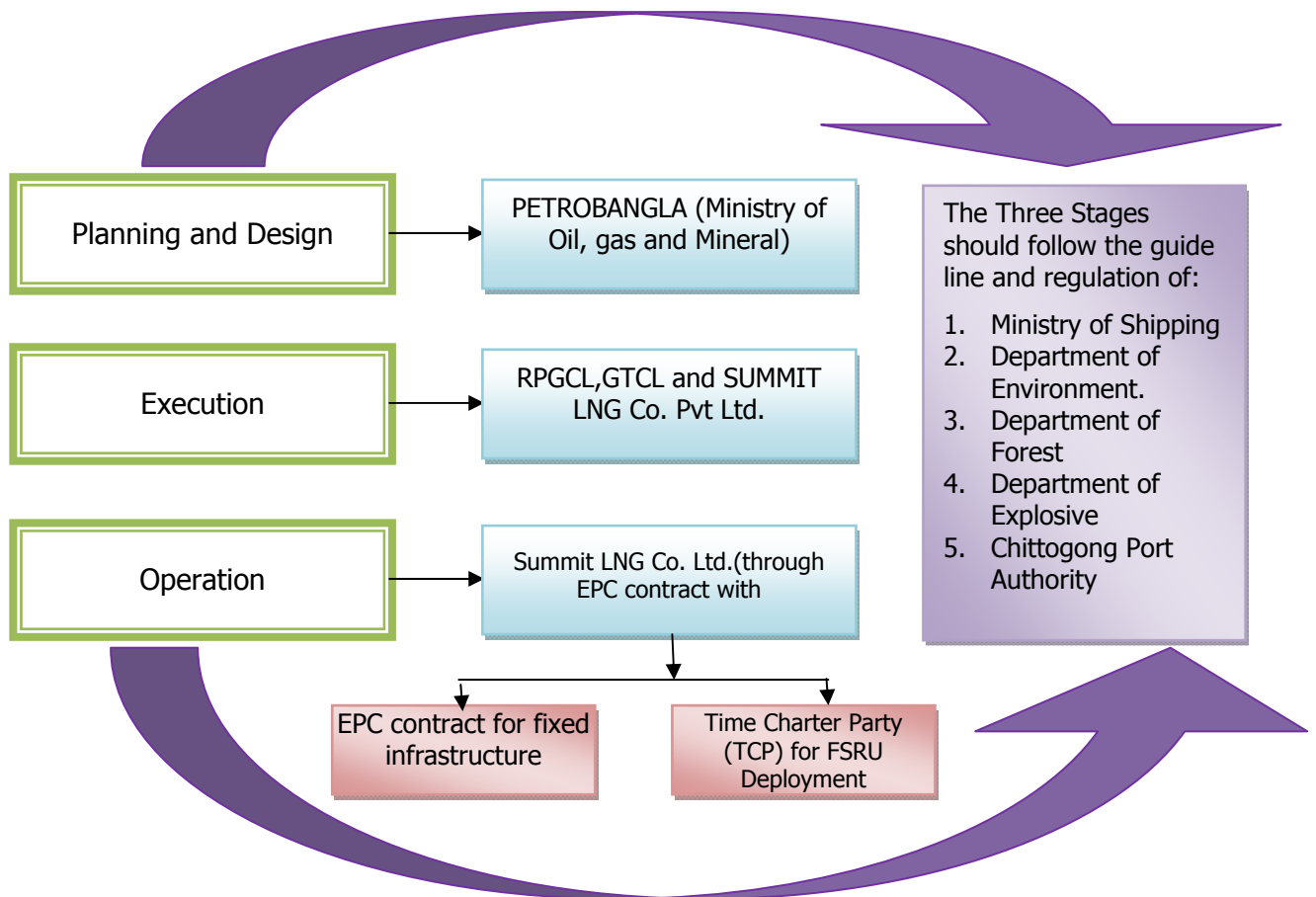
8. **Employment of Local people:** Every development activities open a door for employment of local and neighbor people. In true perspective Maheshkhali is an under developed coastal Upazila in Bangladesh. Mega development project like SUMMIT FSRU LNG definitely will create employment opportunities for local skill and unskilled people. During public consultation and Focus Group Discussion, local people also demanded these types of facilities to the consultant team.
9. **Employment of people returned from Overseas Employment:** The project would open up opportunities of employment for the people returned from Employment in different other countries and the skill acquired by them can be best utilized in the project.
10. **Development of social Lifestyles:** During Socio economic survey the consultant team tried to find out the social, educational, religious recreational activities of local people. As per CSR activities of the project developer/ EPC contractor, there will be development of school, college, recreational club, cyber café, Solar power system, in house religious structures etc with consent of local authorities. Definitely these activities will develop the socio economic lifestyle of local people.

In fine, the proposed LNG FSRU project is expected to play a key role in the interests of national energy security and thus to contribute tremendously in power generation and eventually industrialization process of the country.

CHAPTER-13: INSTITUTIONAL CAPACITY

For any effective and environment friendly operation of the gas industry, a set of guideline tools and suggestions are necessary which need to be followed at various stages of exploration, drilling, work over, pipeline and plant installation, operation and maintenance. It is equally applicable for this particular Offshore FSRU, Sub Sea Gas Pipeline and Onshore Tie-in Point activities project.

This Institutional capacity (IC) of relevant agencies is required depending on the nature of the activity and types of operation. The following organizational set up and operational inter-relationship (OIR) can be envisaged for building up the appropriate and desired IC for the subject project. It is further presumed that the configuration of such OIR placed below mingling the institutional involvement of different agencies in successive stages of FSRU Construction, implementation and operation would serve with minor changes as and when deemed necessary.



SUMMIT LNG is now in advance stage in respect of discussion with consortium of GEOOCEAN S.A.S France and MACGREGOR NORWAY as EPC contractor of fixed infrastructure.

Time Charter Party (TCP) contract has been signed with M/S accelerate for deployment of FSRU on 15 years basis. Floating Storage and Regasification Unit (vessel) will be imported on Time Carter Party Agreement for whole 15 years Term. Value of this vessel for import will be around USD 280 Million and the details of other cost are give below:

LIST OF MACHINERIES (LOCAL AND IMPORTED)

Sl. No.	Type of Machinery	Local or Imported	Approximate Value (USD)
1.	Submerged Torrent Loading and Mooring system, Chains, Fenders, Riser, Umbilical, Buoyancy Modules	Imported	60,000,000
2.	Stern Mooring Equipment	Imported	5,000,000
3.	Offshore gas pipeline, Flanges, Bends, PLEMN, Communication links, Cathodes Production equipment, Manual isolation valves, Emergency Shutdown (ESD) Valves, Gas Lines pigging equipment and Others	Imported	30,000,000
Total Imported Materials			95,000,000

Source: "BIDA, Registration of Proposed industrial project of SUMMIT LNG Terminal Co. Ltd.. Year 2017

CHAPTER-14: PUBLIC CONSULTATION

14.1 Introduction

This chapter of the report is to ensure that consultation with interested parties and the general public has taken place so that their views are taken in to account in the planning and execution of the project through consultation with the stakeholders and the concerned members of the different cross section of public in general found available during the consultations as such.

The Consultant accordingly undertaken some relevant key informant interviews (KII), public consultations along with house hold survey, data collection works and Focus Group Discussion (FGD) involving all stake holders, throughout the study at relevant stages, to identify environmental issues and concerns relevant to the project including those relating to Floating Storage Re-gasification Unit (FSRU) for addressing the same in the Environmental Assessment.

The Consultant will documented all the consultations including the issues raised and actions planned / taken and justifications for no action wherever relevant. This chapter of this report will contain discussions as to how the public concerns that were raised during different stages of consultations have been considered and would be addressed in the project.

14.2 Public Consultation & Disclosure

The multidisciplinary EIA Team of the consultant along with RPGCL engineers have visited and examined the site and their surroundings, social and physical aspect and have obtained all information that were necessary for the purpose of execution of study and preparing of reports.

Consultation with the key informants and affected groups was carried out under a consultation strategy during the period between October and November 2017 to ensure that all stakeholders and affected people are fully informed about the project, and the views of these people on the consequences of the project are taken into account consideration.

Simultaneously, distinction between positive and negative impacts, direct and indirect impacts including impacts from possible accidents, and Immediate and long-term impacts have been carefully drawn out including identification of impacts, which are unavoidable or irreversible.

This has been done to provide support and assistance to the Client in meeting the disclosure requirements, which should meet the Government policy on public disclosure. Physical environmental sample has been collected from the project site for conducting necessary quality analysis of existing Sea water and secondary data as available has been consulted for ground water, noise and vibration etc for incorporate within EIA report.

Effective steps has also been taken to obtain NOC from Local authority and following submittal and presentation on this EIA report, further steps would be taken for obtaining Environmental Clearance for the project from DOE.

14.3 Checklist Used for Public Consultation

For uniformity and clarity in conducting the public consultation meetings, a checklist was devised by the consultants and was used to enable the participants to comprehend the issues easily. This has helped them so much so that they could effectively participate in the

discussions and express their opinions from objective points of views. This participatory approach contained in the Checklistso devised and given belowwas well accepted by all the participants:

Consultants Checklist:

- Location of consultation
- Name and occupation of the participants
- Awareness of the participants about the Project
- Description of the Project
- Benefits of the Project
- Impacts of the Project on social and environmental components
- Concerns about the Project
- Expectations from the Project
- Suggestions about the Project

During the public consultations, social, environmental as well as cross-cutting issues were discussed in detail. In addition, such discussions also included the potential impacts of the project activities on environmental and social parameters, identification of sensitive issues, risks, potential threats, public concerns and expectations from the project.

14.4 Findings from Focus Group Discussion

The salient features of the opinions expressed by the participants of different profession have divulged in general that they are concerned with due compensation and rehabilitation wherever any damage is done and with request for providing gas in their localities on priority basis.

The participants in general welcomed the project and expected that the project will contribute to the national economy in many ways. As reported, the following major issues among others were raised in the public consultation meetings.

- Agricultural products and vegetation will be affected. But more concern was expressed for the affect on Salt & Shrimp Cultivation Due compensation of which should be paid on the spot to the affected people.
- Assembly of people during project activities may damage crops, other trees. and particularly Salt & Shrimp Cultivation at different seasons of the year as long the project activities will continue.
- Noise pollution from vehicles and equipment at the project sites may cause disturbance to human being and wild life.
- Compensation for land as per government rate would not be a fair compensation to the affected person as it is far below prevailing market rate.
- There will be enhanced soil erosion particularly on the shore line / banks, which should be addressed properly.
- Water pollution of the natural water bodies may be aggravated and should be taken care of as this water is used for agriculture and domestic purposes.
- Movement of vehicles may affect movement of people, especially women, children and disabled persons from one place to another.
- Air pollution due to dust and gaseous emission should be controlled.
- Environmental pollution through sanitation and waste materials as well as other social nuisance should be controlled.
- Loss of land fertility should be reduced. Proper Compensation should be given to the cultivator of salt production and shrimp cultivation.

14.5 Expectations of the People

The consultant team has been conducting public consultation and stake holder's meetings since last October and the following expectations of the local people they evidence during the consultations:

- Local personnel should be employed in different activities of the project on a priority basis.
- Preference should be given to engage local businessmen/ contractors in different phases of the project for construction and development depending in their suitability for such engagements.
- Compensation payment, in whatever form it may be, should be properly and promptly distributed so that the actual affected person gets his full share and in right time.
- Supply of gas would help improving their socio-economic conditions and therefore gas should be made available in the areas through which gas line would be passing through.

14.6 Key Informant Interview (KII) and Public Consultation Results

Public Consultation and house hold surveys are going on in three union areas 01) Boro Moheshkhali and 02)

Kutubjom and 03) Hoyanok. Earlier, Key Informant Interview (KII) were conducted at their respective offices during the visit of the EIA team during October-November 2017 to understand the views and suggestions of the Key Informants on the EIA study in respect of its positive and negative impacts etc including market value of their assets being affected, payment of compensation and grievance redress mechanism were discussed in details.

The suggestions on the losses, mitigation options and implementation strategies were taken from the people and the information and comments provided by each individual owner or his relative present in the HH was duly recorded in the questionnaire well structured to cover all relevant points respective to his socio-economic condition, attitude towards implementation and his claim / expectation of compensation for the losses he is going to incur for the project.

The findings are keeping in records and formulate and present in following. In this session the recorded observation from KII and FGD have been presented in the Table-14.1 indicating the critical issues Different Key Informants interviewed with names is listed at the Table-14.2.

Table-14.1: Findings of KII and Public Consultations

Project Name	Issues Discussed	Issue Raised	Suggestions
Offshore Floating LNG Storage and Re-gasification Unit (FSRU) Terminal permanently moored at Island/Finger Jetty Activities Project at Moheshkhali area under Cox's Bazar District	Impact of construction of onshore & sub sea Gas Pipeline and operation of the FSRU	• Build up new Industrious	• New industry will develop upon proper installation of gas pipeline.
		• Reduce Unemployment	• Skilled and unskilled labour should be taken from that locality.
		• Social & Economic development	• Living status will be high.
		• Land & property damage	• Due compensation to be paid according to the latest approval price list.
		• Crop damage	• Due compensation to be paid on the spot.
		• Trees damage	• Due compensation to be paid on the spot.
		• Gas availability	• Discuss with superior person of the locality.
		• Compensation assessment	• Compensation assessment by DC and local leader.
		• Fish breeding	• Must avoid breeding time.

Project Name	Issues Discussed	Issue Raised	Suggestions
		<ul style="list-style-type: none"> Affected Homestead, if any 	<ul style="list-style-type: none"> Due Compensation to be given.
		<ul style="list-style-type: none"> Pollution of air and surface water 	<ul style="list-style-type: none"> Monitoring shall be adopted.
		<ul style="list-style-type: none"> Sanitary problem 	<ul style="list-style-type: none"> Sanitary system should be developed during gas pipeline installation.
		<ul style="list-style-type: none"> Fishing in the Bay 	<ul style="list-style-type: none"> Due compensation will be paid to the genuine Fishermen affected, if any
		<ul style="list-style-type: none"> Salt & Shrimp Cultivation 	<ul style="list-style-type: none"> Due compensation will be paid to the genuinely affected cultivators and farmers, if any

Table-14.2: Findings of KII

Sl. No.	Date	Time	Place	Name & Designation	Contact phone & Mobile No.	Comments	Remarks
1.	15 October 2017	11:15 pm	GTCL HO	Mohammad Zakirul, DGM (Survey and Environment)	01709639694	<ul style="list-style-type: none"> Opined that it might not be possible to provide necessary detail information and documentation about the project at this stage Also advised to meet with RPGCL and SUMMIT LNG Co. Ltd, for more information and documentation. 	
2.	15 October 2017	1 pm	DoE Head Office, Dhaha	Syed Nazmul Ahsan, Director (Environment & Clearance)	01819427358	<ul style="list-style-type: none"> He advised to follow the ToR correctly and collect necessary NoCs from respective Authorities. 	
3.	16 October 2017	11:30 am	RPGCL HO	Engr. Kazi Md. Anwarul Azim MBA, Manager (LNG Cell)	01911400046	<ul style="list-style-type: none"> He assured all possible assistance for successful completion of the project and also advised to collect all available data from Mr. Sharif, DM(LNG CELL) and SUMMIT LNG CO. Ltd. 	
4.	16 October 2017	11:30 am	SUMMIT Center, Kawran Bazar, Dhaka.	A.N.M Tariqur Rashid, MD, SUMMIT LNG Co. (Pvt.) Ltd.	01730050056	<ul style="list-style-type: none"> He assured all necessary support for implementing this priority development project. 	
5.	24 October 2017	12:30 pm	DC Office, Coxsbazar	Mahidul Islam, ADC (Revenue)	01556640101	<ul style="list-style-type: none"> Acknowledging the field visit program of the project area Existing Development activities of Cox's Bazar especially the the Moheshkhali Islands Assured about all sort of security support necessary for the project site visit MR. Jahir, (RDC) also present in the meeting 	
6.	24 October 2017	2.50 PM	DoE Zonal Office, Coxsbazar	Syful Asrab, Assistant Director,	0171268503	<ul style="list-style-type: none"> Confirmed the Project location is out of the ECA boundary Shared the process of Environmental Clearance procedure Shared the national policies of the EIA 	
7.	24 October 2017	3.45 PM	Department of Fishery, Coxsbazar.	Dr. Md. Abdul Alim, Distrct Fisheries Officer	01718157730	<ul style="list-style-type: none"> Welcomed the proposed port project Expressed concern about the 	

Sl. No.	Date	Time	Place	Name & Designation	Contact phone & Mobile No.	Comments	Remarks
						fishing community in and around the proposed port area <ul style="list-style-type: none"> • Construction activities should not be during the Hilsha breeding period • Poor fishermen should have proper support from the project • Avoid as much as vibration in the offshore area • Fiber boat for the registered fishermen from the project would be a good compensation. 	
8.	24 October 2017	5:00 PM	Rupantorito Prakritik Gas Company Ltd. (RPGCL), Coxsbazar	Engr. Mostafa Kamal, Manager	017307002828	<ul style="list-style-type: none"> • He expressed all his support for the project. 	
9.	25 October 2017	10.15 AM	UNO office, Moheshkhali	Mohammad Abul Kalam, UNO and Upazila Nirbahi magistrate	01733373209	<ul style="list-style-type: none"> • He expressed all his support for the project but requested for due compensation of the project affected persons. 	
10.	25 October 2017	11.30 AM	Upazila Fisheries office, Moheshkhali	Mr. Rabi Chandra Chakma, Senior Assistant.	176121606	<ul style="list-style-type: none"> • Shared the types of fishing, fishing nets, registered fishermen etc. of the proposed project area Awareness built up about the proposed project should be done. 	
11.	25 October 2017	12.30 PM	Gotibhanga Fishing Association	Dr. Amiruzzaman Anju, Chairman, FA	01874752242	<ul style="list-style-type: none"> • There was a confusion like discover of gas field in the sea which was cleared after the briefing of the project • Chairman assured the local support as and when required 	
12.	25 October 2017	12.30 PM	Gotibhanga Fishing Association	Md. Amir Hossain, General Secretary, FA	01827930689	<ul style="list-style-type: none"> • He said any development project of the Government. is good for the nation but he was afraid whether his professional earning would be interrupted. If so, he should be properly compensated 	
13.	25 October 2017	12.30 PM	Moheshkhali Police Station	AKM shafiqul Alam Chowdhury, Inspector of Police	01711063771	<ul style="list-style-type: none"> • He expressed all his support for the project. 	
14.			Cox's Bazar	Commander Coast Guard	01730014920	<ul style="list-style-type: none"> • Could not be contacted because he was otherwise preoccupied 	
15.			Cox's Bazar	Naval Contingent Commander	0341-63893	<ul style="list-style-type: none"> • Could not be contacted because he was otherwise preoccupied 	

Table-14.3: Details of a FGD Meeting held at Boro Moheshkhali Union Parisad Office during 25 October, 03-04, 13-14 November 2017

Sl. No.	Date	Time	Place	Name & Designation	Contact phone & Mobile No.	Comments	Remarks
A. Gotibhanga Fishing Association							
01	25-10-2017		Moheshkhali	Amirruzzaman Arju, Fishermans Samity Secretary	01874752242	- All sorts of cooperation will be given	
02				Amir Hossain, Fishermans Samity General Secretary	01827930689	- Proper Compensation is required	
03				Jafor Alam, Fishermans Samity Member	01831511551		
04				Nabir Hossain Fishermans Samity Member	01812996139		
05				Abdul Jalil Fisherman's Samity Member	01827799356		
06				Asmot Ali Fishermans Samity Member	01833277953		
B. Boro Moheshkhali Union Chairman Office							
01	04-11-2017	12 pm – 01 pm	Boro Moheshkhali Union Chairman Office	Enayei Ullah Babul (Chairman) Boro Mohehkhali	01714015512	- All sorts of cooperation will be given - Proper compensation needed and resettlement	
02				Abdul Hakim, Businessman	01820185300	- Proper compensation needed during acquisition	
03				Mohor Amin, Member of UP	01855231900	- All sorts of cooperation will be given	
04				Md. Shihab Uddin, Secretary, UP	01819647948	- Proper compensation needed and resettlement	
05				Ekhlasur Rahman President, Jagiraghona Primary School	01867166457	- Proper compensation needed and resettlement	
06				Md Shafiul Alam, Member of UP	01726519515	- Proper compensation needed during acquisition	
07				Md Helal Uddin, Businessman	018747772667	- Engagedment local people during construction or operation stage.	
08				Emtajul Karim, Fisherman	01816464552	- To creat employment for local people	
09				Moulovi Amzad Ali, Son of Late Hazi Najor Ali (Moulovi)	01829257250		
10				Md. Doulat Mia Son of Late Kalu Mia (Salt Farmer)			
11				Md. Moson Ali Son of Late Abdur Rahman(Salt Farmer)			
12				Dr. Faridul Alam Son of Late Mamun Mia (Salt Farmer & Service)			
13				Md. Amin Hosen Halaly Son of Late Fazol Ahmed			
14				Md. Ali Ahmed Son of Rowson Ali (Salt Farmer)			
C. Boro Moheshkhali Union Bazar							
01	13-11-2017		Boro Moheshkhali	Amin, Farmer	01855231900	- All sorts of cooperation will be given	
02				Amal Monir, Farmer	01838142178	- Proper compensation needed	
03				Shah alam, Farmer	01863993251	- Support of	
04				Ali Ahad, Farmer			

Sl. No.	Date	Time	Place	Name & Designation	Contact phone & Mobile No.	Comments	Remarks
05				Habul Hossain, Fisher man		Employment opportunity	
06				Md. Kharul Amin, Business	01825260227	- Concern of salt cultivation in future	
07				Answar, Business	01831511858	- All sorts of cooperation will be given	
08				Kamal Mia, fisher man		- Proper compensation needed and resettlement	
09				Samsul Alam, Business	01832036791	- Proper compensation needed during acquisition	
10				Jahidul Islam, Business	01827723613		
11				Obaidul Kadir, Business	01853139302		
12				Abu Bakar Siddique, Business	01882287954		
13				R Rahim, Farmer	01836538944		
14				Noor Ahad, Boatman	01858574453		
D. Hoanok Boro Bazar							
01	14-11-2017			Md. Jafor Ullah, Business	01718276492	- All sorts of cooperation will be given	
02				Md. Abul Hossain, Business		- Proper compensation needed and resettlement	
03				Md. Amir Hamza, Business	01856329561	- Proper compensation needed during acquisition	
04				Md. Mofiz Alam Business	01825662208	- Alternative Employment and resettlementSkill Training	
05				Md. Answer Karim, Meson	01977537212		
06				Md. Dulal, Services	01876254551		
07				Md. Earshad Ullah Business	01812203351		
08				Md. Safi alam, Fisherman			
09				Md. Babul Hossain, Farmer	01825559073		
10				Abul Hasan, Fisherman	01914841269		

Table-14.4: Findings of Public Consultations

Serial No	Name of the Participants	Address & Contact Number	Occupation	Age Year	Signature of the Participants	Remarks
1	Hajji Sharif Bhadsha	Chairman	Social Welfare	47	All Participants Signed in the FGD meeting record sheet with the following comments: 1. There will be support for smooth progress of the project activities 2. People of the locality, are ready to help at any time. 3. They hope to get gas line connection in their area and they will be grateful for that.	Field Enumerator Mr.Moazzem Hossain conducted the meeting, and recorded the participant details and their comments & opinions on the impacts of the projects under different phases of implementation as compiled in different subsection of the Chapter on Public Consultation
2	Enayei Ullah Babul (Chairman) Boro Mohekhali	Chairman, Boro Mohekhali 01816464822	Social Welfare	40		
3	Mohammad Nurul Islam	Mohekhali Pouroshoba :01812663439	Business	65		
4	Md. Shihab Uddin, Secretary, UP	Secretary, Union Porisod 01830978369	Service Holder	40		
5	Mohammad BhadurAlam	Fakiragol	Farmer	42		
6	Mohammad Abdul Hoque	Fakiragol	Salt Trader	36		
7	Mohammad Ali Ahammad	Boro Mohekhali	Farmer	64		
8	Mohammad Redhwan	Boro Mohekhali	Farmer	50		
9	Mohammad Nur Ahammad	Fokiragata	Farmer	46		
10	Mohammad Abul Kalam	UP Member Ward No. 1 01823910716	Social Welfare	55		

Serial No	Name of the Participants	Address & Contact Number	Occupation	Age Year	Signature of the Participants	Remarks
11	Mohammad Aklas Mia	Fokiragata	Farmer	36		
12	Mohammad Farid	Bordoil	Doctor	40		

Table-14.5: Per acre compensation for 6 month in salt Cultivation

Land Price per acre	Salt Production per acre	Labor cost	Material cost	Lease value per acre	Selling price per 40 kg	Total Selling price per acre	Net Profit per acre
5 lakh	700maund	300x2x180 days=108000.00	10000.00	25000.00	300.00	700 x 300= 210000	67000.00

Maund=40kg(Local system)

Table-14.6: Per acre compensation for 6 month in salt land

	Land Price	Lease value	Profit value	Total loss for land per acre
Regarding loss for salt land (6 month)	500000.00	25000.00	67,000.00	

Table-14.7: Per acre compensation for 6 month for shrimp cultivation

Land Price per acre	Shrimp Production per acre	Labour cost	Maintenance, Feeding	Lease value per acre	Selling price per kg	Total Selling price per acre	Net Profit per acre
5 lakh	8 maund	300x3x180 days=162000.00	15,000.00	6000.00	700.00	700 x40x8= 224000.00	41000.00

Maund=40kg(Local system)

CHAPTER-15 : CONCLUSION AND RECOMMENDATIONS

15.1 Conclusion

15.1.1 The Assessment Process

This environmental impact assessment of the offshore LNG FSRU moored at STL Project has been prepared based on review of draft technical specifications of the Project as provided by GTCL and Summit LNG Co. (Pvt) Ltd. The assessment process included scoping site visits, site surveys for impact assessment based on project level information provided by the Project developer, primary baseline studies and monitoring and extensive stakeholder consultations along with reviewing of Site and Configuration Selection Report, Reconnaissance Survey Report for Onshore Pipelines, Process Layout of LNG Facilities, Cadastral Maps of the locations and studying satellite imageries. The total outcome of the EIA study process has been placed in this report containing 15 different Chapters. These have been organized pursuant to the directives of the DOE and in consonance with the requirement of GTCL, the later being responsible for the EIA part of this project. In addition to these Chapters, the report has also been supplemented with usual other contents on Executive Summary, Abbreviation and References etc.

15.1.2 Observations on Potential Impacts

15.1.2.1 Potential Positive Impacts

The Project will have both positive and adverse impacts on social environment. The positive impacts will include temporary employment opportunity for the unskilled labourers during the construction period (the Project Developers plans to hire unskilled labour from the island Upazila), business opportunities for the local people (tea stalls, eateries, shops for general provisions, garages, etc.). The implementation of the Project in both onshore & offshore areas is expected to result in to a significant economic emancipation of the local area, as well as Bangladesh in general. To be more specific, the execution of this Project has the possibility of leading to several key benefits including but not limited to boosting up of the economic development through securing further energy supply, enhancing export earning and employment generation as well as providing opportunity of furthering local business and employment.

15.1.2.2 Potential Adverse Social Impacts

Based on the present level of information available from the Project Developer it is anticipated that the project is likely to have adverse social impacts pertaining to temporary land loss, land fragmentation, potential physical displacement, loss of income (that may include agricultural labourers, sharecroppers, workers/labourers of salt pans), loss of productive land, potential income loss for fishermen and preventing to fishing related activities and fishing routes. The impacts may be localised and some are permanent in nature that can be mitigated with appropriate measures; it is anticipated that vulnerable groups (women headed households, to be identified during Census survey and social impact assessment) may also experience impacts due to the project implementation. The community at large will lose agricultural land, salt pan land, homestead lands and structures, access to near shoreline fishing grounds and use of sea shore for other activities related to fishing

15.1.3 Analysis of Alternatives

Having regard to the purpose of the EIA which is to provide the public and the permitting

agencies with information about the potential environmental impacts of the proposed Project of the Offshore LNG Floating Storage and Regasification Unit FSRU Terminal permanently moored at Island Project at Moheshkhali area under Cox's Bazar District, due care has been taken to address the afore mentioned additional incorporations as asked for. But the analysis of its alternatives in terms of location and configuration with due consideration of the available energy options, the ones selected by the project proponent has reflected an appropriate judgment. Based on same, the measures recommended in the report for taking care during execution of the project are expected to be adequate enough in ensuring proper mitigation to avoid or minimize any adverse impacts to the maximum extent practical.

15.1.4 Study of Concerns to Identify Key Issues

The consultant team collected available information and essential background documentation from the project proponent, the Project team has conducted significant research not only on the local environmental and social conditions, but also covered the concerns and covenants of a good number of similar other Offshore FSRU complexes, Sea Bed Pipelines, LNG terminals, LNG Carriers and Onshore facilities at different parts of the world. Exposures to the pertinent issues prevailing in the real life situations in different phases of planning and design, construction and operations of all these projects have substantially assisted in identification of a number of key issues which have been extensively discussed in the report and conclusions of same have been presented therein. However, the EIA determined that there are no significant potential impacts that cannot be avoided, mitigated, rectified, or compensated.

Historically, GTCL-a Company of Petrobangla, the proponent has a proven track record of successful execution of the projects of significant dimensions and magnitudes in the past and thus has been entrusted with the responsibility of this project too. It is therefore, technically and logically expected that it will continue to address the pertinently challenging issues of these project with due determination and fortitude throughout the construction and operation of the project facilities through monitoring and management feedback mechanisms as outlined in the Environmental Management Plan.

15.1.5 Commitment and Credibility of the Executing Agency

In fine, it can be concluded that RPGCL and SUMMIT being the executing agencies of this project, has by this time, possessed enough of proven track records in successfully materializing the different gas sector projects of significant dimension and magnitude. Further, Summit LNG, the proposed implementing agency have also no less experience of implementing and operating a number of Power sector Projects in the country. It has appeared during the study that both are committed to complying with all relevant national standards and generally recognized industry standard and practices for implementation and management of this offshore FSRU and all related LNG import facility project with onshore Tie-in Point at kaladiar Char of Moheshkhali. Since GTCL has the primary responsibility of smooth, safe and environment-friendly execution of the project, it hopes to continue and enhance its good reputation within Bangladesh and within the local communities as well. This in turn would pave the way for Bangladesh in achieving yet another land mark opportunity of entering into the LNG market of the world and thus materializing one of its multidirectional efforts in obtaining energy security for the nation.

15.2 Recommendations

15.2.1 In general

In general, it is recommended that a detail assessment of safety and security of the Project is made before launching its execution in consultation with the national and local agencies. This has to be based on a systematic assessment of potential risks to navigation safety and maritime security associated with the proposed Project. In addition to same, further clarifications and high lights of the recommendations made earlier in this EIA report are placed

below:

15.2.2 Potential Risks

The assessment of potential risks has to be evaluated in terms of the components of risk: threats, vulnerabilities, and consequences. This assessment may lead to the preliminary determination that additional measures would be necessary to make the Project suitable for LNG carrier traffic and identified additional measures that would provide for the safety and security of the proposed FSRU and LNG carriers; It is presumed that those measures would be considered by the concerned agencies during its review of the proposed Project.

15.2.3 Hazard Zones

Hazard zones associated with a large release of LNG from the Project should be further calculated as part of assessing the suitability of the Project Waterway for LNG carrier traffic and the suitability of the proposed location of the FSRU. In addition, separate calculations and risk-based analyses should be used for determining the size and shape of the proposed safety and security zones around the FSRU and the LNG carriers. Further, since none of the hazard zones around the FSRU extend to a population center due to the minimum 3-8 km distance between the FSRU and land, it appears that the Hazard Zones to be finally determined would also not extend to the shore associated with transiting LNG carriers, and hence it may be concluded that there are currently no known, credible threats against the proposed facility, although periodic threat assessments must be conducted to ensure that the security measures are in place and remain appropriate to address unknown threats.

15.2.4 Safety and Security

There are many significant safety and security benefits associated with the location of the FSRU, especially with respect to threat and consequences since it would be remote from population centers. Eventually, this remoteness would serve to reduce the attractiveness of the FSRU as a target. But still then the Project construction, testing and commissioning and subsequent operational activities might cause some law enforcement, seismic and climatic disaster, catastrophic failures, explosion and fire safety challenges. So, apart from additional security resources consisting of particularly trained law enforcement personnel and well equipped patrol boats as detailed in the Environmental Management Plan (EMP) required to mitigate safety and security risks, it is recommended that provision is retained for additional marine firefighting & disaster control resources are retained to mitigate fire and other adverse climatic disaster, environmental damage and pollution control risks associated with the Project.

15.2.5 Adequacy of Resources

It may be pertinent to note that, if the concerned agencies conclude that the adequate resources in meeting law enforcement, firefighting and pollution control requirements are not available prior to initiation of operation, they would not provide the project proponent with final approval to go ahead with the construction and operation of the Project.

15.2.6 Grievance Redress Mechanism

The socio-economic survey of local residents and government officials has revealed an affirmative response to the Project throughout the area. But in certain cases, stakeholders wished to know more about the mode of execution of the Project in the field and particular concern about payment of compensation for the likely damage to their crops, salt cultivation & shrimp farms including loss of income due to possible interruption in their fishing in the bay. So, in order to draw their full co-operation and support to proceed with unhindered progress of implementation of project as well as conducting smooth operation, it is recommended that arrangement is made for dissemination of further project impact related information and ensuring prompt payment of compensations to the project affected persons well before launching the field activities in the project areas. Further, there should be a well defined grievance redress mechanism to mitigate any problem and issues, if any, cropped from such

compensation payment procedures.

15.2.7 EMP and Emergency Response Plan

Apart from the emergency response plan as provided in the chapter on EMP of this report, all roles and responsibilities including those of external parties are to be clearly communicated and standard practice will be followed to inventory and properly dispose of all crew waste. Solid waste produced from general operations and camp sites. A waste management plan has been provided to adequately deal with all waste likely to be produced throughout the project implementation. Similarly, disturbance in fishing and navigation in the Project area during construction & operational activities should be further studied meticulously and an effective EMP shall have to be drawn on this aspect in consultation with local people.

15.2.8 Coastal Biodiversity

In pursuance to the impact assessment of the migratory birds, coastal and marine biota, known fishing grounds and aquatic mammals in the potentially impacted area, it is further recommended that care should be taken in order to avert noise and other disturbance caused by movement of people, vehicles, and boats & transiting LNG carriers including all FSRU related offshore & onshore facilities through adopting all appropriate monitoring and mitigation measures as outlined in this report. This should be duly addressed with site specific mitigation plan and in consultations with fishermen, boat operators, tour operators, and ferry operators well ahead of any intervention in the project areas likely to be affected by such interventions.

15.2.9 Incorporation of HSE & allied Issues in EPC Contract

RPGCL and SUMMIT are committed to taking all appropriate monitoring and mitigation measures and ensure further actions before fielding the project, as outlined in this report. Further, they are also committed to maintaining a positive approach towards environmental management including positive growth within the communities in which they operate. It has, therefore, been recommended that the HSE and allied issues are made obligatory in the EPC contract and full compliance of the aforementioned observations and recommendations are strictly ensured at all phases of execution of the project.

In view of the foregoing perspective it is recommended that an Environmental Clearance Certificate be issued, in favor of Gas Transmission Company Ltd to proceed with the Project in the interests of national energy security.

LISTS OF ANNEXURES

- Annexure-1 : Environmental Clearance Certificate (ECC)
- Annexure-2 : Terms of Reference
- Annexure-3 : Onshore manifolds (6m) Layout-EE & SUMMIT
- Annexure-4 : NoC from Local Authority and Government Agencies
- Annexure-5 : List of Flora and Fauna
- Annexure-6 : Remedy from IEE and Approval of ToR for EIA from DoE
- Annexure-7 : Questionnaire for Socio-economic Survey
- Annexure-8 : Laboratory Analysis Report
- Annexure-9 : Table-of Socio-Economic condition and FGD samples.
- Annexure-10 : Photographs
- Annexure-11 : Chalan Copy of DoE's Fee and VAT
- Annexure-12 : Letter to Bangladesh Economic Zones Authority (BEZA)
- Annexure-13 : Draft National Oil Spill Contingency Plan

Annexure-1 : Environmental Clearance Certificate (ECC)

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Government of the People's Republic of Bangladesh
Department of Environment
www.doe.gov.bd
Head Office, Paribesh Bhaban
E-16 Agargaon, Dhaka-1207

Memo No: 22.02.0000.018.72.014.17, 20

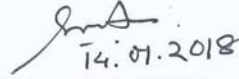
Date: 14/01/2018

Subject: Environmental Clearance for Proposed Offshore LNG Floating Storage and Re-Gasification Unit (FSRU) moored at STL (Submerged Turret Loading) Project at Maheshkhali under Cox's Bazar to Build up Summit LNG Terminal Co. (Pvt.) Ltd.

Ref: Your application dated 04/12/2017.

Please refer to your letter of 04/12/2017 on the captioned subject, I have the pleasure to award the Environmental Clearance as well as the approval of Environmental Impact Assessment (EIA) Report to the proposed project : Offshore LNG Floating Storage and Re-Gasification Unit (FSRU) moored at STL (Submerged Turret Loading) Project at Maheshkhali under Cox's Bazar to Build up Summit LNG Terminal Co. (Pvt.) Ltd.

A copy of the said Environmental Clearance Certificate is attached herewith for your kind information and necessary action at your end.


14.01.2018
(Syed Nazmul Ahsan)
Director (Environmental Clearance)
Phone # 8181673

General Manager (Planning)
Gas Transmission Company Limited (GTCL)
Plot No. F-18/A, Sher-E-Bangla Nagar Administrative Area, Agargaon
Dhaka-1207.

Copy Forwarded to :

- 1) PS to the Secretary, Ministry of Environment and Forests, Bangladesh Secretariat, Dhaka.
- 2) Director, Department of Environment, Chittagong Regional Office, Chittagong.
- 3) Deputy Director/ Officer-In-Charge, Department of Environment, Cox's Bazar District Office, Cox's Bazar.
- 4) Assistant Director, Office of the Director General, Department of Environment, Head Office, Dhaka.

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Government of the People's Republic of Bangladesh
Department of Environment
Head Office, E-16 Agargaon
Dhaka-1207
www.doe.gov.bd

Environmental Clearance Certificate

Section 12 of the Environment Conservation Act, 1995 (Amended 2002)

Clearance Certificate Number: 20

File number: 22.02.0000.018.72.014.17

Clearance Certificate Issue Date: 14 January, 2018

Renewal date not later than: 13 January, 2019

A. Clearance Certificate Type

Environmental Clearance Certificate

B. Clearance Certificate Holder

General Manager (Planning)

Gas Transmission Company Limited (GTCL)

Plot No. F-18/A, Sher-E-Bangla Nagar Administrative Area, Agargaon
Dhaka-1207.

C. Premises to which this Clearance Certificate Applies

The Project site location of Summit FSRU terminal is in the South East of Bangladesh, driving distance approximately 380 km from Dhaka, 90 km south of the port city Chittagong. The site is on the Bay of Bengal. The project coordinate has already fixed up at 21°33'20.46"N; 91°48'58.22"E. For evacuation of re-gasified gas already Maheshkhali-Anwara 30 inch dia×91 km long gas transmission pipeline installed and 42 inch×79 km Maheshkhali-Anwara parallel gas transmission pipeline is being installed by GTCL.

D. Activities for which this Clearance Certificate Authorizes and Regulates

The said project includes construction and operation of following components:

- Submerged/ Directional Turret Loading FSRU.
- Floating Storage and Regasification Unit (FSRU) with storage capacity of 1,38,000 m³ to 1,70,000 m³.
- Regasification onboard FSRU for send out of RLNG with 600 MMSCFD as peak capacity.
- High Pressure 24" subsea re-gasified LNG (RLNG) pipeline of 3-8 km.



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E. Terms and Conditions for Environmental Clearance Certificate

1. **Limit Condition for Discharges to Air and Water:** The Environmental Clearance Certificate must comply with schedule 2 and 10, rule 12 of the Environment Conservation Rules, 1997 (Annex-I & II).
2. **Noise Limit:** The Environmental Clearance Certificate must comply with the Noise Pollution (Control) Rules, 2006

In case of non-coverage of ECR 1997, the World Bank Environment, Health and Safety Guideline shall be adhered to.

3. Operating Conditions:

- 3.1 Activities must be carried out in a competent manner. This includes:
 - (a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and
 - (b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.
- 3.2 All plant and equipment installed at the premises or used in connection with the Environmental Clearance activity:
 - (a) must be maintained in a proper and efficient condition; and
 - (b) must be operated in a proper and efficient manner.
- 3.3 Construction works shall be restricted to day time hours so as to avoid/mitigate the disturbance of local lives as well as implementation schedules of the works shall be notified in advance to nearby residents.
- 3.4 Storage area for chemicals and other construction materials shall be carefully selected to avoid disturbance of the natural drainage. To avoid soil contamination at labour camp and work-site chemical, cement and petroleum derivatives shall be handled cautiously.
- 3.5 Sufficient number of drainage facilities shall be installed properly to ensure sufficient drainage capacity.
- 3.6 During site preparation, piling work, construction of land embankments, project approach roads and temporary access roads, top soil shall be kept aside and shall be restored after completion of the said activities.
- 3.7 The open areas that are grasslands can be used for construction but with appropriate safeguards to maintain material and dump sites from contaminating river/sea waters.
- 3.8 This shall be ensured that soil is obtained through dredging. The construction equipment and vehicles shall be cleaned regularly.
- 3.9 Re-vegetation and replanting shall be undertaken if rehabilitation works involve extensive vegetation clearance.
- 3.10 Vegetation clearance shall be minimizing at the construction phase as to minimize soil erosion. Soils for embankments shall be properly tested and compacted to ensure stability.
- 3.11 Soil erosion caused by removal of vegetative cover and excavated loose soil shall be checked through repopulation with local vegetation as soon as possible; loose soil shall be covered and stored away from the edge of the river/sea.
- 3.12 Proper construction practices shall be followed that minimize loss of habitats and others species including fish breeding, feeding and nursery sites.



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- 3.13. Necessary steps shall be taken to protect flooding of local areas due to restricted flow at the project sites.
- 3.14 Proper and adequate sanitation facilities shall be ensured in labor camps throughout the proposed project period.
- 3.15 In order to control noise pollution, vehicles & equipment shall be maintained regularly; working during sensitive hours and locating machinery close to sensitive receptor shall be avoided.
- 3.16 No solid waste can be burnt in the project area. An environment friendly solid waste management should be in place during whole the period of the project in the field.
- 3.17 Proper and adequate on-site precautionary measures and safety measures shall be ensured so that no habitat of any flora and fauna would be demolished or destructed.
- 3.18 Any heritage site, ecological critical area and other environmentally and/or religious sensitive places shall be avoided during project construction phase.
- 3.19 To control dust vehicles and equipment to be used for this project shall be maintained properly, water trucks shall be used, stockpiles to be located away from sensitive receptors and vehicle speed limits shall be enforced.
- 3.20 Resettlement plan should be properly implemented and people should be adequately compensated, where necessary.
- 3.21 Construction material should be properly disposed off after the construction work is over.
- 3.22 Climate Change effects and maximum storm surge height shall have to consider at the design phase.
- 3.23 No activity of cutting/razing/dressing of hill or hilly land is endorsed under this clearance without due permission/clearance of the concerned authority of the Government of Bangladesh.
- 3.24 Appropriate permission would be required to obtain from the forest department in favor of cutting/felling of any plant/tree/sapling forested by any individual or government before doing such type of activity.
- 3.25 The mitigation measures described in the Environmental Management Plan (EMP) included in the EIA report shall strictly be implemented and kept functioning on a continuous basis.
- 3.26 Erosion, accretion, change of river/sea morphology and undue interventions and activities within the proximity of the project site shall be monitored during operation period.

4.1 Monitoring and Recording Conditions:

- 4.1.1 The results of any monitoring required to be conducted by this Clearance Certificate must be recorded.
- 4.1.2 The following records must be kept in respect of any samples required to be collected for the purposes of this Clearance Certificate:
 - (a) the date(s) on which the sample was taken;
 - (b) the time(s) at which the sample was collected;
 - (c) the point at which the sample was taken; and
 - (d) the name of the person who collected the sample.

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4.2 Requirement to Monitor Concentration of Pollutants Discharged

For each monitoring, the Clearance Certificate holder must monitor (by sampling and obtaining results by analysis) the following parameter: water flow, water quality, air quality, noise, the surrounding areas for spread of invasive species, the changes in aquatic habitats before, during and after construction, fish catch during and after construction.

5. **Reporting Conditions:** Environmental Monitoring Reports shall be made available simultaneously to Head quarters and Cox' Bazar District office of the Department of Environment on a quarterly basis during the whole period of the project.
6. **Notification of environmental harm:** The Clearance Certificate holder or its employees must notify the Department of Environment of incidents causing or threatening material harm to the environment as soon as practicable after the person becomes aware of the incident.

F. RECORDING OF POLLUTION CONTROL:

The certificate holder must keep a legible record of all complaints made to the certificate holder or any employee or agent of the certificate holder in relation to pollution arising from any activity to which this Environmental Certificate applies. The record must include details of the following:

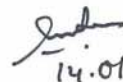
- (a) the date and time complaint;
- (b) the method by which the complaint was made;
- (c) any personal details of the complaint which were provided by the complaint or, if no such details were provided, a note to that effect;
- (d) the nature of the complaint;
- (e) the action taken by the certificate holder in relation to the complaint, including any follow-up contact with the complaint; and
- (f) if no action was taken by the certificate holder, the reasons why no action was taken.

The record of a complaint must be kept for at least 4 (four) years after the complaint was made. The record must be produced to any authorized officer of the DOE who asks to see them.

G. VALIDITY OF THE CLEARANCE CERTIFICATE:

This Environmental Clearance is valid for one year from the date of issuance and the Project authority shall apply for renewal to the Cox' Bazar District office of DOE at Cox' Bazar with a copy to Head Office of Dhaka at least 30 (thirty) days ahead of expiry.

Violation of any of the above conditions shall render this clearance void.


14.01.2018

(Syed Nazmul Ahsan)
Director (Environmental Clearance)

Annexure-2 : Terms of Reference

Section 6. Terms of Reference

The Terms of Reference (TOR) is the key document in the RFP. It explains the objectives, scope of work, activities, tasks to be performed, respective responsibilities of the Client and the Consultant, and expected results and deliverables. Adequate and clear TOR are essential for the understanding of the assignment and its correct execution by the Consultant. It also helps reducing the risk of ambiguities during the preparation of proposals by the Consultant, contract negotiation, and execution of the services.

Terms of Reference normally contain the following sections:

- *Background of the project;*
- *Objectives of the assignment;*
- *Scope of Services;*
- *Transfer of Knowledge (training) (when appropriate);*
- *List of reports, Schedule of deliveries, period of performance;*
- *Data, personnel, facilities and local services to be provided by the Client, and*
- *Institutional arrangements*

Four handwritten signatures in black ink, arranged horizontally. The first signature is on the left, followed by three more signatures to its right.

The Offshore LNG FSRU terminals with STL (Submerged Turret Loading) configuration in operation in United States; Brazil; Argentina; Egypt; Italy; Dubai, UAE; Pakistan; China; Indonesia. Several others under development (e.g. India; Vietnam; Myanmar).

LNG is vaporized aboard the FSRU using either sea water or steam from the ship's boilers as the heat source. Vaporized LNG from the FSRU is transferred to shore through high pressure (HP) gas arms and a gas pipeline. Sendout gas pipeline can be either subsea or mounted on a trestle to shore.

The EIA will identify impacts on all aspects of environment, socio-economy, health and biodiversity. The impact assessment will include positive and negative, short term and long term including reversible and irreversible impacts. Based on the analysis of impacts the EIA shall identify the potential mitigation measures to reduce and offset the negative impacts. The EIA will also suggest management plans incorporating all mitigation measures.

The environmental legislation in Bangladesh, particularly, the Environmental Conservation Act, 1995 (Amended in 2002), states that any development project shall require environmental clearance from the Department of Environment (DOE), Ministry of Environment and Forest, The Government of the People's Republic of Bangladesh. The proposed Project falls under the "Red Category" as per the Environmental Conservation Rules of 1997, which requires submitting Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA) report to obtain both Site Clearance and Environmental Clearance from the DOE. In order to mitigate the existing gas supply crisis of Chittagong and nearby areas as per government decision, the project is being implemented pursuant to the recently introduced "Power & Energy Fast Supply Increase (Special Provision) Act-2010" and as such it is in utmost consideration for expeditious implementation. For necessary exemption from submitting IEE for site clearance, application has already been submitted to DoE. So, the TOR of EIA should be prime concern in line with DOE's requirement.

2.0 Objectives of the Assignment:

The overall objective of this assignment is to conduct Environmental Impact Assessment (EIA) for the proposed Offshore LNG Floating Storage and Re-gasification Unit (FSRU) moored at STL (Submerged Turret Loading) Project, Maheshkhali, Cox's Bazar district. The project located in the same vicinity under the EIA study conducted by GTCL and given the zero point for tie in pipelines is situated around same coordinate 21°33'4.8" N; 91°48'24" E. The environmental study of the selected route will be carried out to submit EIA reports in accordance with the Environment conservation Act 1995, The Environmental Conservation Rules 1997, Bangladesh Gas Safety Rules 1991 (Amended in 2003), Land Acquisition and Requisition of Immovable Property Ordinance 1982, the EIA guidelines for industries of Department of Environment (DoE), international standards & guidelines, international treaties & conventions related to protection of ecosystem and other applicable laws & regulations of home & abroad.

2.1 Project Components:

The Project includes installation of Offshore LNG Floating Storage and Re-gasification Unit (FSRU) moored at STL (Submerged Turret Loading) Project, Maheshkhali, Cox's Bazar district approximately 3-8 km offshore from Maheshkhali Island (co-ordinates 21°33'4.8" N; 91°48'24" E) in a water depth of approximately 30-40 meters on the Bay of Bengal.

2.2 The Regulations and Guidelines to conduct the assessment:

The descriptions and requirements of the pertinent policies, the regulations and guidelines of the Government of Bangladesh as well as international standards and guidelines, international treaties and conventions shall govern the conduct of this assessment. Among others, they include:

- The laws and regulations of the Government of Bangladesh relevant to route selection, environment and social issues related to the project;
- Regional provincial or communal environmental assessment regulations;
- Environmental assessment regulations of any other organization involved in the project.
- Bangladesh Natural Gas safety Rule 1991 (amendment in 2003).
- Rio Declaration
- Convention on Biological Diversity, Rio de Janeiro (1992).
- United Nation Convention on the law of the Sea, Montero Bay, (1982)
- Other applicable laws.

2.3 Study Area:

The project site location of Summit FSRU terminal is in the South East of Bangladesh, driving distance approximately 380 km from Dhaka, 90km south of the port city Chittagong. The site is on the Bay of Bengal. The project coordinate has already fixed up at 21°33'4.8" N; 91°48'24" E and two letter regarding this matter issued from Petrobangla, Ministry of Shipping are attached herewith as Appnedix1 and Appnedix2. The area is relatively undeveloped consisting mostly of coastal area and island. Adequate water for a closed cooling system is at the site. For the evacuation of re-gasified gas already Maheshkhali-Anowara 30 inch dia x 91km long gas transmission pipeline installed and 42 inch x 79 km Maheshkhali-Anowara parallel gas transmission pipeline is being installed by GTCL.

3.0 Scope of Services:

The consultant shall work with the scope defined within this "Terms of Reference". The following steps will be required for conducting EIA.

3.1 Approach and Methodology:

The Consultant shall make necessary studies, investigation, experiment analysis, etc. to prepare reports and to meet the requirement of DoE. The Consultant shall review other local and international studies. Consultant shall also work in close coordination with the Local authority, Department of Environment and other concerned agencies. Consultant shall take necessary steps for obtaining NOC (No Objection Certificate) from local authority and clearance from DoE.

The Consultant shall undertake public consultations, involving all stake holders, throughout the study at relevant stages, to identify environmental issues/concerns relevant to the project including those relating to Floating Storage Re-gasification Unit (FSRU), address the same in the Environmental Assessment and provide opinion on project design wherever relevant. The Consultant shall document all the consultations including the issues raised and actions planned/taken and justifications for no action wherever relevant. The report should discuss how the public concerns that are raised during different stages of consultations have been considered and addressed in the project.

3.2 Hazard and Risk Assessment:

The environmental assessment should also include assessment of various hazards and risks associated with the installation of Floating Storage Re-gasification Unit (FSRU). The Consultant shall identify the potential failures (e.g. leaks and ruptures in FSRU) that could lead to emergencies such as fire and/or explosion. Relevant quantitative models shall be used to evaluate the risks and impacts of such failures under different likely scenarios. Based on the assessment of risks and as per the international best practices, the Consultant shall recommend the various preventive measures including the safe distances that need to be maintained while installation of Floating Storage Re-gasification Unit (FSRU) at different sea site uses. The Consultant shall also prepare an emergency response and preparedness plan in order to handle the various emergencies that are identified in the hazard assessment study.

3.3 Public Disclosure:

The Consultants will prepare a plan for in country disclosure, specifying the timing and locations, translate the key documents, such as the Environmental Impact Assessment (EIA) summary in local language, and help the Client to place all the EIA reports in the Client's website. The Consultants shall prepare a non-technical EIA summary Report for public disclosure.

3.4 Description of the Environment and Social Baseline Condition:

The Consultant shall collect, evaluate and present baseline up-to-date data on the environmental and social characteristics (air, water and soil quality, marine biological data etc.) of the impacting area. For ambient conditions, collect historical data, and collect field observations to validate. Include information on any changes anticipated before the project commences. The Consultant shall depict specific information around the project area on the following:

3.4.1 Physical Environment

- Topography & Geology
- Sediment mobility
- Climate & Meteorology
- Ambient Air Quality
- Ambient Water Quality
- Sediment Quality
- Surface water Hydrology
- Receiving water Quality
- Availability sweet water
- Ambient Noise (Note contribution from major Sources, if any)
- Oceanography
- Coastal erosion and deposition aspect
- Rate of sedimentation
- Tectonics behavior of the area
- Land use pattern
- Cyclone effect (91/235km/hr, speed 6.9m water height)
- Habitation

3.4.2 Biological Environment

- Flora (e.g. types and diversities)
- Fauna (e. g. residents and migratory)
- Rare or endangered species within or in areas adjacent FSRU installation site or along the gas pipeline ROW

3.4.3 Social Environment (includes both present and projected, where appropriate)

- Offshore site land use
- Planned development activities
- Community structure
- Employment and labor market
- Distribution of income , goods and services (if possible, estimate average income for each source for representative family types)
- Recreation
- Public health
- Education
- Cultural properties (e.g. archeological and historically significant sites)

- Vulnerable groups (very poor, those without formal title, household headed by women, isolated groups, disabled)
- Customs, aspiration and attitude

3.5 Legislative and Regulatory Considerations:

The Consultant shall depict information on the following:

- Describe the relevant regulations and standards governing environmental quality, health and safety, protection of sensitive areas, protection endangered species, siting, and use control, land acquisition, compensation, etc. at the local, regional, national, and international levels.
- Review GOB's current policies, operational procedure and practices to address and mitigate social issues.

3.6 Determination of the Potential Impacts of the Proposed Project:

- The Consultant shall identify all significant impacts, which the project would incur. These would include, among others: Changes in the following; emissions and ambient air quality, effluents and ambient water quality, ambient noise, drainage discharge, sewerage discharge, offshore site use; impacts due to transportation and installation of FSRU along with its accessories.
- Impacts of the project and their activities on the social environment i.e. community's access to social infrastructure-ecologically sensitive areas such as sea shore, mangrove forest, wet lands, wild life etc.; government scheme for development, etc.;
- Assess the impacts from changes brought about by the project on baseline environmental and social conditions;
- Assess the impact on health and safety of public and workers;
- Distinguish between positive and negative social and environmental impacts, direct and indirect impacts including impacts from possible accidents, and immediate and long-term impacts. Identify impacts, which are unavoidable or irreversible;
- Describe impacts quantitatively, in terms of environmental and social costs and benefit, assigning economic values when feasible.

The consultant shall identify all significant impacts on the following:

3.6.1 impacts during installation

- a) Environment Impacts due to
 - Seabed disturbance
 - Pilling discharge
 - Vaporizer discharge
 - Aqueous discharge
 - Wastes
 - Atmospheric emission
 - Sanitation facilities;
 - Noise
 - Accidental (Fire /explosion or other emergencies);
 - Soil and Water contamination;
 - Workers and public safety during construction;

AMS

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2.

(b) Social Impacts due to

- Offshore site land use
- Workers and public safety issues,
- Adverse impacts upon income or living standards, of the fishermen and laborer due to restriction of movement or other activities associated with construction.

The consultant shall identify all relevant environmental and social impacts performing to the construction stage of the project and evaluate the same.

3.6.2 Impacts during Operations

(i) Environmental Impacts due to

- Drainage of sea water from vaporizer
- Impacts of aqueous discharge;
- Impacts atmospheric pollution
- Hydrocarbon spillage
- Large scale gas release
- Fire and explosion ;
- Offshore site land use and impacts aqua culture and mangrove forest;
- Waste disposal from associated facilities/activities such as sea water vaporization, LNG conversion to dry gas, FSRU maintenance etc.

(ii) Social Impacts caused by operation of the project. Among others, these should include

- Impacts on the local market in change in demand for local services;
- Impacts due to creation of barriers for human and migratory life;
- Access to social infrastructure;
- Impacts on marine livelihood;
- Impacts on public entertainment at Maheshkhali Island;
- Fire and explosion related emergencies;
- Threat to public safety.

The consultant shall identify all relevant environmental and social impacts performing to the operation stage of the project and evaluate the same.

3.7 Development of an Environmental Management Plan to mitigate negative impacts:

The Consultant shall develop an Environmental Management Plan with feasible and cost-effective measures to prevent or reduce significant negative impacts during construction/installation/ intervention/ post construction/operation stages to acceptable levels.

3.7.1 Environmental Management Plan (EMP)

The management plans should contain detailed implementation and monitoring plan along with indicators, disaster management and emergency response plan, contingency planning, risk management, clear allocation of responsibility among project sponsor, government agencies, and community-based organizations for the implementation and monitoring. It should be prepared in consultation with affected people, public authorities and other stakeholders. Detail social management plan should be prepared to mitigate possible positive and negative impacts. Provide the list of time-bound environmental management activities; who will be responsible

for what; what would be the cost; who will pay; and where will the money come from etc.

3.7.2 Monitoring Plan

The Consultant should specify the types of monitoring needed for potential environmental impacts during construction and operation. It should contain detailed mitigation measures to address the environmental consequences associated with the project. As in the case of the mitigation plan, requirements should be specific as to what is to be monitored, how and by whom (with clear delineation of responsibilities). The mitigation measures should be for construction/ installation/ intervention/ post construction/ operation phases (including maintenance and repair) of the project. Among other things, this should focus on:

- Treatment and discharge of effluents;
- Control of waste materials;
- Storage and handling of material and equipment
- Odor management
- Improving public safety
- Measures to manage all construction related impacts.

4. List of reports, Schedule of deliveries, Period of performance

4.1 List of reports: Draft EIA report, Draft final EIA report, Final EIA report and Soft copy of final EIA report.

4.2 Schedule of report delivery:

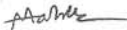
The Consultant shall maintain the schedule for submission of the reports as follows:

- The draft EIA report shall be submitted in 5 (five) copies within 30 (thirty) days from the date of commencement of services;
- The Draft final EIA Report with NOC from local and appropriate authority as applicable and other necessities paper as required by DOE shall be submitted in 5 (five) copies within 10 (ten) days after acceptance of Draft EIA report by the Client.
- Environmental Clearance/Permission for implementation of the project shall required to be obtained from the DOE by submitting the EIA report and other necessities paper as required by DOE within the next 30 (thirty) days from the date of submission of Draft Final EIA report;
- The Final EIA Report shall be submitted in 5 (five) copies within 10 (ten) days after obtaining clearance on Draft final EIA report from DOE;

4.3 Period of performance:

The consultancy services are expected to be commenced from September, 2017 and scheduled completion of the services is March, 2018. A national consultancy firm will be engaged for the assignment. The consultant's composition will be as follows:

Professional Staff: It has been estimated that over the total services period, the below mentioned professional staffs are required which 9 man-months for EIA and it is an initial indication. The interested firms are expected to make their own estimates of staffing to deliver the service:









Sl. no	Position Held	No. of Personnel	Man-Months
For EIA			
1	Team Leader	1	2
2	Gas Processing Engineer/Gas Pipeline Engineer	1	2
3	Hydrologist/Geologist	1	1
4	Financial/Economic Analyst	1	1
5	Sociologist	1	1
6	Field Surveyor cum Data Analyst	2	2
	Total:	7	9

5. Data, Local Services, Personnel and Facilities to be provided by the Client

- Issuance of request letter to officials, agents and representatives of the Government as may be necessary or appropriate for the prompt and effective implementation of the Services;
- Issuance of introductory letter to local and appropriate authority as applicable for No Objection Certificate (NOC) to assist the Consultant in obtaining NOC and necessary permission needed to carry out the services;
- Issuance of forwarding letter to DOE along with EIA report, application in prescribed Form of DOE and necessary government fees to assist consultant in obtaining Environmental clearance.

6. Indicative Work Programme and Location(s) of the various Activities to be carried out by the Consultant

- The Consultant at own responsibility and risk shall visit and examine the site and their surroundings, social and physical aspects and to obtain all information that may be necessary for the purpose of execution of study and preparing of reports. Any cost associated with the site visit shall be borne by the Consultant. Prior permission may be required for visit to the sensitive sites;
- The Consultant shall carry out consultation with the affected groups and prepare a consultation strategy to ensure that all affected people and stakeholders are fully informed about the project, and the views of these people on the consequences of the project are taken into account consideration. The Consultant will distinguish between positive and negative impacts, direct and indirect impacts including impacts from possible accidents, and immediate and long-term impacts. Identify impacts, which are unavoidable or irreversible
- The Consultant shall provide support and assistance to the Client in meeting the disclosure requirements, which at the minimum shall meet the Government of Bangladesh policy on public disclosure;
- The Consultant shall collect physical environmental sample from the project site and conduct necessary quality analysis of existing air, surface & ground water, noise etc to incorporate within EIA report;
- The Consultant shall take effective steps to obtain NOC from local and appropriate authority as applicable & Environmental Clearance for the project from DOE by conducting presentation on the EIA report and other necessary activities as required by DOE

7.0 EIA REPORT STRUCTURE

The EIA report will be prepared following the DOE guidelines and the international guidelines. However, to be adaptable with unique nature of LNG FSRU terminal activities, some modifications are required. The Table of Contents (attached herewith) illustrates the major sections of the report and outline of the contents under each section.

The image shows five handwritten signatures or initials in black ink, arranged horizontally. From left to right: the first is a cursive signature; the second is a simple checkmark; the third and fourth are initials, possibly 'JH' and 'K'; the fifth is a more complex cursive signature.

Government of the People's Republic of Bangladesh
Department of Environment
www.doc.gov.bd
Head Office, E-16 Agargaon
Dhaka-1207

Date: 03/08/2017

Memo No: 22.02.0000.018.72.014.17/382

Subject: Remedy from IEE and Approval of Terms of Reference (TOR) for EIA of the Proposed Offshore LNG Floating Storage and Re-gasification Unit (FSRU) moored at STL (Submerged Turret Loading) project at Maheshkhali, Cox's Bazar.

Ref: Your Application dated 17/07/2017.

With reference to your letter dated 17/07/2017 for the subject mentioned above, the Department of Environment hereby gives Remedy from IEE and Approval of Terms of Reference (TOR) for EIA of the Proposed Offshore LNG Floating Storage and Re-gasification Unit (FSRU) moored at STL (Submerged Turret Loading) project at Maheshkhali, Cox's Bazar subject to fulfilling the following terms and conditions:

- 1 The project authority shall submit a comprehensive Environmental Impact Assessment (EIA) report considering the overall activity of the said Project in accordance with the TOR and time schedule submitted to the Department of Environment (DOE);
- 2 The EIA shall incorporate the following components/items in addition to the issues mentioned in the proposed TOR for EIA:

I. Executive Summary

II. Introduction

- II.1. Background
- II.2. Purpose of the Study
- II.3. Need of the Project
- II.4. Importance of the Project
- II.5. Scope of EIA Study
- II.6. EIA Team

III. Legal and Legislative Framework, Regulations and Policy Considerations
Legislative, regulation and policy consideration (covering the potential legal, administrative, planning and policy framework within which the EIA will be prepared)

IV. Project Data Sheet

- IV.1. Project Proponent
- IV.2. Project location and area
- IV.3. Nature and Size of the Project
- IV.4. Project Concept
- IV.5. Project Components
- IV.6. Project Activities
- IV.7. Project schedule
- IV.8. Resources and utilities demand
- IV.9. Sources of Primary Fuels (Quality and Country of Origin)
- IV.10. Transportation of primary Fuel

V. Project Description

- V.1. Project Site
- V.2. Project Layout
- V.3. Land Requirement
- V.4. Fuel Requirement

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- IX.3.2 Impact on Natural Resources
- IX.3.3 Impact on Eco-systems
- IX.3.4 Impact on Ambient Air
- IX.3.5 Impact on Ambient Noise
- IX.3.6 Impact on Water Bodies
- IX.3.7 Impact on Soil
- IX.3.8 Impact on Workers Health, Sanitation and Safety
- IX.3.9 Impact on Key Point Installations & Others
- IX.3.10 Solid Waste Disposal
- IX.3.11 Social Impact due to industrial set up and harnessing of coal and other resources locally (if any)
- IX.3.12 Impact due to transportation of raw materials

IX.4 Operation Stage Impact

- IX.4.1 Impact on Natural Resource
- IX.4.2 Impact on Eco-systems
- IX.4.3 Impact on Ambient Air
- IX.4.4 Impact on endangered Species (e.g. Dolphin)
- IX.4.5 Impact on Ambient Noise
- IX.4.6 Impact on Water Bodies (both surface & ground)
- IX.4.7 Solid Waste Disposal
- IX.4.8 Soil and Agriculture
- IX.4.9 Impact on Ground Water
- IX.4.10 Ecology (Flora and Fauna)
- IX.4.11 Impact on Occupational Health
- IX.4.12 Impact on Public Health and Safety
- IX.4.13 Impact on Navigation
- IX.4.14 Social Impact
- IX.4.15 Impact on Tourism
- IX.4.16 Impact due to transportation of Raw Materials

X. Evaluation of Impacts

The impacts should be evaluated in terms of their local, regional and national importance. The impact should be assessed in terms of the magnitude, significance, frequency of the occurrence, duration and probability. The confidence level in the prediction must be stated. The judgment of significance of impacts can be based on one or more of the following, depending on the environmental factor being evaluated. These are :

- i. comparison with laws, regulation or accepted national or international standards
- ii. reference to pre-set criteria such as conservation or protected status of a site, feature or species
- iii. consistency with pre-set policy objectives
- iv. consultation and acceptability with the relevant decision makers, civil society, local community or the general public.

XI. Mitigation Of Impacts

Mitigation measures which may be of the following categories and coverages:

- i. changing project layout, transport routes, disposal routes or locations, timing or engineering design
- ii. introducing pollution controls, waste treatment, phased implementation and construction, engineering measures, monitoring, landscaping, social services or public education;
- iii. rehabilitation, compensation to restore, relocate or provision of concession for damage

XII. Environmental Management Plan

- XIV.3 Responsibility Matrix
- XIV.4 Budgets for Monitoring
- XIV.5 Reporting System and Format

XV. Work Plan

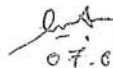
XVI. Public Consultation

Public Consultation both in Local and National Level should be carried out. The public participation process is critical in ensuring public review and input into the EIA process. Some of the authorities to be engaged include: Department of Environment, Forest Department, Water Development Board, BIWTA, Port Authority, Bangladesh Parjatan Corporation, Department of Fisheries, LGED, other national/local departments where deemed necessary, Local Administrations (DC, UNO, UP Chairman & Members), Local Communities, Non-Governmental Organizations, etc.

The project authority must provide a detailed Public Participation Plan, which shall include, but not be limited to the following: A timetable for communication, detailing who will be consulted and why; as a minimum, one public meeting during the impact assessment phase. The timing of these meetings would be decided upon in conjunction with relevant stakeholders, compile minutes of the meetings and send to all participants and organize appropriate feedback mechanisms for public comment.

XVIII. Conclusion & Recommendation

3. Without obtaining approval of EIA report by the Department of Environment, the project authority shall not be able to start the physical activity of the project and also not be able to open L/C in favor of importable machineries.
4. The proposed EIA study would not establish any claim, right in favour of the proponent for getting site clearance or environmental clearance.
5. Without obtaining Environmental Clearance, the project authority shall not be able to start the operation of the project.
6. The project authority shall submit the EIA report along with the filled-in application for Environmental Clearance in prescribed form, the feasibility study report, the applicable Environmental Clearance fee in a treasury chalan, the applicable VAT on clearance fee in a separate treasury chalan, the No Objection Certificate (NOC) from local authority, NOC from Forest Department (if it is required in case of cutting any forested plant, private or public), NOC in favor of Cutting/Dressing (if it is required) of Hill/Hillock from the concerned authority and NOC from other relevant agencies for operational activity etc. to the Cox's Bazar District Office of DOE at Cox's Bazar with a copy to the Head Office of DoE in Dhaka.
7. A soft copy of the image data as well as the maps to be generated from the image shall be submitted to DOE Head Office along with the EIA.


07.08.2017

(Syed Nazmul Ahsan)

Director (Environmental Clearance)

Phone # 02-8181673

Managing Director
Gas Transmission Company Ltd.
Plot - F-18/A, Shcr-E-Banglanagar Administrative Area
Agargaon, Dhaka-1207.

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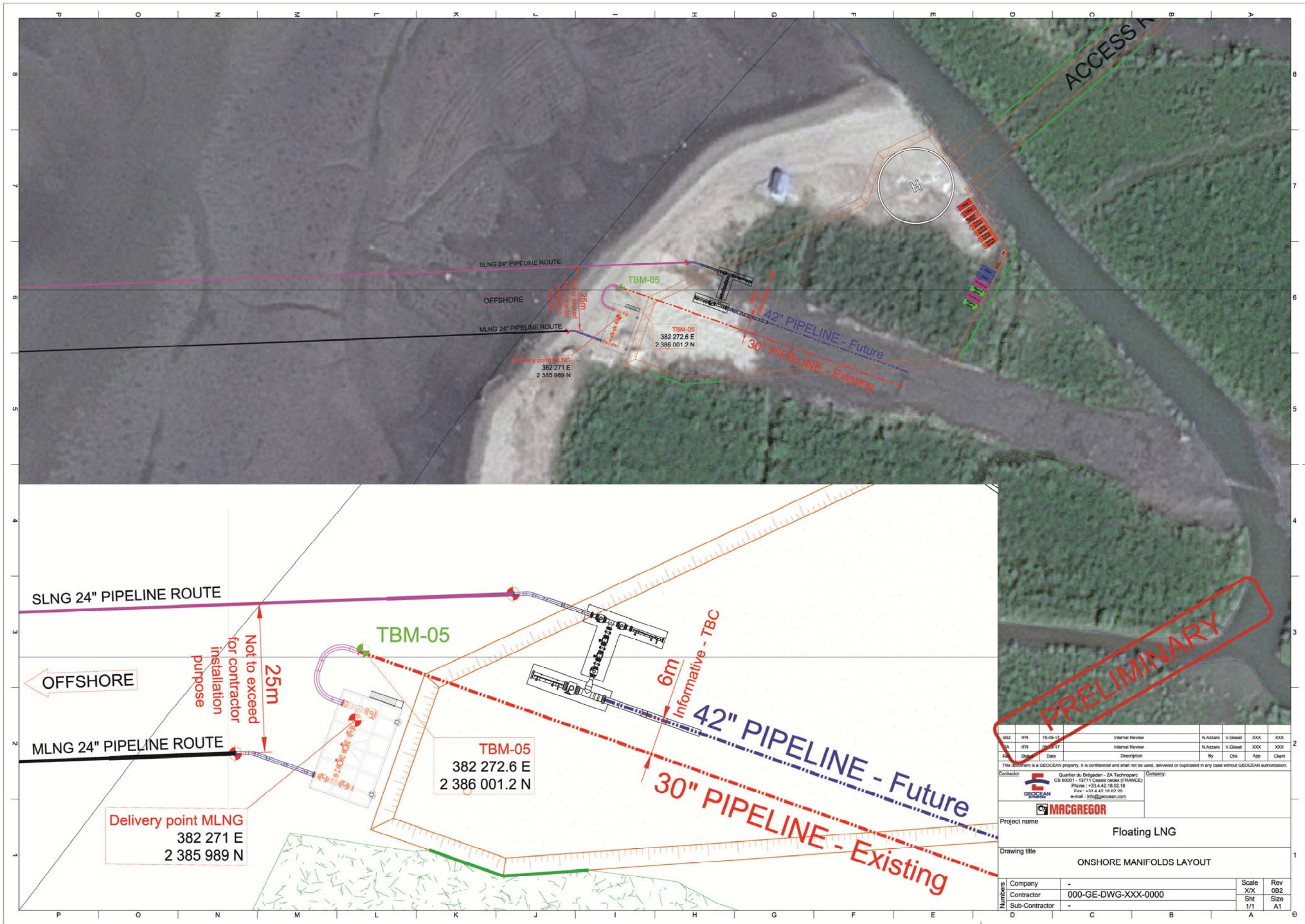
- 1) PS to the Secretary, Ministry of Environment and Forests, Bangladesh Secretariat, Dhaka.
- 2) Director, Department of Environment, Chittagong Regional Office, Chittagong.
- 3) Deputy Director/Officer In-charge, Department of Environment, Cox's Bazar District Office, Cox's Bazar.
- 4) Assistant Director,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





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Annexure-3 : Onshore manifolds (6m) Layout-EE &
SUMMIT



382	IFR	15-06-17	Internal Review	N.Azzara	V.Gisset	XXX	XXX
382	IFR	06-07-17	Internal Review	N.Azzara	V.Gisset	XXX	XXX
Rev	Stage	Date	Description	By	Chk	App	Client
This document is a GEOCEAN property. It is confidential and shall not be used, delivered or duplicated in any case without GEOCEAN authorization.							
Contractor: Quartier du Brigadan - ZA Technoparc CS 80001 - 13711 Cassis cedex (FRANCE) Phone: +33.4.42.18.02.18 Fax: +33.4.42.18.02.20 e-mail: info@geocan.com			Company:				
Project name				Floating LNG			
Drawing title				ONSHORE MANIFOLDS LAYOUT			
Numbers	Company	-	Scale	X/X	Rev	0B2	
	Contractor	000-GE-DWG-XXX-0000		Sht	1/1	A1	
	Sub-Contractor	-					

Annexure-4 : NoC from Local Authority and others



চট্টগ্রাম বন্দর কর্তৃপক্ষ

বন্দর, চট্টগ্রাম।

www.cpa.gov.bd

স্মারক নং ১৮.০৪.০০০০.৫০০.৩৩.১২০.১৭/৯৬

তারিখঃ ১৩-০১-২০১৮ইং

বিষয়ঃ কক্সবাজার জেলার মহেশখালীতে Summit LNG Terminal Co (Pvt) Ltd. কর্তৃক দাতব্যায়িতব্য ভাসমান এলএনজি টার্মিনাল (FSRU) স্থাপনের বিষয়ে অনাপত্তি প্রদান প্রসংগে।
সূত্রঃ নৌপত্র এর পত্র নং-নৌপত্র/চবশা/বন্দর-২/২০০৫(অংশ-৩)-২৪১ তারিখঃ ২০-০৬-২০১৭ইং।

উপর্যুক্ত বিষয়ে সূত্রোক্ত পত্রের প্রেক্ষিতে আদিষ্ট হয়ে জানানো যাচ্ছে যে, কক্সবাজার জেলার মহেশখালীতে ৫০০ এমএমসিএফসি দক্ষতাসম্পন্ন স্থায়ী ভাসমান এলএনজি টার্মিনাল (FSRU) স্থাপনের জন্য Summit LNG Terminal Co (Pvt) Ltd. এর স্থান CO-ordinate (N 21° 33'20.46", E 91° 48.58. 22") হতে ০.৬ নটিকেল মাইল পূর্বে এবং Exxcelerate Energy Bangladesh Limited (EEBL) কর্তৃক বস্ত্রবানানায়ীম ভাসমান এলএনজি টার্মিনাল হতে ১.৫ নটিকেল মাইল উত্তরে অবস্থিত। উক্ত FSRU স্থাপনার CO-ordinate টি বাণিজ্যিক জাহাজের স্বাভাবিক নেভিগেশন রুট ও এয়ারক্রাফট এভিয়ার বাইরে অবস্থিত এবং Summit ও EEBL উভয় FSRU হতে Subsea Pipeline সমূহ পরস্পর হতে ২৫ মিটার দূরত্ব বজায় রেখে Tie Point পর্যন্ত স্থাপন করা হবে। যেহেতু FSRU স্থান এবং FSRU হতে Tie Point পর্যন্ত স্থাপিত Subsea Pipeline মাতারবাড়ি এ্যাপ্রোচ এ সহস্রা স্ক্রিট করবে না বলে প্রতীয়মান হয়; সেহেতু Summit FSRU CO-ordinate (N 21° 33'20.46", E 91° 48.58. 22") এবং Pipeline স্থাপনে ওত্র কর্তৃপক্ষের অনাপত্তি নেই- ভাবে Notices to Mariners ইস্যু করার নিমিত্তে উল্লিখিত ভাসমান এলএনজি টার্মিনাল এবং পাইপ লাইন স্থাপন কার্যক্রম শুরু করার তারিখ চূড়ান্ত করে প্রদেহিত করাতে হবে।

(মোঃ হুমায়ুন কাদের)

সচিব

চট্টগ্রাম বন্দর কর্তৃপক্ষ

ফোন-২৫১০৮৯৯


প্রাপকঃ

সচিব

নৌ-পরিবহন মন্ত্রণালয়

বাংলাদেশ সচিবালয়, ঢাকা।

বিষয়বস্তুটির সংশ্লিষ্ট প্রতিবেদন



কুতুবজোম ইউনিয়ন পরিষদ

কুতুবজোম, থানাঃ মহেশখালী, জেলাঃ কক্সবাজার।

মোঃদারুজ্জামান হোসেন খোকন

চেয়ারম্যান

ফোন নং: ০১৭৩১৩৬ ৩৩১৭৩৩

ফ্যাক্স নং: ০১৭৩১৩৬ ৩৩১৭৩৩

তারিখ: ২৫/১০/১৭

তারিখ: ০৮-০৫-২০১৭

অনুস্থাপন/পরিবেশগত স্বাক্ষরকৃত অন্য স্থানীয় কর্তৃপক্ষ কর্তৃক এসে অর্থাপত্তি পত্রের রক

১. আবেদনকারীর নাম : সমিতি এলএনজি টার্মিনাল কোং (প্রাইভেট) লিমিটেড
২. পিতা/স্বামীর নাম : এমজোয়া মল্লিক
৩. আবেদনকারীর ঠিকানা : সমিতি সেটার, ১৮ কাওরান বাজার বা/এ, ঢাকা- ১২১৫।
৪. কারখানা/প্রকল্পের অবস্থানগত ঠিকানা : কক্সবাজার জেলা।
৫. কারখানা/প্রকল্পের তফসীল : -

জেলার নাম	থানার নাম	মৌজার নাম	খতিয়ান নং	মাফ নং	জমির বরণ	মৌজায় জমির বেটী পরিমাণ
কক্সবাজার	মহেশখালী					

সমিতি ৫০০ এমএমএসসিএফসি এলএনজি টার্মিনাল কুতুবজোম উপকূল হতে ৫/৬ কিলোমিটার সমুদ্রের ভিতরে

৬. কারখানা/প্রকল্পের উৎপাদিত/উৎপাদিতব্য পণ্যের নামঃ বিশেষ ধরনের Liquefied Natural Gas (LNG) পেট্রোলিয়াম আমদানী করে কোম্পানীর Floating Storage Re-gasification Unit (FSRU) এর মাধ্যমে পুনঃ গ্যাসীকরণের মাধ্যমে ৫০০ mmscid গ্যাস জাতীয় ধীরে সরবরাহ করা।

উপরোক্ত তথ্যাদি LNG FSRU Terminal Activities Projects- এর অর্থাপত্তি পর নিম্ন বর্ণিত শর্ত সাপেক্ষে প্রদান করা হলো।

শর্তাবলীঃ

১. কারখানা/প্রকল্প স্থাপন ও পরিচালনার ক্ষেত্রে পরিবেশ সংরক্ষণ আইন ও বিধি যথাযথভাবে অনুসরণ করতে হবে।
২. পরিবেশ অধিদপ্তর হতে বিধি দ্বারা নির্ধারিত পদ্ধতিতে স্বাক্ষর গ্রহণ করতে হবে।
৩. কর্মরত প্রকল্পের শেখাণ্ড স্থাপন ও নিয়ন্ত্রণ নিশ্চিত করতে হবে।
৪. উপযুক্ত অগ্নি নির্বাপক ব্যবস্থা রাখতে হবে এবং অগ্নিকাণ্ড কিংবা অন্য কোন দুর্ঘটনার সময় জরুরী নির্গমন ব্যবস্থা থাকতে হবে।
৫. বায়ু ও শব্দ দূষণ করা যাবে না।
৬. কারখানা/ প্রকল্প সূত্র তরল বর্জ্য অপরিশোধিত অবস্থায় বারিচ নির্গমন করা যাবে না।
৭. স্থানীয় নাগরিকদের স্বাভাবিক জীবন যাত্রার অসুবিধা হয় এমন কিছু স্থাপন করা যাবে না।

উপরোক্ত যে কোন শর্ত লঙ্ঘন করলে যথাযথকৃত কর্তৃপক্ষ কর্তৃক কারখানা/প্রকল্পের বিরুদ্ধে আইনানুগ ব্যবস্থা নেয়া যাবে।

তারিখঃ

স্থানীয় কর্তৃপক্ষের স্বাক্ষর ও সীল
(মোঃদারুজ্জামান হোসেন খোকন)
চেয়ারম্যান
কুতুবজোম ইউনিয়ন পরিষদ
মহেশখালী, কক্সবাজার।

অতি জরুরী
বিশেষ বাহক মারফত

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
বিদ্যুৎ, জ্বালানি ও খনিজ সম্পদ মন্ত্রণালয়
জ্বালানি ও খনিজ সম্পদ বিভাগ
উন্নয়ন-২ অধিশাখা
www.cmrd.gov.bd

নং-২৮.০০.০০০০.০১৬.১৪.০১৭.১৬(অংশ-২)- ৪২৫

১০ জ্যৈষ্ঠ ১৪২৪
তারিখ:-----
২৪ মে ২০১৭

বিষয়: "বিদ্যুৎ ও জ্বালানির দ্রুত সরবরাহ বৃদ্ধি (বিশেষ বিধান) আইন, ২০১০' এর আওতায় এলএনজি আমদানির জন্য কক্সবাজার জেলার মহেশখালীতে Summit Corporation Limited কর্তৃক দৈনিক ৫০০ এমএমসিএফডি ক্ষমতাসম্পন্ন Floating Storage and Re-gasification Unit (FSRU) স্থাপনের লক্ষ্যে অনুমোদিত Implementation Agreement (IA) এবং Implementation Agreement (IA) এর উপর মতামত প্রদান।

সূত্র: প্রতিরক্ষা মন্ত্রণালয়ের নং-২৩.০০.০০০০.১৯০.০১৩.১৩.১৬৮, তারিখ: ১৭-০৫-২০১৭।

উপর্যুক্ত বিষয়ে প্রতিরক্ষা মন্ত্রণালয় হতে প্রাপ্ত মতামত সম্বলিত সূত্রোক্ত পত্রের ছায়াছবি (সংযুক্তিসহ) অবগতি ও প্রয়োজনীয় ব্যবস্থা গ্রহণের জন্য নির্দেশক্রমে এতদসঙ্গে প্রেরণ করা হ'ল।

সংযুক্তি: বর্ণনামতে।

চেয়ারম্যান
পেট্রোবাংলা
কাওরান বাজার
ঢাকা।

আরপিজিসিএল ব্যবস্থাপনা পরিচালকের কার্যালয়	
মহাব্যবস্থাপক (সংরক্ষণ)	
মহাব্যবস্থাপক (অর্থ)	
মহাব্যবস্থাপক (প্রশাসন)	
মহাব্যবস্থাপক (পরিঃ ও ট্রান্সপ)	
মহাব্যবস্থাপক (সিএনজি)	
মহাব্যবস্থাপক (এলএনজি সেল)	
কোম্পানী সচিব	
উপ-মহাব্যবস্থাপক (নিরীক্ষা)	
সহ-ব্যবস্থাপক (সেবা)	

(জনেন্দ্র নাথ সরকার)
উপ-সচিব
ফোনঃ ৯৫৭৬৫৭১
ই-মেইলঃ szanendal1@yahoo.com

অনুলিপি:

- ১। ব্যবস্থাপনা পরিচালক, আরপিজিসিএল, বিলক্ষেত্র, ঢাকা।
- ২। সচিবের একান্ত সচিব, জ্বালানি ও খনিজ সম্পদ বিভাগ।

সংসদীয় প্রতীক নাম কোম্পানী পিঃ ব্যবস্থাপনা পরিচালকের কার্যালয়	
ক্রমিক	তারিখ
১	২০/০৫/১৭
২	২১/০৫/১৭

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
প্রতিরক্ষা মন্ত্রণালয়
গণভবন কমপ্লেক্স, শেরেবাংলা নগর, ঢাকা
www.mod.gov.bd

সচিব
বিদ্যুৎ, জ্বালানি ও খনিজ সম্পদ মন্ত্রণালয়
জ্বালানি ও খনিজ সম্পদ বিভাগ
সচিবের দপ্তর
অতিরিক্ত সচিব (উঃ/পরিঃ)
অতিরিক্ত সচিব (প্রঃ/অপঃ)
অতিরিক্ত সচিব (পত্রিকল্পনা)
অতিরিক্ত সচিব (উন্নয়ন)
যুগ্ম-সচিব (অপারেশন)
ভাষেীর নং: ৩৭২০
তারিখ: ১৪ মে ২০১৭
স্মারক ১৪২৪
১৪ মে ২০১৭

নম্বর ২৩.০০.০০০০.১৯০.৩১.০১৩.১৩.১১৬

বিষয়: "বিদ্যুৎ ও জ্বালানির দ্রুত সরবরাহ বৃদ্ধি (বিশেষ বিধান) আইন, ২০১০" এর আওতায় এমএমসিএফ আমদানীর জন্য কক্সবাজার জেলার মহেশখালিতে Summit Corporation Limited কর্তৃক দৈনিক ৫০০ এমএমসিএফ ক্ষমতাসম্পন্ন Floating Storage & Re-gasification Unit (FSRU) স্থাপনের লক্ষ্যে অনুস্বাক্ষরিত Terminal Use Agreement (TUA) ও Implementation Agreement (IA)-এর বিষয়ে মতামত প্রদান।

সূত্র: (ক) বিদ্যুৎ, জ্বালানি ও খনিজ সম্পদ মন্ত্রণালয়ের পত্র নম্বর ২৮.০০.০০০০.০১৬.১৪.০১৭.১৬(অংশ-১).১৮৩; তারিখ: ৯ মার্চ ২০১৭
(খ) প্রতিরক্ষা মন্ত্রণালয়ের পত্র নম্বর ২৩.০০.০০০০.১৯০.৩১.০১৩.১৩.১০৮; ২৩ মার্চ ২০১৭
(গ) সেনাদর জিএস শাখার পত্র নম্বর ২৩.০০.০১.৯০১.০২৩.০৩.২৬৭.০৩.১৩.০৪.১৭; তারিখ: ১৪ এপ্রিল ২০১৭

উপর্যুক্ত বিষয়ে 'সূত্রোক্ত গ' পত্রের মাধ্যমে সেনাসদর জানিয়েছে যে, Terminal Use Agreement (TUA) ও Implementation Agreement (IA)-এর অন্তর্গত নিরাপত্তা বা অন্য কোন বিষয়ে আপাতদৃষ্টিতে বাংলাদেশ সেনাবাহিনীর প্রত্যক্ষ সংশ্লিষ্টতা নাই। Summit Corporation Limited কর্তৃক দৈনিক ৫০০ এমএমসিএফ ক্ষমতাসম্পন্ন Floating Storage & Re-gasification Unit (FSRU) নিরাপত্তা ব্যবস্থা উক্ত স্থাপনার নিজস্ব কাঠামোর অধীনে প্রয়োজনীয় সংখ্যক নিরাপত্তাকর্মী ও আইন-শৃঙ্খলা রক্ষাকারী বাহিনীর সমন্বয়ে নিশ্চিত করা বাঞ্ছনীয়। তবে, রাষ্ট্রীয় স্বার্থ বিবেচনা সাপেক্ষে সরকার কর্তৃক বিষয়োক্ত স্থাপনার নিরাপত্তার বিধানের দায়িত্ব সেনাবাহিনীর উপর অর্পণ করা হলে নিম্নলিখিত বিষয়গুলি নিশ্চিত করার আবশ্যকীয়তা রয়েছে (কপি সংযুক্ত):

ক) স্থাপনাটি নিরাপত্তার সার্বিক দায়িত্ব সম্পূর্ণভাবে সেনাবাহিনীর অধীনে ন্যস্তকরণ। এক্ষেত্রে সেনাবাহিনীর সদস্যগণ কর্তৃক নিরাপত্তা সংক্রান্ত সকল দায়িত্ব সম্পন্ন করা হবে। স্থাপনাটির নিরাপত্তার বিষয়ে সম্পূর্ণ বিভিন্ন নিরাপত্তার প্রতিষ্ঠান/সংস্থা/আইন-শৃঙ্খলা রক্ষাকারী বাহিনীর আদেশ ও নিয়ন্ত্রণ ব্যবস্থা নিশ্চিতকরণে প্রয়োজনীয় আইনী বিষয়সমূহ (Legal Aspect) যথাযথভাবে বিবেচনা করতে হবে;

খ) Summit Corporation Limited কর্তৃক স্থাপনাটির নিরাপত্তা সংক্রান্ত ভৌত অবকাঠামো ও অন্যান্য নিরাপত্তা সহায়ক সরঞ্জামাদি সংযোজনের ব্যবস্থা গ্রহণ ও তা সম্পন্নকরণ। এক্ষেত্রে প্রয়োজন সাপেক্ষে সেনাবাহিনীর নিরাপত্তা বিশেষজ্ঞ কর্তৃক নিরাপত্তা সংক্রান্ত উপদেশ গ্রহণ করা যেতে পারে এবং

গ) স্থাপনাটিতে দায়িত্ব পালনরত সেনাসদস্যগণের জন্য প্রয়োজনীয় মানসম্পন্ন বাসস্থান ও অন্যান্য আনুষঙ্গিক সুবিধা নিশ্চিতকরণ।

২। এ অবস্থায়, সেনাসদরের পত্র অনুযায়ী প্রাপ্ত মতামতের ফটোকপি নির্দেশক্রমে প্রেরণ হলো।

সংযুক্তি: বর্ণনামতে:

অতিরিক্ত সচিব (উন্নয়ন)
ই.সি.সি. (ইউ-১) বিজ্ঞান/বিজ্ঞান-৩
বর্তমান কর্মতরতা
ভাষেীর নং:
তারিখ: ১৪ মে ২০১৭
অতিরিক্ত সচিব (উন্নয়ন)

ফাতেমা বেগম
যুগ্মসচিব
ফোন : ৯১১১৩১৬
modd19@ymail.com

সচিব
বিদ্যুৎ, জ্বালানি ও খনিজ সম্পদ মন্ত্রণালয়
জ্বালানি ও খনিজ সম্পদ বিভাগ
বাংলাদেশ সচিবালয়, ঢাকা

২৩

অতি জরুরী
বিশেষ বাহক মারফত

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
বিদ্যুৎ, জ্বালানি ও খনিজ সম্পদ মন্ত্রণালয়
জ্বালানি ও খনিজ সম্পদ বিভাগ
উন্নয়ন-২ অধিশাখা
www.emrd.gov.bd

নং-২৮.০০.০০০০.০১৬.১৪.০১৭.১৬(অংশ-২)- ৪৩০

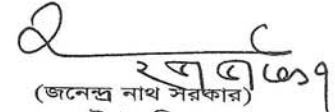
তারিখ: ১১ জ্যৈষ্ঠ ১৪২৪
২৫ মে ২০১৭

বিষয়: কক্সবাজার জেলার মহেশখালীতে Summit LNG Terminal Co. (Pvt.) Ltd. কর্তৃক বাস্তবায়িতব্য ভাসমান এলএনজি টার্মিনাল (FSRU) স্থাপনের বিষয়ে অনাপত্তি প্রদান।

উপর্যুক্ত বিষয়ে জানানো যাচ্ছে যে, কক্সবাজারের মহেশখালীতে ৫০০ এমএমসিএফডি ক্ষমতাসম্পন্ন দ্বিতীয় ভাসমান এলএনজি টার্মিনাল (FSRU) স্থাপনের জন্য Summit LNG Terminal Co. (Pvt.) Ltd.-এর সাথে গত ২০-০৪-২০১৭ তারিখে Terminal Use Agreement (TUA) ও Implementation Agreement (IA) স্বাক্ষরিত হয়েছে (কপি সংযুক্ত)। উক্ত চুক্তির আওতায় Summit LNG Terminal Co. (Pvt.) Ltd. কর্তৃক FSRU স্থাপনের Co-ordinate (N 21° 33' 4.8", E 91° 48' 24") নির্ধারণ করা হয়েছে। বর্ণিত Co-ordinate -এ FSRU স্থাপন, Site ও Shoreline এ প্রবেশাধিকার এবং Subsea Pipeline স্থাপনের জন্য Seabed ব্যবহার, Seawater ব্যবহার ও Dredging এর অনুমতি প্রয়োজন।

২। এমতাবস্থায়, বর্ণিত Co-ordinate (N 21° 33' 4.8", E 91° 48' 24")-এ FSRU স্থাপন, Site ও Shoreline এ প্রবেশাধিকার এবং Subsea Pipeline স্থাপনের জন্য Seabed ব্যবহার, Seawater ব্যবহার ও Dredging এর অনুমতি প্রদানের জন্য নির্দেশক্রমে অনুরোধ করা হ'ল।

সংযুক্তিঃ বর্ণনামতে।


(জেনেদ্র নাথ সরকার)
উপ-সচিব

ফোনঃ ৯৫৭৬৫৭১

ই-মেইলঃ szanendra11@yahoo.com

সচিব
নৌ-পরিবহন মন্ত্রণালয়
বাংলাদেশ সচিবালয়
ঢাকা।

অনুলিপিঃ

- ১। চেয়ারম্যান, পেট্রোবাংলা, কাওরান বাজার, ঢাকা।
- ২। ব্যবস্থাপনা পরিচালক, আরপিজিসিএল, খিলক্ষেত, ঢাকা।
- ৩। সচিবের একান্ত সচিব, জ্বালানি ও খনিজ সম্পদ বিভাগ।

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
নৌপরিবহন মন্ত্রণালয়
গভীর সমুদ্র বন্দর শাখা
(www.mos.gov.bd)

নং-নৌপম/চবশা/বন্দর-২/২০০৫(অংশ-৩)-২৪নং

তারিখঃ ২০-০৬-২০১৭


বিষয়ঃ কক্সবাজার জেলার মহেশখালীতে Summit LNG Terminal Co (Pvt) Ltd কর্তৃক বাস্তবায়িতব্য ভাসমান এলএনজি টার্মিনাল (FSRU) স্থাপনের বিষয়ে অনাপত্তি প্রদান সংক্রান্ত।

সূত্রঃ বিদ্যুৎ, জ্বালানী ও খনিজ সম্পদ বিভাগ হতে প্রাপ্ত পত্র সংখ্যা-২৮.০০.০০০০.০১৬.১৪.০১৭.১৬(অংশ-২)-৪৩০
তারিখঃ ২৫-০৫-২০১৭

উপর্যুক্ত বিষয় ও সূত্রোক্ত পত্রের পরিপ্রেক্ষিতে জানানো যাচ্ছে যে, কক্সবাজার মহেশখালীতে ৫০০ এমএমসিএফডি দক্ষতাসম্পন্ন দ্বিতীয় ভাসমান এলএনজি টার্মিনাল (FSRU) স্থাপনের জন্য Summit LNG Terminal Co (Pvt) Ltd এর সাথে গত ২০-০৪-২০১৭ তারিখে Terminal Use Agreement (TUA) Implementation Agreement (IA) স্বাক্ষরিত হয়েছে। চুক্তির আওতায় Summit LNG Terminal Co (Pvt) Ltd কর্তৃক FSRU স্থাপনের Co-ordinate(N 21 33 4.8, E 91 48 24)-এ নির্ধারণ করা হয়েছে।

০২। এমতাবস্থায়, কক্সবাজার জেলার মহেশখালীতে Summit LNG Terminal Co (Pvt) Ltd কর্তৃক বাস্তবায়িতব্য ভাসমান এলএনজি টার্মিনাল (FSRU) স্থাপনের লক্ষ্যে Co-ordinate স্থাপন, FSRU স্থাপন Site ও Shoreline এ প্রবেশাধিকার এবং Subsea Pipeline স্থাপনের নিমিত্ত Seabed ব্যবহার Seawater ব্যবহার ও Dredging এর বিষয়ে মতামত প্রদানের জন্য নির্দেশক্রমে অনুরোধ করা হলো।

সংযুক্তিঃ বর্ণনামতে।


(মোঃ আবদুস সাভার)
উপসচিব
ফোন: ৯৫১৫১৮৫।
email:ds.cpa@mos.gov.bd

বিতরণ(জ্যেষ্ঠতার ভিত্তিতে নয়):

- ১। চেয়ারম্যান, চট্টগ্রাম বন্দর কর্তৃপক্ষ, চট্টগ্রাম।
- ২। মহাপরিচালক, সমুদ্র পরিবহন অধিদপ্তর, মতিঝিল, ঢাকা।
- ৩। প্রধান নির্বাহী কর্মকর্তা, গভীর সমুদ্র বন্দর সেল, ১৪৫ নিউ বেইলী রোড, ঢাকা।

অনুলিপিঃ

- ১। সচিব, বিদ্যুৎ, জ্বালানী ও খনিজ সম্পদ বিভাগ, বাংলাদেশ সচিবালয়, ঢাকা।
- ২। সচিবের একান্ত সচিব, নৌপরিবহন মন্ত্রণালয়, ঢাকা।



গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
নৌ-পরিবহণ অধিদপ্তর
সিইএন্ডএসএস এর অধিশাখা
১৪১-১৪৩ মতিঝিল বা/এ (৮ম তল
ঢাকা-১০০০

ফোন : ৯৫১৩৩০৫
ফ্যাক্স : ৯৫৮৭৩০১
ই-মেইল : info@dos.gov.bd
ওয়েব সাইটঃ www.dos.gov.bd

নং-১৮.১৭.০০০০.০০২.১১.০১২.১৫- / ৪৬৬৩

তারিখ : ১৭/০৭/২০১৭ খ্রিঃ

সচিব,
নৌ পরিবহন মন্ত্রণালয়,
ঢাকা।

দৃঃ আঃ- জনাব মোঃ আবদুস সাত্তার, উপসচিব, গভীর সমুদ্র বন্দর শাখা

বিষয়ঃ কক্সবাজারের মহেশখালীতে Summit LNG Terminal Co (Pvt) Ltd. কর্তৃক বাস্তবায়িতব্য ভাসমান এলএনজি টার্মিনাল (FSRU) স্থাপনের বিষয়ে অনাপত্তি প্রদান সংক্রান্ত

সূত্রঃ নৌ পরিবহন মন্ত্রণালয়ের পত্র নং নৌপম/চবশা/বন্দর-২/২০০৫(অংশ-৩)-২৪৯
তারিখ ২০-০৬-২০১৭খ্রিঃ

উপর্যুক্ত বিষয়ে সূত্রোক্ত পত্রের বরাতে জানানো যাচ্ছে যে, কক্সবাজারের মহেশখালীতে Summit LNG Terminal Co (Pvt) Ltd. কর্তৃক ভাসমান এলএনজি টার্মিনাল (FSRU) স্থাপনের প্রস্তাবটি নৌ-পরিবহন অধিদপ্তর কর্তৃক নিরীক্ষা করা হয়েছে। দেশের আশু প্রয়োজনীয় জ্বালানী নিরাপত্তার বিষয়টি বিবেচনায় রেখে Summit LNG Terminal Co (Pvt) Ltd. এর ভাসমান এলএনজি টার্মিনাল স্থাপন এবং Site ও Shoreline এ প্রবেশাধিকার প্রদানে Subsea Pipeline seabed এর অনূন্য ১.৫ মিটার গভীরে স্থাপন করা হলে sea water ব্যবহার ও ড্রেজিং এর অনুমোদন দেয়া যেতে পারে। তবে স্থান নির্ধারণের ক্ষেত্রে সরকারের চলমান কোন প্রকল্পের/গভীর সমুদ্র বন্দরের সাথে সাংঘর্ষিক হবে কি-না সে মর্মে চট্টগ্রাম বন্দর কর্তৃপক্ষ এবং গভীর সমুদ্র বন্দর সেলের মতামত নেওয়া যেতে পারে।

কমডোর সৈয়দ আরিফুল ইসলাম, (ট্যাজ), এনডিসি, পিএসসি, বিএন
মহাপরিচালক

Annexure-5 : List of Flora and Fauna

List of fauna in Bangladesh covered under CITES appendices I and II

Class	Order	Family	Appendix I		Appendix II		English Name
			Genus	Species	Genus	Species	
MAMMALIA	PRIMATES	Cercopithecidae	Semnopithecus	entellus			Common Langur *
		"	Tracypithecus	pileatus			Capped Langur *
		Hylobatidae	Hylobates	boolock			Hoolock Gibbon *
	PHOLIDOTA	Mainidae			Mains spp		Pangolin *
	LAGOMORPHA	Leporidae	Caprolagus	bispidus			Hispid Hare
	RODENTIA	Sciuridae			Ratufa spp		Squirrel *
	CETACEA	Platanistidae	Platanista spp				River Dolphin *
		Delpbinidae	Sousa spp				Indo-Pacific humpback *
		Pbocoenidae	Neopbocaena	pbocaenoides			Fineless Porpoise *
		Balaenopteridae	Balaenoptera	muculus			Blue Whale
	CARNIVORA	Canidae			Canis	Anpus	Wolf
		"			Cuon	Alpinus	Dhole *
		Ursidae	Helardos	malayanus			Sun Bear
		"	Melursus	ursinus			Sloth Bear
		"	Ursus	tbibetanus			Black Bear
		Mustelidae	Lutra	lutra			Common Otter *
		"			Aonyx	cinerea	Small-Clawed Otter *
		"			Lutra	perspicillata	Smooth Coated Otter *
		Felidae	Pardofelis	marmorata			Golden Cat
		"	Prionailurus	bengalensis			Leopard Cat
		"	Neofelis	nebulosa			Clouded Leopard *
		"			Felis	cbaus	Jungle Cat *
		"			Felis	viverrinus	Fishing Cat *
		"	Pantbera	pardus e.w			Cheeta
		"	Panthera	tigris			Bengal Tiger
	PROBOSCIDEA	Elephantidae	Elephas	maximus			Asian Elephant *
	PERISSODACTYLA	Rhinocerotidae			Rhinoceros	Unicornis e.w	Asiatic One horned Rhinoceros
		"			Dedermocerus	sumatrensis e. w	Two horned Rhinoceros

P. e = Possibly Extinct, e. w = Extinct in Wild in Bangladesh

* = all asteric market species have been reported from eastern coastal region.

List of fauna in Bangladesh covered under CITES appendices I and II							
Class	Order	Family	Appendix I		Appendix II		English Name
			Genus	Species	Genus	Species	
	ARTIODACTYLA	Cervidae	Cervus	duvaucelii			Swamp Deer
		"	Axis	porcinus			Hog Deer
		Bovidae	Bos	gaurus			Gaur
		"	Nacmorbedus	sumatraensis			Goat Antelope *
AVES	PELECANIFORMES	Pelecanidae	Pelecanus	crispus			Dalmatian pelican
	CICONIFORMES	Ciconiidae	Ciconia	boyciana			Oriental strock
		Threskironithidae			Platalea	Leucordia	Spoon bill *
	ANSERIFORMES	Anatidae	Carina	scutulata			White winged duck
		"	Rbodonessa	caryopbyllacea p.e			Pick-headed duck
		"			Anas	formosa	Baikal Teal
		"			Sarkidiomis	melanotos	Comb Duck
	FALCONIFORMES	Cathartidae	Vultur	grypbus			Griffon Vulture
		Ccaipitridae	Aquila	beliaca			Imperial Eagle
		"	Haliaeetus	leucocephalus			Pallas's Sea-Eagle
		Falconidae	Falco	jugger			Falcon
		"	Falco	peregrinus			Peregrine Falcon *
		Phasianidae	Syrmaticus	bumiae			Humes Pheasantt
		"			Pavo	muticus p.e	Green Peafowl
		"			Polyplectreron	bicalaratum	Grey Peacock Pheasant
	GRUIFORMES	Gruidae			Grus	antigone	Surus Crane
		"			Antbropodies	uirgo	Demosile Crane
	CHARADIIFORMES	Scolopacidae	Tringa	guttifer			Nordman's Greenshank *
	CORACIIFORMES	Bucerotidae	Aceros	nipalensis			Fufous-necked Hombill
		"	Buceros	bicomis	Anthracoceros spp.		Great Hombill
	PASSERIFORMES	Pittidae			Pitta	nypba	Pitta
REPTILIA	TESTUDINATA	Emydidae	Batagur	baska			Batagur
		"	Geoclemys	bamiltoni			Spotted Pond Turtle
		"	Melanochelys	tricarinata	Testudinidae spp. *		Tricarinet Hill Turtle *

P. e = Possibly Extinct , e. W = Extinct in Wild in Bangladesh

List of fauna in Bangladesh covered under CITES appendices I and II							
Class	Order	Family	Appendix I		Appendix II		English Name
			Genus	Species	Genus	Species	
		Testudinidae			Indotestudo	elongata	Elongated Tortoise
		"			Manouria	emys	Anian Giant Tortoise
		Cheloniidae	Caretta	caretta			Loggerhead Turtle *
		"	Chelonia	mydass			Green Turtle *
		"	Eretmochelys	imbricata			Hawksbill Turtle *
REPTILIA	TESTUDINATA	Cheloniidae	Lepidochelys	olivacea			Olive Ridley Turtle *
		Dermochelyidae	Dermochelys	coriacea			Leatherback Turtle
		Trionycidae			Lissemys	punctata	Brahminy flap shell Turtle *
		"	Aspideretes	gangeticus			Indian Softshell Turtle
		"	Aspideretes	nigricans			Black Soft-shell Turtle
		"	Aspideretes	hurun			Indian Peacock Soft-shell Turtle
	CROCODYLIA	Crocodylidae	Crocodylus	palustris e.w			Mugger
		"	crocodylus	porosus			Estuarine Corcodile
		Gavialidae	Gavialis	gangeticus			Gharial
	SAURIA	Varanidae	Varanus	bengalensis			Black Monitor *
		"	Varanus	flavescens			Yellow Monitor
		"			Varanus	salvator	Water Monitor *
	SERPENTES	Boidae	Python	molurus			Indian Python *
		"			Pytbon	reticulatus	Reticulated Python
		"			Boa	constrictor	Sand Boa
		Colubridae			Ptyas	mucosus	Rat Snake *
					Elacbistodon	westermanni	Indian Egg-eating snake
		Elapidae			Naja	naJa	Indian cobra
		"			Opbiopbagus	bannab	King Cobra *
AMPHIBIA	ANURA	Ranidae			Rana	bexadactyla	Green Frog *
		"			Rana	tigerina	Indian Bull Frog *
ANNELIDA	HIRUDINOIDEA	Hirudinidae			Hirudo	medicinalis	Leech

P. e = Possibly Extinct, e. w = Extinct in Wild in Bangladesh

Wildlife of Eastern Coastal Region of Bangladesh, including the Hill forests species

No.	Scientific Name	Common Name
<i>MAMMALS</i>		
1	<i>Order-Insectivora</i> <i>Suncus murinus</i>	Grey Mask Shrew
2	<i>Order-Chiroptera</i> <i>Pteropus giganteus</i>	Flying Fox
3	<i>Rousenttus leschenaulii</i>	Fulvous Fruit Bat
4	<i>Cynopterus spinix</i>	Shortnosed Fruit Bat
5	<i>Rhinopome hardwickei</i>	Lesser Rat-tailed Bat
6	<i>Megaderma lyra</i>	False vampire
7	<i>Pipistrellus corromandra</i>	Pipistrelle
8	<i>Hesperoptenus tickelli</i>	Tickell's Bat
9	<i>Scotophilus temminki</i>	Lesser Yellow Bat
10	<i>Order-Primate</i> <i>Macaca mulatta</i> <i>Macaca fascicularis</i> <i>Hylobates hoolock</i> <i>Traccypithecus pileatus</i> <i>Macaca assamensis</i>	Rhesus Macaque Crabeating Macaque-Ex. Hoolock Gibbon Capped Langer Assamere macaque
11	<i>Order-Carnivora</i> <i>Canis aureus</i>	Jackal
12	<i>Vulpes bengalensis</i>	Bengal Fox
13	<i>Lutra perspicillata</i>	Smooth Indian Otter
14	<i>Aonyx cinerea</i>	Clawless Otter
15	<i>Viverra zibetha</i>	Large civet
16	<i>Viverricula indica</i>	Small Civet
17	<i>Paradoxurus harmaphroditus</i>	Palm Civet
18	<i>Herpestes auropunctatus</i>	Small Mongoose
19	<i>H. edwardsi</i>	Common Mongoose
20	<i>Panthera tigris</i>	Bengal Tiger-Ex
21	<i>Felis bengalensis</i>	Leopard Cat
22	<i>Felis viverrina</i>	Fishing Cat
23	<i>Felis chaus</i>	Jungle Cat
<i>Order-Artiodactyla</i>		
24.	<i>Muntiacus muntiac</i>	Barking Deer
25.	<i>Sus scrofa</i>	Wild Boar
<i>Order-Lagomorpha</i>		
26.	<i>Lepus nigricollis</i>	Rufoustailed hare
<i>Order-Rodentia</i>		
27.	<i>Funumbulus pennauti</i>	Fivestripped Palm Squirre
28.	<i>Bandicota bengalensis</i>	Lesser Bandicoot
29.	<i>B. indica</i>	Bandicoot Rat
30.	<i>Mus booduga</i>	Indian Porcupine
31.	<i>M. musculus</i>	House Mouse
32.	<i>Rattus rattus</i>	Common House Rat
33.	<i>Hystrix indica</i>	Indian Porcupine
<i>Order-Cetacea</i>		
34.	<i>Orcaella brevirostris</i>	Irrawaddy Dolphin
35.	<i>Neophocaena phocaenoides</i>	Little Porpoise
36.	<i>Stenella malayana</i>	Malay Dolphin
37.	<i>Platanista gangetica</i>	Ganges River Dolphin
38.	<i>Delphinus delphis</i>	Common Dolphin
39.	<i>Sotelea plumbea</i>	Plumbeous Dolphin
<i>Birds</i>		
<i>Family-Prodicipedidae</i>		
40.	<i>Podiceps ruficollis</i>	Little Grebe

No.	Scientific Name	Common Name
	<i>Family-Pelecanidae</i>	
41.	<i>Pelecanus philippensis</i>	Spotbilled Pelican
42.	<i>P. onocrotalus</i>	White/Rose Pelican
	<i>Family-Phalacrocoracidae</i>	
43.	<i>Phalacrocorax carbo</i>	Large Cormorant
44.	<i>P. niger</i>	Little cormorant
45.	<i>Anhinga rufa</i>	Darter
	<i>Family-Ardeidae</i>	
46.	<i>Ardea goliath</i>	Giant Heron
47.	<i>A. cinerea</i>	Grey Heron
48.	<i>A. purpurea</i>	Purple Heron
49.	<i>A. imperialis</i>	Great Whitebellied Heron
50.	<i>Butorides striatus</i>	Little Green Heron
51.	<i>Ardeoal grayii</i>	Pond Heron
52.	<i>Bubulcus ibis</i>	Cattle egret
53.	<i>Egretta alba</i>	Large egret
54.	<i>Egretta intermedia</i>	Intermediate Egret
55.	<i>Egretta garzetta</i>	Little egret
56.	<i>Nycticorax nycticorax</i>	Night Heron
57.	<i>ixobrychus cinnamomeus</i>	Chestnut Bittern
58.	<i>I. Sinensis</i>	Yellow Bittern
59.	<i>Dupetor jlavicollis</i>	Black Bittern
60.	<i>Gorsachius melanopterus</i>	Tiger Bittern
	<i>Family-Ciconiidae</i>	
61.	<i>Ibis leucocephalus</i>	Painted stork
62.	<i>Anastomus oscitans</i>	Openbill Stork
63.	<i>Ciconia ciconia</i>	White Stork
64.	<i>Ciconia episcopus</i>	Whitenecked stork-Ex
65.	<i>Leptoptilos javanicus</i>	Lesser Adjutant
66.	<i>L.dubius</i>	Greater Adjutant-Ex
67.	<i>Xenorhynchus oscitans</i>	Blacknecked Stork
	<i>Family-Threskiornithidae</i>	
68.	<i>Threkiornis melanocephala</i>	White Ibis
69.	<i>Platelea leu cordia</i>	Spoonbill
	<i>Family-Anatidae</i>	
70.	<i>Anser isdicus</i>	Barheaded Goose
71.	<i>anser</i>	Grey Lag Goose
72.	<i>Dendrocygna javanica</i>	Lesser Whistling Teal
73.	<i>Anas penelope</i>	Wigeon
74.	<i>A. crecca</i>	Common Teal
75.	<i>A. clypeata</i>	Shoveller
76.	<i>A. acuta</i>	Pintail
77.	<i>A. Platyrrhynchus</i>	Mallard
78.	<i>A. strepers</i>	Gadwall
79.	<i>A querquedula</i>	Gargancy
80.	<i>Aythya fuligula</i>	Tufted Duck
81.	<i>A nyroca</i>	Whiteeyed Pochard
82.	<i>A ferina</i>	Common Pochard
83.	<i>Tedorna ferruginea</i>	Brahminy Duck
84.	<i>Nettapus coromandelianus</i>	Cotton Teal
85.	<i>Netta rufina</i>	Redcrested Pochard
	<i>Family-Pandionidae</i>	
86.	<i>Pandion haliaetus</i>	Osprey
	<i>Family Accipitridae</i>	
87.		Blackwinged Kite

No.	Scientific Name	Common Name
	<i>Elanus caeruleus</i>	
88.	<i>Milvus migrans</i>	Pariah Kite
89.	<i>Haliaeetus</i>	Brahminy Kite
90.	<i>Accipter badius</i>	Shikra
91.	<i>A.nisus</i>	Sparrow Hawk
92.	<i>A. Triviagatus</i>	Crested Goshawk
93.	<i>Butaster teesa</i>	Whiteeyed Buzzard
94.	<i>Pernis ptilorhynchus</i>	Honey Buzzard
95.	<i>Spizaetus limnetus</i>	Changeable Hawk
96.	<i>Buteo rufinus</i>	Longlegged Buzzard
97.	<i>B.buteo</i>	Buzzard
98.	<i>Hiraaetus pennatus</i>	Booted Hawk Eagle
99.	<i>Aquila rapax</i>	Tawny Eagle
100.	<i>A. clanga</i>	Greater Spotted Eagle
101.	<i>A. pomarina</i>	Lesser Spotted Eagle
102.	<i>Ictinaetus malayensis</i>	Black Eagle-Ex
103.	<i>Haliaeetus leueogaster</i>	Whitebellied Sea Eagle
104.	<i>H. leucoryphus</i>	Pallas's Fishing Eagle
105.	<i>Ichthyophaga ichthaetus</i>	Greyheaded Fishing Eagle
106.	<i>Gyps bengalensis</i>	Whitebacked Vulture
107.	<i>Circus macrourus</i>	Pale Harrier
108.	<i>C. melanoleucos</i>	Pied harrier
109.	<i>C. aeruginosus</i>	Marsh harrier
110.	<i>Spilornis cheela</i>	Crested Serpent Eagle
111.	Family-Falconidae <i>Falco peregrinus</i>	Shaheen Falcon
112.	<i>F. chiquera</i>	Redheaded Merlin
113.	<i>F. serverus</i>	Oriental Hobby
114.	Family-Phasianidae <i>Francolinus Gularis</i>	Swamp Partridge
115.	<i>Gallus gallus</i>	Red Jungle Fowl
116.	Family-Rallidae <i>Rallus aquaticus</i>	Water Rail
117.	<i>Amourornis fuscus</i>	Ruddy Crake
118.	<i>A. phoenicurus</i>	Whitebreasted water Hen
119.	<i>Gallixrex cinerea</i>	Water Cock
120.	<i>Gallinula chloropus</i>	Moorhen
121.	<i>Fulica atra</i>	Coot
122.	<i>Porphyrio porphyrio</i>	Purple Moorhen
	Family-Jacanicidae	Bronzewinged Jacana
123.	<i>Metapidius indicus</i>	Pheasanttailed Jacana
124.	<i>Hydrophasianus chirurgus</i>	
	Family-Haematopodidae	
125.	<i>Haematopus ostralegus</i>	Oystercatcher
	Family-Charadriidae	
126.	<i>Vanellus cinereus</i>	Greyheaded Lapwing
127.	<i>V. spinosus</i>	Spurwinged Lapwing
128.	<i>V. indicus</i>	Redwattled Lapwing
129.	<i>V. malabaricus</i>	Yellowwattled Lapwing
130.	<i>Pluvialis spuatorola</i>	Grey Plover
131.	<i>P. dominica</i>	Eastern Golden Plover
132.	<i>Charadrius placidus</i>	Longbilled Ringed Plover
133.	<i>C. mongolus</i>	Mongolian Plover

No.	Scientific Name	Common Name
134.	<i>C. leschenaulti</i>	Large Sand Plover
135.	<i>C. alexandrinus</i>	Kentish Plover
136.	<i>C. dublus</i>	Little Ringed Plover
137.	<i>C. hiaticula</i>	Ringed Plover
138.	<i>Numeneus phaeopus</i>	Eastern Whimbrel
139.	<i>N. arpuata</i>	Curlew
140.	<i>Limosa limosa</i>	Blacktailed Godwit
141.	<i>Tringa glareola</i>	Wood Sandpiper
142.	<i>T. erythropus</i>	Spotted Redshank
143.	<i>T. terek</i>	Terek Sandpiper
144.	<i>T. totanus</i>	Common Redshank
145.	<i>T. nebularia</i>	Green Shank
146.	<i>T. ochropus</i>	Green Sandpiper
147.	<i>T. hypoleucos</i>	Common Sandpiper
148.	<i>T. stagnatilis</i>	Marsh Sandpiper
149.	<i>Limnodromus semipalmetus</i>	Asian Dowitcher
150.	<i>Arenaria inter pres</i>	Turnstone
151.	<i>Capella gallinago</i>	Fantail Snipe
152.	<i>Capella stenura</i>	Pintail Snipe
153.	<i>Calidris alpinus</i>	Dunlin
154.	<i>C. minutus</i>	Little Stint
155.	<i>C. temmincki</i>	Temminck's Stint
156.	<i>C. tenuirostris</i>	Eastern Knot
157.	<i>C. alfa</i>	Sanderling
158.	<i>C. testaceus</i>	Curlew
159.	<i>Philomachus pygnax</i>	Sandpiper
160.	<i>Stercoraxius parasiticus</i>	Parasitic Skua
	<i>Family-Rostratulidae</i>	
161.	<i>Rostratula bengalensis</i>	Painted Snipe
	<i>Family-Recurvirostridae</i>	
162.	<i>Haemantopus haemantopus</i>	Blackwinged Stilt
163.	<i>Recurvirostra avosetta</i>	Avocet
	<i>Family-Burhinidae</i>	
164.	<i>Burhinus oedicnemus</i>	Thick Knee
	<i>Family-Glareolidae</i>	
165.	<i>Glareola lactea</i>	Small Pratincl
	<i>Family-Laridae</i>	
166.	<i>Larus argentatus</i>	Herring Gull
167.	<i>L. burnnicephalus</i>	Brownheaded Gull
168.	<i>L. ridibundus</i>	Blackheaded Gull
169.	<i>L. ichthaetus</i>	Great Blackheaded Gull
170.	<i>Chlidonias hybrida</i>	Whiskered Tern
171.	<i>Gelochelidon nilotica</i>	Gullbilled Tern
172.	<i>Sterna bergii</i>	Largecrested Tern
173.	<i>S. acuticauda</i>	Whi tewinged Black Tern
174.	<i>S. bengalensis</i>	Lesser Crested Tern
175.	<i>S albifrons</i>	Little Tern
176.	<i>S. aurentia</i>	River Tern
177.	<i>S. hirundo</i>	Common Tern
178.	<i>Hydroprogne caspia</i>	Caspian Tern
179.	<i>Rynchops albicollis</i>	Indian Skimmer
	<i>Family-Columbidae</i>	

No.	Scientific Name	Common Name
180.	<i>Treron phoenicoptera</i>	Yellowfooted Green Pigeon
181.	<i>T curvirostra</i>	Thickbilled Green Pigeon
182.	<i>Tpompadora</i>	Greyfronted Green Pigeon
183.	<i>Ducula aenea</i>	Green Imperial Pigeon
184.	<i>Columba livia</i>	Blue Roack Pigeon
185.	<i>Streptopelia decaocto</i>	Ring Dove
186.	<i>S. tranquibarica</i>	Red Turtle Dove
187.	<i>S. chinensis</i>	Spotted Dove
188.	<i>S. orientalis</i>	Rufous Turtle Dove
189.	<i>Chaleophaps indica</i>	Emerald Dove
	<i>Family-Psittacidae</i>	
190.	<i>Psittacula krameri</i>	Roseringed Parkeet
191.	<i>P. finschi</i>	Slatheaded Parakeet
192.	<i>P. roseata</i>	Blossomheaded Parakeet
	<i>Family-Cuculidae</i>	
193.	<i>Clamator coromandus</i>	Red winged Crested Cuckoo
194.	<i>C. jacobinus</i>	Pied Crested Cuckoo
195.	<i>Cuculus micropterus</i>	Indian Cuckoo
196.	<i>C. varius</i>	Brain Fever Bird
197.	<i>Cacomantis merulinus</i>	Plaintive Cuckoo
198.	<i>C. sonneratii</i>	Banded Bay Cuckoo
199.	<i>C. merulinus querulus</i>	Banded Bay Cuckoo
200.	<i>Eudynamys scolopaeaa</i>	Koel
201.	<i>Rhopodytis tristis</i>	Large greenbilled Malkoha
202.	<i>Taccoca lescenaulti</i>	Sirkeer Cuckoo
203.	<i>Contropus sinensis</i>	Crow Pheasant
204.	<i>S. toulou</i>	Lesser Coucal
	<i>Family-Strigidae</i>	
205.	<i>Tyto alba</i>	Barn Owl
206.	<i>Otus scops</i>	Scops Owl
207.	<i>O. bakkamoena</i>	Collard Scops Owl
208.	<i>Bubo nipalensis</i>	Forest Eagle Owl
209.	<i>B. zeylonensis</i>	Brown Fish Owl
210.	<i>B. bubo</i>	Great Horn Owl
211.	<i>B. flavipes</i>	Tawny Fish Owl
212.	<i>Athena brama</i>	Spotted Owlet
213.	<i>Ninox xcutulata</i>	Brown Hawk Owl
214.	<i>Asio flammeus</i>	Shorteared Owl
	<i>Family-Caprimulgidae</i>	
215.	<i>Caprimulgus indicus</i>	Jungle Night jar
216.	<i>C. macrurus</i>	Longtailed Night jar
217.	<i>C. affinis</i>	Franklin's Night jar
	<i>Family-Apodidae</i>	
218.	<i>Cypsiurus parvus</i>	Palm Swift
	<i>Family-Alcedinidae</i>	
219.	<i>Ceryle rudis</i>	Lesser Pied Kingfisher
220.	<i>Alcedo atthis</i>	Common Kingfisher
221.	<i>Pelargopsis amauroptera</i>	Brownwinged Kingfisher
222.	<i>P. capensis</i>	Storkbilled Kingfisher
223.	<i>Halcyon coromandra</i>	Ruddy Kingfisher
224.	<i>H. smyrnensis</i>	Whitebreasted Kingfisher
225.	<i>H. pileata</i>	Blackcapped Kingfisher

No.	Scientific Name	Common Name
226.	<i>H. chloris</i>	Whitecollared Kingfisher
	<i>Family-Meropidae</i>	
227.	<i>Merops orientalis</i>	Green Bee-eater
	<i>Family-Coraciidae</i>	
228.	<i>Coracias bengalensis</i>	Roller
	<i>Family-Upupidae</i>	
229.	<i>Upupa epos</i>	Hoopoe
	<i>Family-Capitonidae</i>	
230.	<i>Megalaima lineata</i>	Lineated Barbet
231.	<i>M. haemacephala</i>	Coppersmith Barbet
	<i>Family-Picidae</i>	
232.	<i>Junx torquilla</i>	Wryneck
233.	<i>Picus flavinucha</i>	Large Yellow naped Woodpecker
234.	<i>P. myrmecophoneus</i>	Little Scaly bellied Green Woodpecker
235.	<i>Dinophum benghalense</i>	Lesser Goldenbacked Woodpecker
236.	<i>Picoides macie</i>	Fulvousbreasted Pied Woodpecker
237.	<i>P. mahrattensis</i>	Yellow fronted Pied Woodpecker
238.	<i>P. nanus</i>	Pigmy Woodpecker
239.	<i>Chrysocaptus lucidus</i>	Larger Goldenbacked Woodpecker
240.	<i>Micropternus brachyurus</i>	Rufous Woodpecker
	<i>Family-Alaudidae</i>	
241.	<i>Mirafra assamica</i>	Asian Bush Lark
242.	<i>Alauda gulgula</i>	Eastern Skylark
	<i>Family-Hirundinidae</i>	
243.	<i>Riparia poludicola</i>	Plain Sand Martin
244.	<i>Hirundo rustica</i>	Common Swallow
245.	<i>H. daurica</i>	Redrumped/Striated swallow
246.	<i>H. smithi</i>	Wire/Longtailed Swallow
247.	<i>Delichon nipalensis</i>	House Martin
	<i>Family-Laniidae</i>	
248.	<i>Lanius vittatus</i>	Baybacked shrike
249.	<i>L. schach</i>	Blackheaded shrike
250.	<i>L. cristatus</i>	Brown Shrike
	<i>Family-Oriolidae</i>	
251.	<i>Oriolus xanthornus</i>	Blackheaded oriole
	<i>Family-Dicruridae</i>	
252.	<i>Dicrurus adsimilis</i>	Black Drongo
253.	<i>D. leucophaeus</i>	Ashy Drongo
254.	<i>D. aeneus</i>	Bronzed Drongo
255.	<i>D. hotentotus</i>	Hairy Crested Drongo
256.	<i>D. paradiseus</i>	Greater Racket tailed Drongo
	<i>Family-Artamidae</i>	
257.	<i>Artamus fuscus</i>	Ashy Swallow Drongo
	<i>Family-Sturnidae</i>	
258.	<i>Aplonis panayensis</i>	Glassy Starling
259.	<i>Sturnus malabaricus</i>	Greyheaded Straling
260.	<i>S. vulgaricus</i>	Starling
261.	<i>S. contra</i>	Pied Myna
262.	<i>Acrodortheres tristis</i>	Common Myna
263.	<i>A. fuscus</i>	Jungle Myna
264.	<i>A. ginginianus</i>	Bank Myna
	<i>Family-Corvidae</i>	

No.	Scientific Name	Common Name
265.	<i>Dendrocitta vagabunda</i>	Rufous Tree-Pie
266.	<i>Corvus splendens</i>	House Crow
267.	<i>C. macrorhynchos</i>	Jungle Crow
	<i>Family-Campephagidae</i>	
268.	<i>Tephrodornis pondicerianus</i>	Common Wood shrike
269.	<i>Coracina melaschistos</i>	Small Grey Cuckoo Shrike
270.	<i>C. novaehollandiae</i>	Large Cuckoo Shrike
271.	<i>S. melanopectera</i>	Blackheaded Cuckoo Shrike
272.	<i>Pericrocotus cinnamomeus</i>	Small Minivet
273.	<i>P. flammeus</i>	Scarlet Minivet
274.	<i>P. erythropylus</i>	White Bellied Minivet
	<i>Family-Irenidae</i>	
275.	<i>Aegithina tiphia</i>	Common Iora
276.	<i>Chloropsis</i>	Goldfronted Chloropsis
277.	<i>C. cochinchinensis</i>	Bluewinged Chloropsis
278.	<i>C. hardwickii</i>	Orangebellied Chloropsis
	<i>Family-Phcnonotidae</i>	
279.	<i>Pycnonotus jocosus</i>	Redwhiskered Bulbul
280.	<i>P. cafer</i>	Redvented Bulbul
281.	<i>P. melanicterus</i>	Blackheaded Yellow Bulbul
	<i>Family-Muscicapidae</i>	
282.	<i>Trichastoma aabotti</i>	Abbot's Babbler
283.	<i>Pellorneum palustre</i>	Marsh Spotter Babbler
284.	<i>P. ruficeps</i>	Spotted Babbler
285.	<i>Turtoides striatus</i>	Jungle Babbler
286.	<i>Aleipe poioicphela</i>	Quaker Babbler
287.	<i>Muscicapa parva</i>	Redbreasted Flycatcher
288.	<i>M. rubeculoides</i>	Bluethroated Flycatcher
289.	<i>M. thalassina</i>	Verditer Flycatcher
290.	<i>Rhipidura albicollis</i>	Blacknaped Flycatcher
291.	<i>Culicicoapa ceylonensis</i>	Greyheaded Flycatcher
292.	<i>Monarcha azurea</i>	Blacknaped Flycatcher
293.	<i>Cisticola juncidis</i>	Streaked Fantail Warbler
294.	<i>C. axillis</i>	Fantail Warbler
295.	<i>Prinia hodgsoni</i>	Franklin Wren Warbler
296.	<i>P. subflava</i>	Plain Longtail Warbler
297.	<i>P. socialis</i>	Ashy Wren Warbler
298.	<i>Orthotomus sutoris</i>	Tailor Bird
299.	<i>Acrocephalus agricola</i>	Paddy Field Warbler
300.	<i>A. orientalis</i>	Eastern Great Reed Warbler
301.	<i>A. stentorius</i>	Great Reed Warbler
302.	<i>A. dumetorum</i>	Blyth's Reed Warbler
303.	<i>Terpsiphona paradisi</i>	Paradise Flycatcher
304.	<i>Bradypterus luteiventris</i>	Brown Bush Warbler
305.	<i>Phylloscopus affinis</i>	Tickl's Leaf Warbler
306.	<i>P. fuscatus</i>	Dusky Leaf Warbler
307.	<i>Erithacus svecicus</i>	Bluethroat
308.	<i>Copsychus saularis</i>	Magpie Robin
309.	<i>C. S. erimelas</i>	Magpie Robin
310.	<i>Phoenicurus ochruros</i>	Black redstart
311.	<i>Suxicola caprata</i>	Pied Bush Chat
312.	<i>S. torquata</i>	Stone Chat

No.	Scientific Name	Common Name
313.	<i>Suxicoloides fulicata</i>	Robin
314.	<i>Monticola solitarius</i>	Blue Rock Thrush
315.	<i>Zoothera citrin a</i>	Orangeheaded Thrush
316.	<i>Turdus ruficollis</i>	Redthroated Thrush
317.	<i>Pachycephala cinerea</i>	Mangrove Whistler
318.	<i>P. grisola</i>	Mangrove Whistler
	<i>Family-Paridae</i>	
319.	<i>Parus major</i>	Grey Tit
	<i>Family-Sittidae</i>	
320.	<i>Sitta castanea</i>	Chestnutbellied Nuthatch
321.	<i>S. frontalis</i>	Velvetfronted Nuthatch
	<i>Family-Motacillidae</i>	
322.	<i>Anthus novaeseelandiae</i>	Paddyfield Pipit
323.	<i>A. hodgsoni</i>	Indian Tree Pipit
324.	<i>Motacilla flava</i>	Yellow Wagtail
325.	<i>M. citreola</i>	Yellowheaded Wagtail
326.	<i>M. alba</i>	Pied Wagtail
327.	<i>M. madaraspatensis</i>	Large Pied Wagtail
328.	<i>M. cinerea</i>	Grey Wagtail
	<i>Family _ Dicaeidae</i>	
329.	<i>Dicaeum crythrorhynchos</i>	Tiekell's Flowerpecker
330.	<i>D. cruentatum</i>	Searletbaeked Flowerpecker
331.	<i>D. agile</i>	Thiekbilled Flowerpecker
332.	<i>D. trigonostigma</i>	Orangebellied Flowerpecker
	<i>Family-Certhiidae</i>	
333.	<i>Certhia himalayana</i>	Tree Creeper
	<i>Family-Nectariniidae</i>	
334.	<i>Nectarinea zeylonica</i>	Purplerumped Sun bird
335.	<i>N. asiatica</i>	Purple Sunbird
	<i>Family-Zosteropidae</i>	
336.	<i>Xosterops palpebrosa</i>	White-eye
	<i>Family-Ploceidae</i>	
337.	<i>Passer domesticus</i>	House Sparrow
338.	<i>Ploceus rutilans</i>	Common Tree Sparrow
339.	<i>P. philippinus</i>	Baya
340.	<i>Pm manyar</i>	Streaked Weaver Bird
341.	<i>Lonchura malabarica</i>	Whitethroated Munia
342.	<i>L. striata</i>	Whitebaeked Munia
343.	<i>L. punctulal</i>	Spotted Munia
	<i>Family-Fringilidae</i>	
344.	<i>Melophus lathami</i>	Crested Bunting
	<i>Reptiles</i>	
	<i>Turtles and Tortoises</i>	
345.	<i>Kachuga tecta</i>	Roofed Turtle
346.	<i>Melanchelys tricarinata</i>	Threekeeled Land Tortoise
347.	<i>Morenia petersi</i>	Yellow Turtle
348.	<i>Lissemys punctata</i>	Spotted FlapShell
349.	<i>Pelochelys bibroni</i>	Bibron's SoftShell
350.	<i>Chitra indica</i>	Asiatic SoftShell
351.	<i>Geoclemys hamiltoni</i>	Black Pond Turtle
352.	<i>Trionyx gangeticus</i>	Ganges SoftShell
353.	<i>T. hurum</i>	Peacock SoftShell

No.	Scientific Name	Common Name
354.	<i>Chelonia mydas</i>	Green Turtle
355.	<i>Caretta caretta</i>	Loggerhead Turtle
356.	<i>Lepidochelys olivacea</i>	Olive Ridley Turtle
357.	<i>Eretmochelys imbricata</i>	Hawksbill Turtle
	<i>Lizards and Skinks</i>	
358.	<i>Hamidactylus brooki</i>	House Lizard
359.	<i>H. jlaviviridis</i>	Common House Lizard
360.	<i>H. frenatees</i>	Mouse Gecko
361.	<i>Gecko gecko</i>	Wall Lizard
362.	<i>Caloes versicolor</i>	Garden Lizard
363.	<i>Mabuya carinata</i>	Common Skink
364.	<i>Varanus bengalensis</i>	Bengal/Grey Lizard
365.	<i>V. salvator</i>	Water Monitor Lizard
	<i>Snakes</i>	
366.	<i>Typhlina porrectus</i>	Slender Worm Snake
367.	<i>T bramina</i>	Common/Brahminy Worm Snake
368.	<i>Python molorus</i>	Rock Python
369.	<i>Eryx conlous</i>	Common Sand Boa
370.	<i>Lycodon aulicus</i>	Common Wolf Snake
371.	<i>Amphiesma stolata</i>	Stripped Keelback
372.	<i>Xenochrophis piscator</i>	Checkered Keelback
373.	<i>X cerasogaster</i>	Darkbellied Marsh Snake
374.	<i>Atretium schistosuri</i>	Olive Keelback
375.	<i>Acrochordus granulatus</i>	File/Wart Snake
376.	<i>Ptyas mucosus</i>	Rat Snake
377.	<i>Dendrelaphis tristis</i>	Common Bronzeback Tree Snake
378.	<i>Ahaetulla nasutus</i>	Common Vine Snake
379.	<i>Enhydris enhydris</i>	Common Smooth Water Snake
380.	<i>Cerberus rhynchops</i>	Dogfaced Water Snake
381.	<i>Gerardia prevostiana</i>	Glossy Marsh Snake
382.	<i>Fordonia leucobalia</i>	Whitebellied Mangrove Snake
383.	<i>Praesecutata viparina</i>	Sea Snake
384.	<i>Bungarus cceruleus</i>	Common Krait
385.	<i>Bungarusfasciatus</i>	Banded Krait
386.	<i>Naja naja</i>	Monocellate Bengal Cobra
387.	<i>Ophiop/zagus hannah</i>	King Cobra
388.	<i>Enhydrina sehistosa</i>	Hooknosed Sea Snake
389.	<i>Hydrophis nigrocinctus</i>	Blackheaded Sea Snake
390.	<i>Hydrophis obscurus</i>	Estuarine Sea Snake
391.	<i>H. caeruleascens</i>	Malacca sea Snake
392.	<i>Microcephalophis gracilis</i>	Common Narrowheaded Sea Snake
393.	<i>M. cantons</i>	Cantor's narrowheaded Sea Snake
394.	<i>Trimeresurus ervihurus</i>	Spot tailed Pit Viper
	<i>Crocodilian</i>	
395.	<i>Crocoth Ius porosus</i>	Estuarine Crocodile — Ex
	<i>Amphibia</i>	
	<i>Faznily — Bufonidae</i>	
396.	<i>Bufo melanostictus</i>	Common Toad
	<i>Pam — Microhylidae</i>	
	<i>Microhyla ornata</i>	Ornate Microhylid
	<i>Family — Ranidae</i>	
397.	<i>Rana hexadactvla</i>	Green Frog

No.	Scientific Name	Common Name
398.	<i>Rana cyanophlictis</i>	Skipper Frog
399.	<i>Rana tigexina</i>	Bull Frog
400.	<i>Rana limnocharis</i>	Cricket From
401.	<i>Rana tytilery</i>	Titlers frog
	Family — <i>Klacophoridae</i>	
402.	<i>Rhacophorus maculatus</i>	Tree Frog

Source: FRMP, 1997 and NCS-IP-1997

List of Plants of Study Area

TREES

Botanical Name	Local Name
<i>Albizia procera</i>	Korai
<i>Antidesma ghaesembilla</i>	Khudijam
<i>Anisoptera scaphula</i>	Boilam
<i>Aphanamixis polystachya</i>	Pithraj
<i>Artocarpus chaplasha</i>	Chapalish
<i>Bombax insiginis</i>	Banshimul
<i>Bursera serrata</i>	
<i>Callicarpa arborea</i>	Barmala
<i>Cassia fistula</i>	Sonalu
<i>Chickrassia vellutina</i>	Chikrass
<i>Ardisia solanacea</i>	B anj am
<i>Dehaasia kurzii</i>	Madan mostok
<i>Dipterocarpus turbinatus</i>	Guardian
<i>Elaeocarpus robustus</i>	Jalpai
<i>Ficus hispida</i>	Dumur
<i>Ficus sp.</i>	
<i>Glochidion multiloculare</i>	Paniaturi
<i>Glycosmis arborea</i>	Datmajan
<i>Macrange peltata</i>	Bura
<i>Maesa indica</i>	
<i>Phyllanthus reticulatus</i>	Sheori
<i>Pterospermum acerifolium</i>	Moos
<i>Pterospermum semisaggitatum</i>	Laona assar
<i>Quercus spicata</i>	
<i>Microcos paniculata</i>	Assar
<i>Syzygium cumini</i>	Kalo jam
<i>Trema orientalis</i>	Jiban
<i>Trevesia palmata</i>	
<i>Zizyphus oenoplea</i>	Banboroi
<i>Ricinus communis</i>	Verenda
<i>Swintonia jloribanda</i>	Civit
<i>Achyranthus aspera</i>	Apang
<i>Adenostemma lavenia</i>	
<i>Alpinia nigra</i>	Tara
<i>Amaranthus spinosus</i>	Kantanotey
<i>Amaranthus viridis</i>	Notey
<i>Begonia sp.</i>	
<i>Borreria erecta</i>	
<i>Borreria articularis</i>	
<i>Centella asiatica</i>	Thankuni
<i>Centranthera hispida</i>	
<i>Cleome viscosa</i>	Haldey hurhury
<i>Colocassia sp.</i>	Kachu
<i>Commelina difJusa</i>	

Botanical Name	Local Name
<i>Commelina erecta</i>	
<i>Corchorus sp.</i>	
<i>Croton bonplandianus</i>	Boncrotton
<i>Curculigo recurva</i>	Bidripata
<i>Cyanotis cristata</i>	
<i>Erechites</i>	
<i>Etlintera loroglossa</i>	
<i>Hedyotis scandens</i>	
<i>hedychium thyrcefiorum</i>	
<i>Lepidagathis incurva</i>	
<i>Leucas sp.</i>	Shetoron
<i>Lindernia ciliata</i>	
<i>Lindernia indica</i>	
<i>Ludwigia hyssopifolia</i>	
<i>Mimosa pudica</i>	Lazzabati
<i>Murdannia nudiflora</i>	
<i>Musa ornata</i>	Ramkola
<i>Ocimum canum</i>	
<i>Hedyotis corymbosa</i>	
<i>Ophiorrhiza mangus</i>	
<i>Osbeckia chinensis</i>	
<i>Peperomia pellucida</i>	
<i>Phrynium pubenrva</i>	
<i>Polygonum hydropiper</i>	Panimorich
<i>Ruellia tuberosa</i>	
<i>Scoparia dulsis</i>	Ban dhaney
<i>Stachytarpheta indica</i>	
<i>Torenia asiatica</i>	
<i>Spilanthes culva</i>	
<i>Vernonia cicerea</i>	
<i>Cassia sophera</i>	Kalakusunda
<i>Cassia tora</i>	Chakunda
<i>Centranthera hispida</i>	Shomraj
<i>Clerodendrum nutans</i>	Malibong
<i>Clerodendrum viscosum</i>	
<i>Crotalaria pallida</i>	Jhanjhani
<i>Desmodium alatum</i>	
<i>Desmodium gyrans</i>	Gorachand
<i>Crotalaria ferruginea</i>	
<i>Glycosmis sp.</i>	
<i>Glochidion sp.</i>	
<i>Hyptis suaveolens</i>	Tokma
<i>Lantana camara var. aculeata</i>	Guagandha
<i>Ocimum basilicum var. purpurescens</i>	
<i>Leea crispa</i>	Kukura
<i>melastoma malabathricum</i>	Phutki
<i>Mussaenda corymbosa</i>	Shilchauri

Botanical Name	Local Name
<i>Premna esculanta</i>	Lalna
<i>Osbeckia sp.</i>	
<i>Rhynchoetechum ellipticum var. hookerii</i>	
<i>Solanum torvum</i>	Phuti begun
<i>Sarchochalamys pulcherrima</i>	Murichia
<i>Sida acuta</i>	Kureta
<i>Sida cordata</i>	Pithberal
<i>Sesbania sp.</i>	
<i>Triumfetta rhomboidea</i>	Banokra
<i>Tephrosia purpurea</i>	Bannil
<i>Uria hamosa</i>	
<i>Urena lobata</i>	Banokra
<i>Urena lobata subsp. sinuala</i>	Kunjira
<i>Pavetta sp.</i>	
<i>Zanthoxylum rhetsa</i>	
<i>Calotropis gigantea</i>	Akanda
<i>Eupatorium odorata</i>	Assam lata
<i>Agryrea argentea</i>	
<i>Derris trifoliata</i>	
<i>Dioscorea bellophylla</i>	Alulata
<i>Dioscorea bulbifera</i>	
<i>Dioscorea oppositifolia</i>	
<i>Dioscorea pentaphylla</i>	
<i>Dioscorea wallichii</i>	
<i>Vitis pentagona</i>	
<i>Dioscorea sp.</i>	
<i>Ipomoea pes-caprae</i>	
<i>Mikania cordata</i>	
<i>Momordica dioica</i>	
<i>Mucuna pruriens</i>	Shimlata
<i>Passiflora foetida</i>	
<i>Passiflora sp.</i>	
<i>Smilax glabra</i>	Kumari lata
<i>Smilax zeylanica</i>	Kumari lata
<i>Trichosanthes sp.</i>	
<i>Thunbergia grandiflora</i>	Banslata
<i>Vitis repens</i>	

Source: FRMP, 1997

Common occurring and commercially important Pelagic and Demersal fin fishes and shell fishes of Marine Environment

Sl. No.	Family	Species (Scientific name)	English name	Local Name
1.	Aridae	<i>Arius sp.</i>	Cat fish	Kata machh
2.	Bagridae	<i>Mystus gulio</i>	Bagrid Cat fish	Nuna Tengua/guilla*
3.	Centropomidae	<i>Latescalcarifer</i>	Giant sea perch/cock-up	Bhetki/Koral machh
4.	Cynogobionidae	<i>Cynoglossus linguatoides</i>	Cynoglossus bilineatus	Kukurjib
5.	Cynogobionidae	<i>Cynoglossus bilineatus</i>	Fourline tongue sole	Kukurjib
6.	Drepanidae	<i>Drepane longimana</i>	Sickle fish	Paun Machh
7.	Ephippidae	<i>Ephippus orbis</i>	Spade fish	Hatir Kasn
8.	Gerridae	<i>Gerres filamentosus</i>	Whip fin mojarra / Silver-biddies	DomMachh
9.	Gerridae	<i>Pentaprion longimanus</i>	Long fin mojarra / Silver-biddies	Jagiri
10.	Harpadontidae	<i>Harpadon nehereus</i>	Bombay duck	Loitha machh*
11.	Lactariidae	<i>Lactarius lactarus</i>	False Trevally	Sadha machh
12.	Lutjanidae	<i>Lutianus johni</i>	Tohn's/Red snapper	Ranga Choukya
13.	"	<i>Lutianus sanguineus</i>	Blood Snapper	Ranga Choukya
14.	"	<i>Lutianus malabaricus</i>	Malabar red snapper	Ranja Choukya
15.	Leiognathidae	<i>Leiogenathus brevirostris</i>	Shortnosed pond fish	Taka Chanda*
16.	Menidae	<i>Menemaculata</i>	Moon fish	Chan Chanda *
17.	Mullidae	<i>Upeneus sulphureus</i>	Goat fish	Sonali bata*
18.	Mugilidae	<i>Liza tade</i>	Tade grey mullet	Gool bata*
19.	"	<i>Liza subviridis</i>	Green back grey mullet	Panda
20.	Mugilidae	<i>Valamergil speigleri</i>	Speigler's grey mullet	Fhena Khaiya
21.	Mugilidae	<i>Mugil aphalus</i>	Flathead grey mullet	Khorul bata*
22.	Nemipteridae	<i>Nemipterus japonicus</i>	Japanese thread fin bream	Rupban
23.	Pangariidae	<i>Pangasius pangasius</i>	<u>Fatty Catfish</u>	-----
24.	Pomadasyidae	<i>Pomadasys hasta</i>	Lined Silver grunter	Datina*
25.	Pomadasyidae	<i>Pomadasys maculatus</i>	Blotched grunter	Gutidatina
26.	Polynemidae	<i>Polynemus indicus</i>	Indian Salman	Lakhua*
27.	Polynemidae	<i>Polynemus paradiscus</i>	Paradise thread fin	Tapsi*
28.	Polynemidae	<i>Eleutheronema tetradactylum</i>	Four finger thread fin	Thailla
29.	Platycephalidae	<i>Platycephalus indicus</i>	Flat-head fish	Murbaila
30.	Priacanthidae	<i>Priacanthus tavenus</i>	Purple-Spotted big-eye	Pari machh
31.	Psettodidae	<i>Psettodes erumei</i>	Indian halibut	Samudra Sarboti
32.	Rachycentridae	<i>Rachycentron canadum</i>	Cobia	Raja Gajar
33.	Synodontidae	<i>Sausida tumbil</i>	Greater Lizard fish	Achila
34.	Sillaginidae	<i>Sillago domina</i>	Lady fish	Tolar dandi
35.	Sciaenidae	<i>Otolithoides pama</i>	Pama Croaker	Lambu
36.	Sciaenidae	<i>Otolithes maculatus</i>	Croaker	Gotipoa
37.	"	<i>Otolithes cuvieri</i>	Lesser tiger footed croaker	Poa
38.	"	<i>Protonibea diacanthus</i>	Spotted Croaker	Kalapoa
39.	"	<i>Lohnius argentatus</i>	Silver Pennah Croaker	Lalpoa
40.	Sparidae	<i>Argyrops spinifer</i>	Long spine Sea bream	Lal datina
41.	Sphyracridae	<i>Sphyrna forsteri</i>	Forster's barracuda	Dharkuta
42.	Signinidae	<i>Siganus javus</i>	Streaked spinefoot	-----
43.	Stromateidae	<i>Pampus chinensis</i>	Chinese pomfret	Rup Chanda**

Sl. No.	Family	Species (Scientific name)	English name	Local Name
44.	"	<i>Pompus argentcus</i>	Silver pomfret	Foli Chanda**
45.	Trichuridae	<i>Leptuvacanthus Sabala</i>	HairtaiVRibbon fish	Chhuri Machh
46.	Theraponidae	<i>Therapar jarbua</i>	Therapon perch	Barguni
47.	Engraulidae	<i>setipinna taty</i>	Hair fin anchovy	Teilla phasa
48.	"	<i>Thryssa mystax</i>	Moustached thryssa	Phasa*
49.	"	<i>Coilia dussumiersi</i>	Ponited tail ancovy	Olua
50.	Clupeidae	<i>Escualosa thoracata</i>	White Sardine	Hichiri Machh*
51.	"	<i>Ilisha filigera</i>	Big eye Dish	Choukya*
52.	Clupidae	<i>Hilsa ilisha</i>	Hilsa Shad	Ilish / Hilsa * *
53.	"	<i>Sardinella fimbriata</i>	Fringe-Scale Sardine	Takhia
54.	Chirocentridae	<i>Chrocentrus dorab</i>	Walf heming	Karatichela
55.	Carangidae	<i>Parastromateus niger</i>	Black Pomfret	Hail Chanda * *
56.	"	<i>Scomberoides Commersonianus</i>	Talang Queen fish	Chapa Kori
57.	"	<i>Selar boops</i>	Oxeye Scad	Moori / Salar
58.	"	<i>Megalaspis Cordvla</i>	hardtali Scad	Kauwa
59.	"	<i>Carangoides malabaridus</i>	Malabar Cavalla	Malabar Mori
60.	"	<i>Alepesd;eddaba</i>	Djeddaba Crevalle	Moori
61.	"	<i>Seriolina nigrotasciate</i>	Black-banded trevally	-----
62.	Scombridae	<i>Euthynnus affinis</i>	Eastern little tuna	Born mattiya*
63.	"	<i>Sards Orienthlis</i>	Striped bonito	Bony mattya**
64.	"	<i>Thunnus Obesus</i>	Big-eye tuna	Born mattya**
65.	Scornbridae	<i>A uxix rochei</i>	Bullet tuna	Born Maittya*
66.	"	<i>Scomberomorus guttatus</i>	Indopacific King Mackeul	MittyaiSurarnari*
67.	"	<i>Scomberomonus Commerson</i>	Narrow barrid Spanish rnakereel	Surma Machh*
68.	"	<i>Rastvelliger Kanagurta</i>	Indian Mackerel	Charnpa*
69.	Carcharhinidae	<i>Scoliodon Sorrakowah</i>	Dog fish	Thatte Hangar ^
70.	"	<i>Scoliodons Walbeehmii</i>	Milk Shank	Karnot/Hangor ^
71.	Dasyatidae	<i>Himantura Uarnak</i>	Sting ray	Haush
72.	Rhynihobatidae	<i>Rhychobatus d;eddensis</i>	Skate	Pitarnbui
73.	Rhinobatidae	<i>Rhinobaton grasulatus</i>	Skate	Pitarnbui
74.	Sphyrpicidae	<i>Sphyrna Bochii</i>	Hammir headed shenk	Haturi Hangor ^

* Commercially important species

** Most commercially important species

^Consumed by the tribal people. Some times the fins and other parts of the body of these Sharks are exported for preparing various foods such as soup.

**Freshwater and Brackishwater Shrimp
Family = PALAEMONIDAE**

1. *Macrobrachium rosenbergii* (De Man)
2. *Macrobrachium malcolmsonii* (H. Milne Edward)
3. *Macrobrachium villosimanus* Tiwari
4. *Macrobrachium birmaniscus* (Schenkel)
5. *Macrobractium rude* (Heller)
6. *Macrobrachium dyanus* (Henderson)
7. *Macrobrachium dolichodactylus* (Hilgendorf)
8. *Macrobrachium mirabilie* Kemp
9. *Macrobractium Iaalarei* (H. Mine Edwards)
10. *Macrobractium idella* Heller
11. *Macrobractium kempii* (Tiwari)
12. *Macrobrachium lancesteri* De Man
13. *Macrobrachium superbum* De Man
14. *Macrobrachium palaemonoides* De Man
15. *Leander (Expalaemon) styliferus* (H. Milne Edwards)
16. *Palaemon (Nematopalaemon) tenuipes* (Henderson)
17. *Palaemon (Exopalaemon) modestus* Heller
18. *Palaemon (N) kamajuliensis* Khan, Fincham & Mahmood
19. *Palaemon (Palaender) serrifer* Stimpson
20. *Palaemon (Palaender) sommelinkii* (De Man)
21. *Lealidrites celebensis* (De Man)
22. *Leptocarpus potamiscus* (Kemp)
23. *Leptocarpus fluminicola* (Kemp)
- 24.

**Brackish water and Marine Shrimp
Family = ALPHEIDAE**

25. *Alphaeus euphorosynae* De Man
26. *Alphaeus trimiziae* Kazmi

Family = PENAEIDAE

27. *Penaeus monodon* Fabricius
28. *Penaeus semisulctus* De man
29. *Penaeus indicus* H. Milne Edwards
30. *Penaeus japonicus* Bate
31. *Penaeus merguensis* De Man
32. *Penaeus penicillatus* Alcock
33. *Penaeus orientalis* Kishinouye
34. *Penaeus canaliculatus* Oliver
35. *Metapenaeus monoceros* (Fabricius)
34. *Metapenaeus brevicornis* H. Milne Edwards
35. *Metapenaeus spinulatus* (Kubo)
36. *Metapenaeus stridulans* (Alcock)
37. *Metapenaeus lysianassa* (De Man)
38. *Matapenaeus affinis* (H. Milne Edwards)
39. *Parapenaeopsis sculptilis* (Heller)
40. *Parapenaeopsis hardwickii* (Miers)
41. *Parapenaeopsis coromandalica* (Alcock)
42. *Parapenaeopsis uncta* (Alcock)
43. *Parapenaeopsis cornuitamaxxillipide* Alcock
44. *Parapenaeopsis stylifera* (H. Milne Edwards)

45. ***Silencer subauda*** Kubo
46. ***Solenocara melautho*** De Man
47. ***Solenocera indica*** Nataraj
48. ***Solenocera haxtil*** Wood Mason
49. ***Trachypenaeus curvirostris*** (Stimp son)
50. ***Metapenaeopsis andamanesis*** Wood Mason

Marine Shrimp

Family = PANDALIDAE

51. ***Plesionika martia*** H. Milne Edwards
52. ***Heterocarpus gibbosus*** Bata
53. ***Heterocarpus woodmasoni*** Alcock
54. ***Hippolysmata (Hippolysmata) vittala*** Kemp
55. ***Latreustes mucronatus*** Stimpson
56. ***Acetes indicus*** H. Milne Edwards
57. ***Acetes erythraeus*** Nobili
58. ***Acetes japonicus*** Kishinouye

Commercially Important Marine & Coastal Shrimps

59. ***Penaeus monodon***
60. ***Penaeus indicus***
61. ***Metapenacus mmocerous***
62. ***Metapenalus dobsoni***
63. ***Meta penaeus brevicornis***

Source: 1. Chingri: Bangladesher Chingri Utpadon O Chash, Shahdat Ali, August, 1992, Page: 21-24
2. Bangladesh Fisheries Development Corporation.

Annexure-6 : Remedy from IEE and Approval of ToR for
EIA from DoE

Government of the People's Republic of Bangladesh
Department of Environment
www.doe.gov.bd
Head Office, E-16 Agargaon
Dhaka-1207

ST/2017-02
54

Memo No: 22.02.0000.018.72.014.17/332

Date: 03/08/2017

Subject: Remedy from IEE and Approval of Terms of Reference (TOR) for EIA of the Proposed Offshore LNG Floating Storage and Re-gasification Unit (FSRU) moored at STL (Submerged Turret Loading) project at Maheshkhali, Cox's Bazar.

Ref: Your Application dated 17/07/2017.

With reference to your letter dated 17/07/2017 for the subject mentioned above, the Department of Environment hereby gives Remedy from IEE and Approval of Terms of Reference (TOR) for EIA of the Proposed Offshore LNG Floating Storage and Re-gasification Unit (FSRU) moored at STL (Submerged Turret Loading) project at Maheshkhali, Cox's Bazar subject to fulfilling the following terms and conditions:

1 The project authority shall submit a comprehensive Environmental Impact Assessment (EIA) report considering the overall activity of the said Project in accordance with the TOR and time schedule submitted to the Department of Environment (DOE).

2 The EIA shall incorporate the following components/items in addition to the issues mentioned in the proposed TOR for EIA:

I. Executive Summary

II. Introduction

- II.1. Background
- II.2. Purpose of the Study
- II.3. Need of the Project
- II.4. Importance of the Project
- II.5. Scope of EIA Study
- II.6. EIA Team

III. Legal and Legislative Framework, Regulations and Policy Considerations
Legislative, regulation and policy consideration (covering the potential legal, administrative, planning and policy framework within which the EIA will be prepared)

IV. Project Data Sheet

- IV.1. Project Proponent
- IV.2. Project location and area
- IV.3. Nature and Size of the Project
- IV.4. Project Concept
- IV.5. Project Components
- IV.6. Project Activities
- IV.7. Project schedule
- IV.8. Resources and utilities demand
- IV.9. Sources of Primary Fuels (Quality and Country of Origin)
- IV.10. Transportation of primary Fuel

V. Project Description

- V.1. Project Site
- V.2. Project Layout
- V.3. Land Requirement
- V.4. Fuel Requirement

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- V.5. Water Requirement
 - V.6. Technology Selection and Process Description
 - V.7. Description of Major Systems
 - V.8. Material Balance
 - V.9. Pollution Mitigation Measures (Units & Devices)
 - VI. **Analysis of Suitability for Different Alternatives** (this analysis shall be performed, among other approaches, in a GIS based Spatial Decision Support System (SDSS) presenting the suitability of different options for both the interventions)
 - VII. **Detail description of the land cover/land use** (with all the existing resource classes along with area coverages shall be shown in the respective maps derived from updated image of proper spatial and spectral resolution. Basic information (name of satellite, date and time of acquisition with atmospheric condition, spatial resolution, color composite etc.) of the image data to be used for making landuse/landcover maps shall be mentioned)
 - VIII. **Description of Environment**
 - VIII.1 Study Area (10 Km. radius), Period, Component and methodology (Seasonal Variation should be covered)
 - VIII.2 Water availability
 - VIII.3 Hydrogeology
 - VIII.4 Meteorology
 - VIII.5 Ambient Air Quality
 - VIII.6 Ambient Noise Quality
 - VIII.7 Surface & Ground Water Quality
 - VIII.8 Aquatic Monitoring
 - VIII.9 Soil Quality
 - VIII.10 Ecology
 - VIII.10.1 Forests
 - VIII.10.2 Flora
 - VIII.10.3 Fauna
 - VIII.11 Demography Profile and Occupational Pattern
 - VIII.12 Land use and Cropping Pattern
 - VIII.13 Socio-economic Scenario
 - VIII.14 Distance to urban and rural communities (proximity to sensitive receptors)
 - VIII.15 Distance to existing infrastructure such as roads, ports, rail, etc.
 - VIII.16 Current and surrounding land use and associated communities
 - IX. **Environmental Impacts**
 - IX.1 Identification of Impact
 - IX.2 **Pre-Construction and Development Stage Impact**
 - IX.2.1 Impact on the sites from where material would be collected
 - IX.2.2 Impact on Landform
 - IX.2.3 Impact on Natural Resources
 - IX.2.4 Impact on Eco-systems
 - IX.2.5 Impact on Ambient Air
 - IX.2.6 Impact on Ambient Noise
 - IX.2.7 Impact on Water Bodies
 - IX.2.8 Impact on Soil
 - IX.2.9 Impact on Workers Health, Sanitation and Safety
 - IX.2.10 Impact on Key Point Installations & Others
 - IX.2.11 Solid Waste Disposal
 - IX.2.12 Impact due to transportation of raw materials
 - IX.3 **Construction Stage Impact**
 - IX.3.1 Impact on Landform

UN

- IX.3.2 Impact on Natural Resources
- IX.3.3 Impact on Eco-systems
- IX.3.4 Impact on Ambient Air
- IX.3.5 Impact on Ambient Noise
- IX.3.6 Impact on Water Bodies
- IX.3.7 Impact on Soil
- IX.3.8 Impact on Workers Health, Sanitation and Safety
- IX.3.9 Impact on Key Point Installations & Others
- IX.3.10 Solid Waste Disposal
- IX.3.11 Social Impact due to industrial set up and harnessing of coal and other resources locally (if any)
- IX.3.12 Impact due to transportation of raw materials

IX.4 Operation Stage Impact

- IX.4.1 Impact on Natural Resource
- IX.4.2 Impact on Eco-systems
- IX.4.3 Impact on Ambient Air
- IX.4.4 Impact on endangered Species (e.g. Dolphin)
- IX.4.5 Impact on Ambient Noise
- IX.4.6 Impact on Water Bodies (both surface & ground)
- IX.4.7 Solid Waste Disposal
- IX.4.8 Soil and Agriculture
- IX.4.9 Impact on Ground Water
- IX.4.10 Ecology (Flora and Fauna)
- IX.4.11 Impact on Occupational Health
- IX.4.12 Impact on Public Health and Safety
- IX.4.13 Impact on Navigation
- IX.4.14 Social Impact
- IX.4.15 Impact on Tourism
- IX.4.16 Impact due to transportation of Raw Materials

X. Evaluation of Impacts

The impacts should be evaluated in terms of their local, regional and national importance. The impact should be assessed in terms of the magnitude, significance, frequency of the occurrence, duration and probability. The confidence level in the prediction must be stated. The judgment of significance of impacts can be based on one or more of the following, depending on the environmental factor being evaluated. These are :

- i. comparison with laws, regulation or accepted national or international standards
- ii. reference to pre-set criteria such as conservation or protected status of a site, feature or species
- iii. consistency with pre-set policy objectives
- iv. consultation and acceptability with the relevant decision makers, civil society, local community or the general public.

XI. Mitigation Of Impacts

Mitigation measures which may be of the following categories and coverages:

- i. changing project layout, transport routes, disposal routes or locations, timing or engineering design
- ii. introducing pollution controls, waste treatment, phased implementation and construction, engineering measures, monitoring, landscaping, social services or public education;
- iii. rehabilitation, compensation to restore, relocate or provision of concession for damage

XII. Environmental Management Plan

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[Signature]



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- XII.1 EMP during Preparation Phase
 - XII.1.1 Land Development
 - XII.1.2 Location and Sources of Soil and Other Material for Development
 - XII.1.3 Transport of Soil and Other Material
 - XII.1.4 Method and Equipment for Collection of Soil and Other Material
 - XII.1.5 Closing of Sites of Sources of Soil and Other Material
- XII.2 EMP during Construction Phase
 - XII.2.1 Site Preparation
 - XII.2.2 Infrastructure Services
 - XII.2.3 Construction Equipment
 - XII.2.4 Safety Measures
- XII.3 EMP during Operation Phase
 - XII.3.1 Air Pollution Management
 - XII.3.1.1 transportation, handling and storage of raw materials and products
 - XII.3.1.2 Operation Stage
 - XII.3.2 Waste Water Management
 - XII.3.3 Noise Management
 - XII.3.4 Solid Waste Management
 - XII.3.6 Safety and Occupational Health
- XII.4 Greenbelt Development
- XII.5 Rain Water Harvesting Plan
- XII.6 Rehabilitation and Resettlement Plan
- XII.7 Thermal pollution management
- XII.8 Budget for EMP
- XII.9 Contingency Plans

The project authority shall:

- a) Provide a conceptual contingency plan that considers environmental effects associated with operational upset conditions such as serious malfunctions or accidents;
- b) Describe the flexibility built into the plant design and layout to accommodate future modifications required by any change in emission standards, limits and guidelines.

XIII. Risk Assessment

- XIII.1 Consequence Analysis
- XIII.2 Emergency Response Plan
- XIII.3 Risk Mitigation Measures

XIV. Environment Monitoring Plan (for all project phases)

- XIV.1 Monitoring Plan
 - XIV.1.1 Ambient Air Monitoring
 - XIV.1.2 Meteorological Monitoring
 - XIV.1.3 Equipment and Ambient Noise
 - XIV.1.4 Surface Water & Waste Water Monitoring
 - XIV.1.5 Ground Water Monitoring
 - XIV.1.6 Solid Waste Monitoring
 - XIV.1.7 Flora and Fauna Monitoring
 - XIV.1.8 Workers Health and Safety Monitoring
 - XIV.1.9 Community Health Monitoring
 - XIV.1.10 Monitoring of DMP
 - XIV.1.11 Monitoring of CSR Activities

XIV.2 EMP Organizational Setup

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- XIV.3 Responsibility Matrix
- XIV.4 Budgets for Monitoring
- XIV.5 Reporting System and Format

XV. **Work Plan**

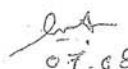
XVI. **Public Consultation**

Public Consultation both in Local and National Level should be carried out. The public participation process is critical in ensuring public review and input into the EIA process. Some of the authorities to be engaged include: Department of Environment, Forest Department, Water Development Board, BIWTA, Port Authority, Bangladesh Parjatan Corporation, Department of Fisheries, LGED, other national/local departments where deemed necessary, Local Administrations (DC, UNO, UP Chairman & Members), Local Communities, Non-Governmental Organizations, etc.

The project authority must provide a detailed Public Participation Plan, which shall include, but not be limited to the following: A timetable for communication, detailing who will be consulted and why; as a minimum, one public meeting during the impact assessment phase. The timing of these meetings would be decided upon in conjunction with relevant stakeholders; compile minutes of the meetings and send to all participants and organize appropriate feedback mechanisms for public comment.

XVIII. **Conclusion & Recommendation**

3. Without obtaining approval of EIA report by the Department of Environment, the project authority shall not be able to start the physical activity of the project and also not be able to open L/C in favor of importable machineries.
 4. The proposed EIA study would not establish any claim, right in favour of the proponent for getting site clearance or environmental clearance.
 5. Without obtaining Environmental Clearance, the project authority shall not be able to start the operation of the project.
 6. The project authority shall submit the EIA report along with the filled-in application for Environmental Clearance in prescribed form, the feasibility study report, the applicable Environmental Clearance fee in a treasury chalan, the applicable VAT on clearance fee in a separate treasury chalan, the No Objection Certificate (NOC) from local authority, NOC from Forest Department (if it is required in case of cutting any forested plant, private or public), NOC in favor of Cutting/Dressing (if it is required) of Hill/Hillock from the concerned authority and NOC from other relevant agencies for operational activity etc. to the Cox's Bazar District Office of DOE at Cox's Bazar with a copy to the Head Office of DoE in Dhaka.
- A soft copy of the image data as well as the maps to be generated from the image shall be submitted to DOE Head Office along with the EIA.


07.08.2017
(Syed Nazmul Ahsan)
Director (Environmental Clearance)
Phone # 02-8181673

Managing Director
Gas Transmission Company Ltd.
Plot - F-18/A, Sher-E-Banglanagar Administrative Area
Dhaka, Dhaka-1207.

Copy Forwarded to :

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

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

Chapter 1 INTRODUCTION

(This Chapter of the report shall provide background information and scope of this EIA study as captioned below):

- 1.1 Background
- 1.2 Brief description of the assessment
- 1.3 Purpose of the Project
- 1.4 Scope of the Present Study
- 1.5 Methodology
- 1.6 EIA Team
- 1.7 Limitation, if any
- 1.8 Acknowledgement

Chapter 2 LEGISLATIVE, REGULATORY AND POLICY CONSIDERATIONS

This chapter shall include description and requirements of the pertinent policies, legal and regulatory framework, standards and guidelines, administrative, planning, international treaties and conventions related to protection of ecosystems.

- 2.1 Introduction
- 2.2 Legal and Regulatory Framework
- 2.3 Relevant National Policies and Legislation.
- 2.4 Environmental Requirements for the Project
- 2.5 Reference to pre-set criteria such as Protected Areas, sites of Bangladesh.
- 2.6 Environmental Quality Standards
- 2.7 International Treaties and Conventions
- 2.8 Compliance with International Guidelines and Standards
- 2.9 Compliance with DOE EIA Guidelines

Chapter 3 PROJECT DESCRIPTION

This chapter will provide a full description of the project incorporating the actual location; general layout, activity flow diagram, start up of operation; schedule of staffing and support facilities and services. This shall be accomplished under the following subheadings.

- 3.1 General
 - 3.1.1 Background Information
 - 3.1.2 Project overview
- 3.2 Project Location
- 3.3 Proposed offshore FSRU operation
 - 3.3.1 FSRU is permanent
 - 3.3.2 FSRU is moored at STL (Submerged Turret Loading)
 - 3.3.3 LNG Ship to Ship (STS) transfer across the jetty, through conventional unloading arms and connecting pipe work
 - 3.3.4 LNG is vaporized aboard the FSRU using either seawater or steam from the ship's boiler as the heat source
 - 3.3.5 Vaporized LNG from the FSRU is transferred to shore through high Pressure (HP) gas arms and a gas pipeline
- 3.4 Routine operational discharge
 - 3.4.1 After cooling vaporizer by sea water then discharge

- 3.4.2 Drainage discharges
- 3.4.3 Sewage discharges
- 3.4.4 Atmospheric emissions
- 3.4.5 Wastes
- 3.5 Access to the Project Area
- 3.6 Basic Data including requirements of land
- 3.7 Analysis of Suitability of Alternatives
- 3.8 Key activities during construction phase
- 3.9 Work Schedule
- 3.10 Investment cost and funding arrangement

Chapter 4 BASELINE/EXISTING ENVIRONMENT

This chapter will include collection of baseline information on physical environment including environmental quality, biological environment, and socio-economic profile and health conditions of the project area. This information will be provided under the following sub headings.

4.0 Covering is 8km from the island

- 4.1 Introduction
- 4.2 Project boundary
- 4.3 Physical Environment
 - 4.3.1 Geology
 - 4.3.2 Sediment mobility
 - 4.3.3 Meteorology
- 4.4 Environmental Quality
 - 4.4.1 Ambient Air Quality
 - 4.4.2 Water Quality
 - 4.4.3 Sediment Quality
 - 4.4.4 Noise Level
- 4.5 Biological Environment
 - 4.5.1 Terrestrial Habitats and fauna
 - 4.5.2 Aquatic life and fisheries
 - 4.5.3 Biodiversity/Environmentally Sensitive Areas
- 4.6 Tectonics behavior of the area
- 4.7 Coastal erosion and deposition aspect
- 4.8 Availability of drinking water
- 4.9 Rate of sedimentation
- 4.10 Cyclone history
- 4.11 Land use pattern
- 4.12 Habitation
- 4.13 Socio-economic Environment
 - 4.13.1 Population: Demographic profile and ethnic composition (100% census survey)
 - 4.13.2 Settlement and housing
 - 4.13.3 Traffic and transport
 - 4.13.4 Public utilities: water supply, sanitation and solid waste
 - 4.13.5 Economy and employment: employment structure and cultural issue in employment

- 4.13.6 Fisheries: fishing activities, fishing communities, commercial important species, fishing resources, commercial factors

Chapter 5 IDENTIFICATION AND EVALUATION OF POTENTIAL IMPACTS

This Chapter will evaluate potential significant negative environmental impacts of the project activities as well as the potential benefits to be derived from the project shall be discussed.

5.0 Covering is the 8km offshore from the Island

- 5.1 Introduction
- 5.2 Impact matrix
- 5.3 Seabed disturbance
- 5.4 Impact of pilling discharge
- 5.5 Impacts of vaporizer discharge
- 5.6 Potential impact of aqueous discharges
- 5.7 Impacts from atmospheric emissions
- 5.8 Wastes
- 5.9 Potential impacts of physical structure at sea
- 5.10 Accidental events
 - 5.10.1 Hydrocarbon spills
 - 5.10.2 Large scale gas release
 - 5.10.3 Fire and explosions
- 5.11 Impacts of well abandoned or suspension
- 5.12 Summary of potential impacts and mitigation measures

Chapter 6 ENVIRONMENTAL MANAGEMENT AND MITIGATION PLAN/PROCEDURES

The EMP will describe the impacts to be mitigated, and activities to implement the mitigation measures, including how, when and where will be implemented. It shall be presented in sufficient detail that this can be incorporated into the criteria for project design, operation and shutdown and allocate roles and responsibilities and show how the Management plan is expected to influence project final design, operation and decommissioning.

- 6.1 Introduction
- 6.2 Environmental Management Procedures
- 6.3 Mitigation Measures
- 6.4 Contingency Planning
- 6.5 Identify immitigable impact as residual impact, Technical & financial plan for proposed Environmental Mitigation
- 6.6 Implementation of the Environmental Management and Mitigation Plan
 - 6.6.1 Organizational Management Aspects
- 6.7 Emergency Response Plan and disaster management plan
- 6.8 Occupational Health and Safety Management Plan
- 6.9 Responsibility of the contractor

Chapter 7 RISK MANAGEMENT

- 7.1 Introduction
- 7.2 Risk Assessment
- 7.3 Identification of hazards
- 7.4 Who might be harmed and how
- 7.5 Evaluation of risks
- 7.6 Risk of property in case of blowout
- 7.7 Emergency response planning
 - 7.7.1 Activation of Emergency Response Group (ERG)



- 7.7.2 Emergency response system
- 7.7.3 Operations specific emergencies

Chapter 8 ENVIRONMENTAL MONITORING PROGRAM FOR PERFORMANCE EVALUATION

This Environmental Monitoring Plan will describe the impacts to be monitored, and when and where monitoring activities will be carried out, and who will carry them out.

- 8.1 Requirements for Management and Monitoring
- 8.2 Monitoring parameters and schedule
- 8.3 Prepare an in-house environmental monitoring system to be operated by the clients own resources (equipment and expertise)
- 8.4 Effluent and emissions monitoring
- 8.5 Direct Construction Impacts Monitoring
- 8.6 Budget of environmental management and monitoring program

Chapter 9 BENEFICIAL IMPACTS

- 9.1 Identify all positive impacts on environment and social life.

Chapter 10 INSTITUTIONAL CAPACITY

- 10.1 Key aspects of the study including the no. of competency of staff.
- 10.2 Size of operational budget
- 10.3 Availability of appropriate technology and equipment.

Chapter 11 CONSULTATIONS WITH STAKEHOLDERS / PUBLIC CONSULTATION

This section will include summarize the consultation with interested parties and the general public including stakeholder and this views will be taken into account in the planning and execution of the project. Contacts will be made and meetings set up with appropriate organizations, government departments, local authorities and community leaders.

Chapter 12 CONCLUSIONS AND RECOMMENDATION

This Section will describe the gains which justify implementation of the project; explain how significant adverse environmental impacts will be mitigated or offset and compensated for; explain/justify use of any irreplaceable resources and; describe follow-up surveillance and monitoring.

ANNEXES

TABLES

FIGURES

PHOTOGRAPHS

REFERENCES



Annexure-7 : Questionnaire for Socio-economic Survey

Environmental Impact Assessment(EIA) of Proposed Summit LNG Floating Storage Re-gasification Unit (FSRU) Terminal Activities Project at Maheshkhali under Cox's Bazar District

আর্থ-সামাজিকবিষয়াবলীসম্পর্কিতখানাজরীপপ্রশ্নাবলী

Questionnaire No.:

❖ সাধারণখানা পরিচিতিঃ

১.০	খানা প্রধানের নাম	:	
১.১	উত্তর দাতার নাম	:	
১.২	খানা প্রধানের সাথে সম্পর্ক	:	
১.৩	গ্রাম	:	
১.৪	মৌজা	:	
১.৫	ইউনিয়ন	:	
১.৬	উপজেলা	:	
১.৭	জেলা	:	
১.৮	ধর্ম ('টিক' দিন)	:	(১) ইসলাম (২) হিন্দু (৩) খ্রিষ্টান (৪) বৌদ্ধ (৫) অন্যান্য

❖ খানার সদস্যদের তথ্যাবলী :

২.০	পরিবারের মোট সদস্য	:	পুরুষঃ		মহিলাঃ		মোটঃ	
২.১	খানার তথ্য (খানার প্রধান থেকে শুরু) : [কোড ব্যবহার করুন]							

ক্রঃ নং	খানার প্রধানের সাথে সম্পর্ক	বৈবাহিক অবস্থা	বয়স	লিঙ্গ	শিক্ষা	প্রধান পেশা	গৌণ পেশা	প্রধান কাজের স্থান
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৯.								
১০.								

কোডিং পদ্ধতি :

সম্পর্ক	
খানা প্রধান	= ১
স্বামী/স্ত্রী	= ২
পুত্র/কন্যা	= ৩
পিতা/মাতা	= ৪
ভাই/বোন	= ৫
পুত্রবধু/জামাতা	= ৬
শ্বশুর/শাশুড়ী	= ৭
পারিবারিক সাহায্যকারী	= ৮
নাতি/নাতনী	= ৯
অন্যান্য	= ১০

পেশা	
কৃষক	= ১
মৎস্যজীবী	= ২
লবন মজুর	= ৩
দিন মজুর	= ৪
চাকুরী	= ৫
ব্যবসা	= ৬
ক্ষুদ্র ব্যবসা	= ৭
পানচাষী	= ৮
গৃহস্থালী রকাজ	= ৯
ছাত্র	= ১০

শিক্ষা	
নিরক্ষর	= ৯৯
শুধুমাত্র পড়তে পারে	= ৯১
পড়তে ও লিখতে পারে	= ৯২
শিশু (৫ বছরের নিচে)	= ১
প্রাথমিক (১ম-৫ম শ্রেণী)	= ২
মাধ্যমিক (৬ষ্ঠ-১০ম শ্রেণী)	= ৩
এস.এস.সি./সমমান	= ৪
এইচ.এস.সি./সমমান	= ৫
এইচ.এস.সি.র উপরে	= ৬
স্নাতক	= ৭

শিশু (৫ বছরের কম) = ১১	মার্টস ও তদোর্ধ = ৮
অবসরপ্রাপ্ত/পঙ্গু = ১২	অন্যান্য = ৯
বেকার = ১৩	
বিদেশে অবস্থানরত = ১৪	
অন্যান্য = ১৫	

প্রধানকাজের স্থান	লিঙ্গ	বৈবাহিকঅবস্থা
গ্রাম = ১	পুরুষ = ১	বিবাহিত = ১
ইউনিয়ন = ২	মহিলা = ২	অবিবাহিত = ২
উপজেলা = ৩		বিধবা = ৩
জেলা = ৪		বিপত্নীক = ৪
অন্য জেলা = ৫		তালাকপ্রাপ্ত = ৫
বিদেশে = ৬		বিচ্ছিন্ন = ৬
		অন্যান্য = ৭

❖ খানারসম্পদ ও অন্যান্য তথ্যাবলী :

৩.০ বসতবাড়ীরধরণ (টিকদিন) :	নিজের ১	ভাড়া ২	অন্যান্য ৩
৩.১ বসতবাড়ীরপ্রকার (টিকদিন) :	কাঁচা ১	আংশিকপাকা ২	পাকা ৩
৩.২ বাড়ীরছাদেরধরণ (টিকদিন) :	খড়/ছন ১	টাইলস ২	টিন ৩
৩.৩ খানার মোটজমিরপরিমাণ (শতাংশ) :	বসতবাড়ী	জি	মোট
৩.৪ বৈদ্যুতিকসুবিধা ('টিক'দিন) :	হ্যাঁ ১	না ২	
৩.৫ রান্নারজ্বালানী ('টিক'দিন) :	পাইপগ্যাস ১	গ্যাসসিলিভার ২	কেরোসিন স্টোভ ৩
বিদ্যুৎ ৪	লাকড়ী/পাতা/কৃষিজউচ্ছিষ্ট ৫	গোবর ৬	অন্যান্য ৭

❖ পানিসরবরাহএবংপয়গনিষ্কাশনঃ

৪.০ পরিবারেরপানিরপ্রধানউৎস('টিক'দিন)ঃ	অগভীরনলকূপ ১	গভীরনলকূপ ২	পানিসরবরাহ ৩	কুয়া ৪	পুকুর ৫	খাল/নদী ৬
৪.১ দূষিতপানিব্যবহারেরফলেপরিবারেরসদস্যদের স্বাস্থ্য সমস্যার কোনঘটনাঘটেছে ?	হ্যাঁ ১	না ২				
৪.২ নিজেরকিটিউবওয়েলআছে?	হ্যাঁ, কাজকরে ১	অকেজো ২	না ৩			
৪.৩ যদি নিজের কোনটিউবওয়েলনা থাকেতাহলেনিকটবর্তী টিউবওয়েলকত দূরে?	ফুট					
৪.৪ আপনারপরিবারকিধরণেরপায়খানাব্যবহারকরে?	স্যানিটারী ১	পিট ২	ঝুলন্ত ৩	খোলাজায়গা ৪	অন্যান্য ৫	
৪.৫ পায়খানার পর কিভাবেহাত ধৌতকরেন ?	শুধুপানি ১	সাবান ২	ছাই ৩	মাটি ৪	অন্যান্য ৫	

❖ পরিবারেরস্বাস্থ্য তথ্যঃ

৫.০ গতবছরেআপনি/আপনারপরিবারের কোনসদস্য রোগেভুগে থাকলেনিম্নে উল্লেখকরুন :

৭.৫ গত বছর কি আপনার ঋণের প্রয়োজন হয়েছিল? (টিক দিন): হ্যাঁ ১ না ২

৭.৬ গত বছরের ঋণের পরিমাণ : টাকা

৭.৭ ঋণের উৎস (টিক দিন): ব্যাংক ১ এনজিও ২ অন্যান্য ৩

(ব্যাংক/এনজিও/অন্যান্য) নাম লিখুন: _____

৭.৮ পরিবারের ধরণ ('টিক' দিন) : ধনী ১ মধ্যবিত্ত ২ দরিদ্র ৩

অতি দরিদ্র ৪ নারী আয় নির্ভর ৫

❖ উপকূলীয় ভূমি ব্যবহার :

৮.০ উপকূলীয় ভূমি ব্যবহার: ম্যানগ্রোভ ১ লবনক্ষেত্র ২ বালিয়ারি ৩

জোয়ার-ভাটা অঞ্চল ৪ বসতি ৫ অন্যান্য (উল্লেখ করুন) ৬

❖ এলাকায় অবস্থিত অবকাঠামো :

৯.০ আপনার এলাকায় বর্ণিত অবকাঠামো থাকলে 'টিক' চিহ্ন দিন: কমিউনিটি ক্লিনিক ১ হাসপাতাল ২

পোস্ট অফিস ৩ তথ্য কেন্দ্র ৪ মাছের আড়ৎ ৫ নদী বন্দর ৬ সমুদ্র বন্দর ৭

স্টেডিয়াম ৮ স্কুল ৯ সাইক্লোন সেল্টার ১০

৯.১ আপনার এলাকায় কি কি বিনোদনের সুবিধা বিদ্যমান আছে? সিনেমা হল ১ ক্লাব ২

বার্ষিক নটক ৩ স্থানীয় ক্রীড়া ৪ নৌকা বাইচ ৫ অন্যান্য (বিবরণ দিন) ৬

৯.২ আপনার এলাকার লোকজন কিভাবে অবসর সময় কাটায়? :

৯.৩ আপনার এলাকায় কোন সাংস্কৃতিক অনুষ্ঠান/খেলাধুলা/উৎসবের আয়োজন হয় কিনা : হ্যাঁ ১ না ২

যদি উত্তর হ্যাঁ হয়, তাহলে আয়োজক সম্পর্কে বিবরণ দিন:

৯.৪ এলাকায় সাংস্কৃতিক অনুষ্ঠান এবং খেলাধুলার জন্য কি কোন অবকাঠামো আছে? : হ্যাঁ ১ না ২

যদি উত্তর হ্যাঁ হয়, তাহলে তালিকা করুন:

৯.৫ এলাকায় সাংস্কৃতিক অনুষ্ঠান/খেলাধুলার জন্য কি আপনার কোন ইচ্ছাপরামর্শ আছে? হ্যাঁ ১ না ২

যদি উত্তর হ্যাঁ হয়, পরামর্শ লিখুন:

৯.৬ আপনার এলাকায় কোন ধরণের সংগঠন কাজ করে 'টিক' চিহ্ন দিন: জেলেদের সংগঠন ১

মহিলা সংগঠন ২ রেড ক্রস ৩ ওয়াটসান ৫ সমবায় সমিতি ৬ ক্ষুদ্র ঋণ দান সংস্থা ৭

৯.৭ এলাকার সংগঠনগুলো আপনার জীবন ও জীবিকার উপর কি গুরুত্বপূর্ণ ভূমিকা পালন করে? হ্যাঁ ১ না ২

যদি উত্তরহ্যাঁ হয়, তাহলে কিভাবে, বিস্তারিত লিখুনঃ

৯.৮ আপনার এলাকার কোন সংগঠনের সাথে জড়িত ?

হ্যাঁ ১ না ২

যদি উত্তরহ্যাঁ হয়, বিস্তারিত লিখুনঃ

❖ এলাকার শিক্ষা ও শিক্ষাপ্রতিষ্ঠানঃ

১০.০ আপনার মতে এলাকার কত শতাংশ শিশু স্কুলে যায়না (উল্লেখ করুন) :

শতাংশ

১০.১ স্কুলে না যাওয়ার প্রধান বাধাসমূহ চিহ্নিত করুনঃ

১০.২ আপনার এলাকায় কী কী শিক্ষাপ্রতিষ্ঠান আছে (উল্লেখ করুন) :

১০.৩ আপনার এলাকায় কি ধরনের শিক্ষার সুযোগ বিদ্যমান (উল্লেখ করুন) :

১০.৪ আপনার এলাকায় শিক্ষার্থী ঝরে পড়ার প্রধান কারণসমূহ কী কী (উল্লেখ করুন) :

❖ এলাকার বন্যপ্রাণীঃ

১১.০ আপনার এলাকায় নিম্ন বর্ণিত বন্যপ্রাণী থাকলে টিক চিহ্ন দিনঃ

১	অতিথি পাখি	২	দেশী পাখি	৩	সাপ	৪	গুঁই সাপ	৫	ব্যাঙ
৬	শিয়াল	৭	খেকশিয়াল	৮	বনবিড়াল	৯	বানর	১০	বেজী
১১	কাঠবিড়ালী	১২	খোস্তাস	১৩	খরগোশ	১৪	অন্যান্য		

১১.১ কোন পরিবেশ সংশ্লিষ্ট সমস্যাসমাধানে আপনি কিসহযোগিতা প্রদান করবেন? :

হ্যাঁ ১ না ২

❖ ঐতিহাসিক নিদর্শন/পুরাকীর্তি/সংস্কৃতি :

১২.০ আপনার এলাকায় কোন আদিবাসী / ক্ষুদ্র জাতিগোষ্ঠী/ শ্রেণী আছে? :

হ্যাঁ ১ না ২

১২.১ হ্যাঁ হলে আদিবাসী/ক্ষুদ্র জাতিগোষ্ঠী/শ্রেণীর নাম ও আনুমানিক সংখ্যা লিখুনঃ

১৩.০ এলাকায় কোন ঐতিহাসিক নিদর্শন অথবা পুরাকীর্তি আছে? :

হ্যাঁ ১ না ২

১৩.১ হ্যাঁ হলে তার নাম ও অবস্থান লিখুনঃ

১৪.০ এলাকায় কোন পুরানাম সজিদ, মন্দির, প্যাগোডা, বৌদ্ধবিহার, গীর্জা, গোরস্থান আছে? :

হ্যাঁ ১ না ২

১৪.১ থাকলে তার সংখ্যা/নাম/অবস্থান লিখুন :

১৫.০ ঐতিহ্যগত কোন প্রথা আপনাদের সমাজে সবচেয়ে গুরুত্বপূর্ণ হিসেবে বিবেচিত হয় :

১৫.১ ঐতিহ্যগত কোন কোন প্রথা আপনার পেশার সাথে সম্পর্কিত :

প্রকল্প সংক্রান্ত :

১৬.০ জলজ উদ্ভিদের উপর প্রকল্পের প্রভাব আপনিকি উদ্বেগজনক মনে করেন?

হ্যাঁ ১ না ২

১৬.১ এলএনজি প্রকল্পের নিকটবর্তী এলাকায় কোন ধরনের মৎস্য জীবির বাসবাস করে?

১৬.২ আপনিকি মনে করেন এই প্রকল্পের কারনে বানিজ্যিক ভাবে মাছ ধরার বিভিন্ন উপকরণের ক্ষয়ক্ষতির সম্ভাবনা আছে?

১৬.৩ আপনিকি মনে করেন এই

প্রকল্প বাস্তবায়নের ফলে সাময়িক ভাবে অফশোর এলাকায় বানিজ্যিক ভাবে মাছ ধরার ক্ষেত্র সংকুচিত হতে পারে?

১৬.৪ এই প্রকল্প গ্রহণের ফলে মাছ ধরা এলাকায় কি ধরনের স্থায়ী ক্ষতি হবে বলে আপনিকি মনে করেন?

১৭.০ মাছ ধরতে নিচের কোন ধরনের ট্রলার/নৌকা ব্যবহার হয় (টিক চিহ্ন দিন) ?

বানিজ্যিক ট্রলার ১ ইঞ্জিন চালিত নৌকা ২ ছোট ইঞ্জিন চালিত নৌকা ৩

১৭.১ আপনিকি ধরনের মাছ ধরার কাজে জড়িত ?

গভীর সমুদ্রে ১ মোহনা ও তীরের কাছাকাছি ২

দৈনিক মাছ ধরা ৩ ছিপ দিয়ে মাছ ধরা ৪

১৮.০ আপনার এলাকার প্রধান সমস্যা গুলো কিকি উল্লেখ করুন:

১৯.০ তথ্য সংগ্রহকারীর মতামত:

.....
.....

তথ্য সংগ্রহকারীর নাম :

তথ্য সংগ্রহের তারিখ :

Annexure-8 : Laboratory Analysis Report



ATOMIC ENERGY CENTRE
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Tel. No. : 880-2-8617946

Ref No: Request letter dated 25/10/17, BETS Consulting Services Ltd.

DATE: 14/11/2017

TEST RESULTS OF AMBIENT AIR QUALITY MONITORING

PROJECT NAME: Environmental Parameter Monitoring for “Environmental Impact Assessment (EIA) for the Proposed offshore LNG Floating Storage and Re-Gasification Unit (FSRU) moored at STL (Submerged Turret Loading) Project at Maheshkhali, Cox'sbazar.”

SAMPLEING SITE DESCRIPTION

1. Sampling location : 6 meter east side of EBBL tie-in point, Moheshkhali (21°34.390 N & 091°51.775E)
2. Date of sampling : 03-04 November, 2017

ANALYSIS

The particulate matters, SPM concentration was measured by collecting sample on Teflon filter using Airmetric portable sampler and subsequent gravimetric analysis using microbalance. The ambient SO₂, NO₂ and CO were monitored sequentially at project site using Gas Badge Pro monitor. The results are also presented below.

RESULTS

Sampling Date	SPM	SO ₂	NO ₂	CO
	µg/m ³ (8h average)	µg/m ³ (24h average)	µg/m ³ (1h average)	mg/m ³ (1h average)
03/11/17	21.2	<12	<13	<0.3
ECR 1997	200	365	100	40mg/m ³

Note: The SPM concentration is lower than ECR 1997 due to seasonal effect (Post-monsoon season).

Begum
14/11/17
(Dr. Bilkis Ara Begum)
Head, Chemistry Division



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PROJECT NAME: Environmental Parameter Monitoring for “Environmental Impact Assessment (EIA) for the Proposed offshore LNG Floating Storage and Re-Gasification Unit (FSRU) moored at STL (Submerged Turret Loading) Project at Maheshkhali, Cox's Bazar.”

SAMPLEING SITE DESCRIPTION

1. Sampling location : Proposed tie-in point of SLNG, Moheshkhali
(21⁰33.618 N & 091⁰51.681E)
2. Date of sampling : 03-04 November, 2017

ANALYSIS

The particulate matters, SPM concentration was measured by collecting sample on Teflon filter using Airmetric portable sampler and subsequent gravimetric analysis using microbalance. The ambient SO₂, NO₂ and CO were monitored sequentially at project site using Gas Badge Pro monitor. The results are also presented below.

RESULTS

Sampling Date	SPM	SO ₂	NO ₂	CO
	µg/m ³ (8h average)	µg/m ³ (24h average)	µg/m ³ (1h average)	mg/m ³ (1h average)
03/11/17	20.6	<12	<13	<0.3
ECR 1997	200	365	100	40mg/m ³

Note: The SPM concentration is lower than ECR 1997 due to seasonal effect (Post-monsoon season).

Begum

14/11/17

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NOISE LEVEL AT PLANT SITES

PROJECT NAME: Environmental Parameter Monitoring for “Environmental Impact Assessment (EIA) for the Proposed offshore LNG Floating Storage and Re-Gasification Unit (FSRU) moored at STL (Submerged Turret Loading) Project at Maheshkhali, Cox's Bazar.”

SAMPLEING SITE DESCRIPTION

1. Sampling locations : Maheshkhali, Cox's Bazar.
2. Date of sampling : 03-04 November, 2017

NOISE LEVEL MONITORING

The noise level is monitored using Sound Level Meter (Model No SL 4012) which is calibrated using Tenma 72-945 (NEDA-1604 IEC-6F22). The noise level at project sites are presented below. The noise levels of project site is lower than the ECR 1997.

Sl. No.	Monitoring Point	Bangladesh Standard	Test Time	Result
1	Middle points sand filling on existing pipe	Day Time 60 dBa	Day	39.4±0.3 dBa
		Night Time 50 dBa	Night	40.2±1.5 dBa
2	6 meter east side of EBBL tie-in point, Moheshkhali	Day Time 60dBa	Day	52.5±0.5 dBa
		Night Time 50 dBa	Night	48.5±0.5 dBa
3	Proposed tie-in point of SLNG, Moheshkhali	Day Time 60dBa	Day	55.6±0.4 dBa
		Night Time 50 dBa	Night	47.4±0.3 dBa

OBSERVATIONS

- Noise level monitoring data is compliant with the National Noise Level Standards (ECR 1997) of Mixed area.

Begum

14/11/17

(Dr. Bilkis Ara Begum)
Head, Chemistry Division



Government of the People's Republic of Bangladesh
Office of the Chief Chemist
Department of Public Health Engineering
Central Laboratory, Mohakhali C/A, Dhaka-1212
Phone : 9893074, Fax : 9892003, E-mail : wqmsc_central_lab@yahoo.com



Memo No. 280/CC, DPHE, CL, Dhaka

Date: 14 / 11 / 2017

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample Identification # CEN2017110046	Sample Collection date:04-11-2017
Ref. Memo No: BCSL/2017/Nill & Dated: 05-11-2017	Sample receiving date: 06-11-2017
Sent By: Carataker: BETS Consulting Services Limited, Dhaka	Carataker: SLNG Terminal (SW-1)
Date of Testing: 06-11-2017 -14-11-2017	Sample Source: Surface Water
	Sample location: Moheshkhali, Cox's Bazar

LABORATORY TEST RESULTS:

SL	Water quality parameters	Bangladesh Standard (Inland Surface Water)	Concentration present	Analysis Procedure	LOQ
01	Alkalinity	-	115	Titrimetric	-
02	Biochemical Oxygen Demand (BOD) _{5days}	50 mg/l	400	5 days Incubation	0.20
03	Chemical Oxygen Demand (COD)	200 mg/l	1600	CRM	-
04	Chloride	150-600 mg/l	14290	Titrimetric	-
05	EC	1200 μ s/cm	43500	Multimeter	-
06	pH	6-9	8.7	pH Meter	-
07	Total Dissolved Solid (TDS)	2100 mg/l	22200	Multimeter	-
08	Total Suspended Solid (TSS)	150 mg/l	14	Gravity Multimeter	-

Comments: Sample was collected & supply by client

N.B: AAS-Atomic Absorption Spectrophotometer, UVS-UV-VIS Spectrophotometer, MFP-Membrane Filtration Procedure, LOQ-Limit of Quantitation.

Test performed by : Name: Taslima Akhter Designation: Sample Analyzer Signature: নমুনা বিশ্লেষণ 14.11.17 জনস্বাস্থ্য অধিদপ্তর কেন্দ্রীয় পরীক্ষাগার মহাখালী, ঢাকা	Test performed by : Name: Md. Saiful Alam Khosru Designation: Sample Analyzer Signature: নমুনা বিশ্লেষণ 14.11.17 জনস্বাস্থ্য অধিদপ্তর কেন্দ্রীয় পরীক্ষাগার মহাখালী, ঢাকা	Countersigned/Approved by : Name: Md. Biplab Hossain Designation: Chief Chemist Signature: মোঃ বিপ্রব হোসেন 14/11/2017 চীফ কেমিস্ট জনস্বাস্থ্য অধিদপ্তর কেন্দ্রীয় পরীক্ষাগার মহাখালী, ঢাকা।
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Phone : 9893074, Fax : 9882003, E-mail : wqmsc_central_lab@yahoo.com



Memo No. 280/CC, DPHE, CL, Dhaka

Date: 14 / 11 / 2017

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample Identification # CEN2017110046	Sample Collection date:04-11-2017
Ref. Memo No: BCSL/2017/Nil & Dated: 05-11-2017	Sample receiving date: 06-11-2017
Sent By: Carataker: BETS Consulting Services Limited, Dhaka	Carataker: SLNG Terminal (SW-2)
Date of Testing: 06-11-2017 -14-11-2017	Sample Source: Surface Water
	Sample location: Moheshkhali, Cox's Bazar

LABORATORY TEST RESULTS:

SL	Water quality parameters	Bangladesh Standard (Inland Surface Water)	Concentration present	Analysis Procedure	LOQ
01	Alkalinity	-	105	Titrimetric	-
02	Biochemical Oxygen Demand (BOD) 5days	50 mg/l	120	5 days Incubation	0.20
03	Chemical Oxygen Demand (COD)	200 mg/l	400	CRM	-
04	Chloride	150-600 mg/l	14015	Titrimetric	-
05	EC	1200 μ s/cm	41400	Multimeter	-
06	pH	6-9	8.8	pH Meter	-
07	Total Dissolved Solid (TDS)	2100 mg/l	21100	Multimeter	-
08	Total Suspended Solid (TSS)	150 mg/l	12	Gravity Multimeter	-

Comments: Sample was collected & supply by client

N.B: AAS-Atomic Absorption Spectrophotometer, UVS-UV-VIS Spectrophotometer, MFP-Membrane Filtration Procedure, LOQ-Limit of Quantitation.

Test performed by : Name: Taslima Akhter Designation: Sample Analyzer Signature: নমুনা বিশ্লেষক জনস্বাস্থ্য প্রকৌশল অধিদপ্তর কেন্দ্রীয় পরীক্ষাগার মহাখালী, ঢাকা	Test performed by : Name: Md. Saiful Alam Khosru Designation: Sample Analyzer Signature: নমুনা বিশ্লেষক জনস্বাস্থ্য প্রকৌশল অধিদপ্তর কেন্দ্রীয় পরীক্ষাগার মহাখালী, ঢাকা	Countersigned/Approved by : Name: Md. Biplab Hossain Designation: Chief Chemist Signature: মোঃ বিপ্লব হোসেন চীফ কেমিস্ট জনস্বাস্থ্য প্রকৌশল অধিদপ্তর কেন্দ্রীয় পরীক্ষাগার মহাখালী, ঢাকা
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Annexure-9 : Table-of Socio-Economic condition and
FGD samples.

ক্র: নং	নাম	ঠিকানা	ইউনিয়ন	পেশা	ফোন	স্বাক্ষর
	আব্দুল হাকিম	হুগু মহল্লা	হুগু মহল্লা	ইন্সপেক্টর	০১৫০২৫৩০০	A. Bakim
	মোঃ আমিন	হুগু মহল্লা ৩৩ নং এম	হুগু মহল্লা	বেলনা MUP	০১৪৫৫২৩১৯০০	Amir
	মোঃ মিল্লাব উদ্দীন	হুগু মহল্লা	হুগু মহল্লা	মসজিদ	০১৪১৯৬৪৭৭৪৪	Milhab
	আব্দুল হাকিম	হুগু মহল্লা ০৮ নং এম ইউ সি	হুগু মহল্লা	MUP	০১৪৬৭১৬৬৫৫	Abul
	মোঃ আব্দুল হাকিম	হুগু মহল্লা	হুগু মহল্লা	মসজিদ	০১৭২৬৫১৫১৫	Abul
	মোঃ হাদিস উদ্দীন	হুগু মহল্লা MUP	হুগু মহল্লা	MUP	০১৪৭৭৭৭২৬৬৭	Hadi
	মোঃ হাদিস উদ্দীন	হুগু মহল্লা	হুগু মহল্লা	মসজিদ	০১৪৬৬৬৬৬৬৬	Hadi
	মোঃ হাদিস উদ্দীন	হুগু মহল্লা	হুগু মহল্লা	মসজিদ	০১৪৬৬৬৬৬৬৬	Hadi

ক্র: নং	নাম	ঠিকানা	ইউনিয়ন	পেশা	ফোন	স্বাক্ষর
	আব্দুল হাকিম	বড় মাহেশখালী	বড় মাহেশখালী	উদ্ভিদ	০১৮২০১৫৩০০	A. B. Khan
	মোঃ হুমায়ুন কামিল	বড় মাহেশখালী ১৩মাটি এম	বড় মাহেশখালী	বেকশা MUP	০১৮৫৫২৩১৯০০	A. M. Z.
	মোঃ জিতেন্দ্র উদ্দান	বড় মাহেশখালী	বড় মাহেশখালী	মন্ডি	০১৮১৯৬৪৭১৫৪	M. M. Khan
	আব্দুল হাকিম	বড় মাহেশখালী ০৮নং এম ইউনি	বড় মাহেশখালী	MUP	০১৮৬৭১৬৬৫৫৫	A. M. Z.
	মোঃ হুমায়ুন কামিল	জাঙ্গিলাখোলা বড় মাহেশখালী	ব	মহাসচিব জাঙ্গিলাখোলা বড় মাহেশখালী	০১৭২৬৫১৯৫১৫	M. M. Khan
	মোঃ জাঙ্গিলাখোলা	জাঙ্গিলাখোলা MUP	ব	MUP	০১৮৭৭৭২৬৬৭	M. M. Khan
	মোঃ হুমায়ুন কামিল	বড় মাহেশখালী	ব	বড় মাহেশখালী	০১৮১৬৬৪৫৫২	M. M. Khan
	মোঃ হুমায়ুন কামিল	জাঙ্গিলাখোলা	ব	বড় মাহেশখালী	০১৮২০১৫৩০০	M. M. Khan

ক্র: নং	নাম	ঠিকানা	ইউনিয়ন	পেশা	ফোন	স্বাক্ষর
১	প্রমোদ চন্দ্র বিশ্বাস	কড়াখালী	কড়াখালী	(স্বাক্ষর)	৫৭৭৭-৫১১১২	

১/ ডায়ালগ: কখন কখন
কেন্দ্রীয়: মাহেশখালী
কর্তৃপক্ষ: (ইয়াং) ক
F.G.D এর উপস্থিতি: জালিয়া

১. শ্রী: জাকির হোসেন - কক্সবাজার - ০১৭১৪২৭৬৭০২ - জাকির

২. শ্রী: আবুল হাশেম - " - " - হাশেম

৩. শ্রী: আমির হাশেম - " - ০১৪৫৬৩২০৫৬১ - আমির

৪. শ্রী: মাহিউজ্জামান - " - ০১৪২৫৬৬২২০৪ - মাহিউজ্জামান

৫. শ্রী: আমানুল করিম - কক্সবাজার - ০১৭৭৭৫৩৭২১২ - আমানুল

৬. শ্রী: দুলাল - কক্সবাজার - ০১৪৭৬২৬১০৫৫১ - দুলাল

৭-১১-০৭ ৭. শ্রী: বিল্লাহ হোসেন - কক্সবাজার - ০১৪১২২০৩৫১ - বিল্লাহ হোসেন

৮. শ্রী: মাহিউজ্জামান - কক্সবাজার - " - মাহিউজ্জামান

৯. শ্রী: আবুল হাশেম - কক্সবাজার - ০১৪২৫৫৫০০৭৩ - আবুল হাশেম

১০. আবুল হাশেম - কক্সবাজার - ০১৭১৪৪১২৬০ - আবুল হাশেম

(৫)

শ্রীঃ - কুমার
 উদ্দেশ্য - মহেশখালী
 ২৩ - (স্বাক্ষর)

প্রঃ কোনটি কি গ্রামপাট্টা পল্লী প্রকল্পের
 আধীন কি?
 * হ্যাঁ, মহেশখালী পল্লী গ্রাম নিয়ে একটি বিদ্যুৎ
 উন্নয়ন কেন্দ্র ২০ এলাকায় স্থাপন করা হয়েছে।

প্রঃ প্রকল্পের ব্যক্তিগত আধারদে (কোন
 ধরনের অধি ২০ কিভাবে?
 হ্যাঁ, প্রকল্প ব্যক্তিগত আধারদে অধি অধি-
 গ্রহণ করা হয়েছে। উন্নয়ন অধি উন্নয়ন কেন্দ্র
 উন্নয়ন অধি অধি দেয়।

প্রঃ প্রকল্প থেকে আধারদে প্রকল্প কি?

- * বৈদ্যুতিক ২০।
- * মিলন প্রতিষ্ঠান গড়ে উঠে।
- * উন্নয়ন অধি অধি উন্নয়ন কেন্দ্র
 (যেমন - বাস-ঘর, বীজ উন্নয়ন, মিলন
 প্রতিষ্ঠান, স্কুল কেন্দ্র)।
- * উন্নয়ন অধি অধি ২০।
- * বিদ্যুৎ উন্নয়ন অধি অধি ২০।
- * অধি অধি: সুবর্ণা অধি অধি ২০।

Date : _____

~~সমস্যা সমাধান~~

কোনো: কক্স বজার

উদ্দেশ্য: মাহেশখালী

বিতরণ: (১০০০) -

(কক্স বজার - ৬৪০০০ টন, (মাহেশখালী - ৪৯০০০ টন)

২	(১০০০) -	১৩০০০
২	২০০০ টন -	১৫০০০
০	১০০০ টন -	১২০০০
৪	১০০০ টন -	৩৫০০০
৭	১০০০ -	১২০০০
৬	১০০০ -	১৩০০০
৯	১০০০ -	৪০০০০



প্রশ্ন: কক্সবাজার উপ-সাহসকারী ইউনিট: কক্সবাজার

১। - আলাদা স্যান-বার্ন-লার্ন প্রকল্পে সম্ভাব্য আঘাত কিসে?
 Ans: - হ্যাঁ, আলাদা স্যান-বার্ন-লার্ন প্রকল্পে সম্ভাব্য -
 - আঘাতের ভাঙ্গা আছে।

২। প্রকল্প: - আলাদা স্যান-বার্ন-লার্ন প্রকল্পে আঘাত হতে পারে।
 প্রকল্পে বিলম্ব-আঘাতের ভাঙ্গা আছে হতে পারে।

* বা স্যান-বার্ন-লার্ন প্রকল্পে আঘাত হতে পারে।
 - হ্যাঁ, স্যান-বার্ন-লার্ন প্রকল্পে আঘাত হতে পারে।

৩। প্রকল্প-আলাদা স্যান-বার্ন-লার্ন প্রকল্পে আঘাত হতে পারে।
 * প্রকল্পের আলাদা স্যান-বার্ন-লার্ন প্রকল্পে আঘাত হতে পারে।

* প্রকল্পের আলাদা স্যান-বার্ন-লার্ন প্রকল্পে আঘাত হতে পারে।
 * প্রকল্পের আলাদা স্যান-বার্ন-লার্ন প্রকল্পে আঘাত হতে পারে।

* প্রকল্পের আলাদা স্যান-বার্ন-লার্ন প্রকল্পে আঘাত হতে পারে।
 প্রকল্পের আলাদা স্যান-বার্ন-লার্ন প্রকল্পে আঘাত হতে পারে।

* প্রকল্পের আলাদা স্যান-বার্ন-লার্ন প্রকল্পে আঘাত হতে পারে।
 - বিলম্ব-আঘাতের ভাঙ্গা আছে। স্যান-বার্ন-লার্ন প্রকল্পে আঘাত হতে পারে।

* প্রকল্পের আলাদা স্যান-বার্ন-লার্ন প্রকল্পে আঘাত হতে পারে।
 আলাদা স্যান-বার্ন-লার্ন প্রকল্পে আঘাত হতে পারে।

*

(স্বাক্ষর: কক্স বজার) ৩০-০৩-২০২৩
 ঠিকানা: মহেশখালী
 (স্বাক্ষর: মোঃ মাহমুদ)

মোঃ মাহমুদ - ৩৩. নি. ১১২৩ - ০১৮৫৫২৩১৯০০ - ১১২৩
 মোঃ মোস্তাফিজ - ৩৩ - ০১৮৩৮১৪২১৭৮ - ১১২৩
 মোঃ মোস্তাফিজ - ৩৩ - ০১৮৬৩৩৯৩২৫১ - ১১২৩
 মোঃ মোস্তাফিজ - ৩৩ - ০১৮৩১৫১১৮৫৮ - ১১২৩
 মোঃ মোস্তাফিজ - ৩৩ - ০১৮২৫২৬০২২৭ - ১১২৩
 মোঃ মোস্তাফিজ - ৩৩ - ০১৮৩১৫১১৮৫৮ - ১১২৩
 মোঃ মোস্তাফিজ - ৩৩ - ০১৮৬২০৩৬৭৯১ - ১১২৩
 মোঃ মোস্তাফিজ - ৩৩ - ০১৮২৭৭২৩৬১৩ - ১১২৩
 মোঃ মোস্তাফিজ - ৩৩ - ০১৮৫৩১৩৯৩০২ - ১১২৩
 মোঃ মোস্তাফিজ - ৩৩ - ০১৮৮২২৮৭৭৫৪ - ১১২৩
 মোঃ মোস্তাফিজ - ৩৩ - ০১৮৩৬৫৩৪৭৫৪ - ১১২৩
 মোঃ মোস্তাফিজ - ৩৩ - ০১৮৫৪৫৭৫৫৩ - ১১২৩

১৩-১১-২৩

Date : _____

কোনঃ মহেশখালী ~~কক্স বজার~~
 উন্নয়নঃ মহেশখালী
 বিভাগঃ মহেশখালী

সেতালীতি মালিকঃ জালাল
 মোট মূল্য - 65000000
 মোট খরচ - 81000000

- ১ মালিকানাধীন - 2500+0000 মন
- ২ জল - 1000 মন
- ৩ খরচ - 2200 মন
- ৪ বিদ্যুৎ - 250 মন
- ৫ কয়লা - 1000 মন
- ৬ গুণ - 1200 মন
- ৭ গ্যাস - 200 মন

①

<u>ক্রম</u>	<u>সংস্থা</u>	<u>উপস্থান</u>	<u>সংযোগ</u>	<u>যোগাযোগ নম্বর</u>
১	স্বাধীনতা সড়ক - হাটঘাট স্বাধীনতা সড়ক নিম্ন - স্বাধীনতা	স্বাধীনতা	১	০১৮৭৫২২৪২ স্বাধীনতা
২	স্বাধীনতা (স্বাধীনতা - স্বাধীনতা)	স্বাধীনতা	১	০১৮২৭৭৬০৫৫৩
৩	স্বাধীনতা	স্বাধীনতা	১	স্বাধীনতা
৪	স্বাধীনতা	স্বাধীনতা	১	০১৮৩১৫১১৫৫১
৫	স্বাধীনতা	স্বাধীনতা	১	০১৮২৭৭৩৩৬
৬	স্বাধীনতা	স্বাধীনতা	১	০১৮৩৩২৭৭৭৫৩
				০১৮১২৯৭৬১৩৭

25-10-17

Socioeconomic Condition based on Field Survey

Table 1 Age structure of surveyed household population

Age level (Years)	Male	Female	Total	Total (%)
>=1 to 5 Yrs	34	21	55	12.53
>=6 to 15 Yrs	67	60	127	28.93
>= 16 to 45 Yrs	109	83	192	43.74
>= 46 to 60 Yrs	28	24	52	11.85
Above 60 Yrs	11	2	13	2.96
Total surveyed HH population:	249	190	439	100.00

Table 2 Level of Education of the household population

Educational Status	Male	%	Female	%	Total Pop.	Total %
Illiterate	93	37.35	66	34.74	159	36.22
Can read only	4	1.61	0	0.00	4	0.91
Can read & write	2	0.80	2	1.05	4	0.91
Children (< 5 yrs)	37	14.86	22	11.58	59	13.44
Primary (Class I-V)	74	29.72	58	30.53	132	30.07
Secondary (VI-X)	29	11.65	33	17.37	62	14.12
S.S.C /Equivalent	7	2.81	5	2.63	12	2.73
H.S.C/Equivalent	2	0.80	3	1.58	5	1.14
Degree	1	0.40	0	0.00	1	0.23
Masters+Honors	0	0.00	1	0.53	1	0.23
Others	0	0.00	0	0.00	0	0.00
Total:	249	100.00	190	100	439	100

Table 3 Type of Farmer

Type of Farmer	No. of H/H	%
Cultivation own land	5	6.25
Own and other's land	2	2.50
Only owner of land	3	3.75
Share cropper	22	27.50
Total	32	40

Table 4 Last Year Major Crops Cultivated (if collected)

Name of Crop	Name of Mouza	Area of Land(Decimal)	Production(kg)	Price/Kg(Tk.)
HYBBoro	BoroMoheshkhali	80	800	N/A
Salt	BoroMoheshkhali	4960	587000	N/A
Salt	Hoanak	3100	338000	N/A
Betel leaf	BoroMoheshkhali	50	LS	N/A
Betel leaf	Hoanak	50	LS	N/A

Table-5 Types of Housing Structures

Type of Housing Structure	No. of H/H	%
Thatched	80	100
Semi Pucca	0	0
Pucca	0	0
Others	0	0
Total:	80	100

Table-6 Electricity Connection of the Project Area

Response	No. of H/H	%
Yes	21	26.25
No.	59	73.75
Intermittent connection	0	0
Others	0	0
Total:	80	100

COOKING FUEL:

Table 7 Cooking Fuel of the Project Area

Type of Cooking Fuel	No. of H/H	%
Natural pipe gas	0	0.00
Cylinder Gas	0	0.00
Kerosene Stove	0	0.00
Electricity	3	3.75
Wood	77	96.25
Cow dung	0	0.00
Others	0	0.00
Total:	80	100.00

SOURCES OF WATER AND USES

Table 8 Sources of Water and Uses

Type of Sources	Drinking No. H/H	(%) H/H	Cooking/Washing No. H/H	(%) H/H	Bathing No. H/H	(%) H/H
Tubewell (STW)	73	91.3	71	88.75	71	88.75
Deep Tubewell (DTW)	7	8.8	7	8.75	7	8.75
Supply Water	0	0.0	0	0	0	0.00
Well	0	0.0	0	0	0	0.00
Pond	0	0.0	2	2.5	2	2.50
Khal/River	0	0.0	0	0	0	0.00
Total No. HH:	80	100.0	80	100.0	80	100

DISEASE SUFFERED BY FAMILY IN LAST 1 YEAR

Table 9 Disease suffered you and your family in last 1 year

Name of Disease	No. of Response	%	Remarks
Diarrhea	8	10.0	
Typhoid	2	2.5	
Dysentery/Gastroenteritis	16	20.0	
Jaundice	2	2.5	
Skin Disease	0	0.0	
Tetanus	0	0.0	
TB	0	0.0	
Pneumonia	1	1.3	
Asthma	5	6.3	
Others	41	51.3	fever, cold fever, headache, cough etc.

Table 10 Types of Treatment

Access to Health Facilities	No. of H/H response	%
Govt. Hospital	35	24
UP Health Clinic	64	43
Good Doctor	52	35
Private Clinic	16	11
NGO Clinic	5	3
Good Pharmacy	73	49
Village Doctor	76	51
Homeopathy	13	9
Ayurvedic/Herbal	7	5

INCOME AND EXPENDITURE OF THE HOUSEHOLDS

Table 11 Monthly Income Level of the Household

Income Level	No. of Household	%
Tk. 1000 - Tk. 5000	0	0.00
> Tk. 5000 - Tk. 10000	15	18.75
> Tk. 10000 - Tk. 15000	30	37.50
> Tk. 15000 - Tk. 20000	20	25.00
> Tk. 20000 - Tk. 25000	9	11.25
Tk. 25001 and Above	6	7.50
Total:	80	100.00

MONTHLY EXPENDITURE OF THE HOUSEHOLDS

Table-12 Monthly Expenditure Level of Household

Expenditure Level	No. of Household	%
Tk. 1000 - Tk. 5000	0	0.00
> Tk. 5000 - Tk. 10000	18	22.50
> Tk. 10000 - Tk. 15000	34	42.50
> Tk. 15000 - Tk. 20000	19	23.75
> Tk. 20000 - Tk. 25000	5	6.25
Tk. 25001 and Above	4	5.00
Total:	80	100.00

Table-13 : Economic condition of household

Condition	No. of HH	%
Rich	1	1.25
Middle class	13	16.25
Poor	60	75.00
Very poor	6	7.50
Total:	80	100.00

Table-14: Occupational pattern of the surveyed H/H

Occupation	No. H/H	%
Fishermen	50	62.50
Salt Cultivator	30	37.5
Total:	80	100

Table-15: Type of Latrine of the Household

Types of Latrines Used	No. of Households	% of Households
Sanitary	6	7.50
Pit	71	88.75
Hanging	3	3.75
Open space	0	0.00
Others	0	0.00
Total:	80	100.00

Table-16: Hand washing after toilet use/defecation

Cleaning Item	Household No.	%
Only Water	12	15.00
Soap	47	58.75
Ash	20	25.00
Soil	1	1.25
Others	0	0.00
Total:	80	100.00

Annexure-10 : Photographs

Public Consultation:



Picture 1: Public Consultation with fisherman



Picture 2: Public Consultation with fisherman & villagers



Picture 3: Public consultation with Dhalghata residents affected by the project at GTCL Valve Station



Picture 5: Public Consultation at local tea stall, Boro Moheshkhali.



Picture 6: FGD with members of Gotibhanga Fishing Association



Picture 7: FGD at UP Office, Boro Moheshkhali

Key Informers Interview (KII):



Picture 6: Meeting with ADC, General, Coxsbazar.



Picture 7: Meeting with Assistant Director, DoE Coxsbazar Zobe office



Picture 8: Meeting with Distrci Fishery Officer, coxsbazar



Picture 9: Meeting with Manager, RPGCL, Coxsbazar.



Picture 10: Meeting with UNO, Moheshkhali



Picture 11: Meeting with Inspector of Police (Investigation) of Moheshkhali

Sample collection from Site:



Picture 7: Air monitoring near the EEBL FSRU Tie-in-Point.



Picture 8: Deploying second air monitoring equipment at coordinates 21°33'15.43"N, 91°51'37.19"E



Picture 9: Collecting GPS coordinates at North side of proposed tie end point



Picture 10: Collecting water sample



Picture 11: Soil Sample 1 collected



Picture 12: Collecting GPS Coordinate at sediment collecting point



Picture 13: Soil Sediment sample collection



Picture 14: Monitoring Noise level



Picture 15: Water sample collection near FSRU terminal point



Picture 16: Noise level Monitor near FSRU terminal point

Annexure-11 : Chalan Copy of DoE'S Fee & VAT



গ্যাস ট্রান্সমিশন কোম্পানী লিমিটেড (জিটিসিএল)

(পেট্রোবাংলার একটি কোম্পানী)

GAS TRANSMISSION COMPANY LTD. (GTCL)

(A Company of Petrobangla)

সূত্র নং ২৮.১৪.০০০০.১৭৭.২৪.০১১.১৭/ ৭২৬

তারিখঃ ০৪-১২-২০১৭

সহকারী পরিচালক
পরিবেশ অধিদপ্তর, কক্সবাজার জেলা অফিস
সায়মান রোড, জাওয়াতলা
কক্সবাজার।

বিষয়ঃ Summit LNG Terminal Co. (Pvt.) Ltd. কর্তৃক স্থাপিতব্য Offshore LNG FSRU moored at STL (Submerged Turret Loading) প্রকল্পের অনুকূলে পরিবেশগত ছাড়পত্র (Environmental Clearance) প্রদান প্রসঙ্গে।

মহোদয়,

উপর্যুক্ত বিষয়ে আপনার অবগতির জন্য জানানো যাচ্ছে যে, গ্যাস ট্রান্সমিশন কোম্পানী লিমিটেড (জিটিসিএল) বিদ্যুৎ, জ্বালানী ও খনিজ সম্পদ মন্ত্রণালয়ের অধীনস্থ পেট্রোবাংলার একটি কোম্পানী। Summit LNG Terminal Co. (Pvt.) Ltd. কর্তৃক স্থাপিতব্য বিষয়োক্ত প্রকল্পের অনুকূলে পরিবেশ অধিদপ্তর, প্রধান কার্যালয়, ঢাকা কর্তৃক গত ০৩-০৮-২০১৭ তারিখে পত্র নং-22.02.0000. 018.72.014.17/382-এর মাধ্যমে প্রকল্পের Initial Environmental Examination (IEE) হতে অব্যাহতি এবং Environmental Impact Assessment (EIA)-এর Terms of Reference (ToR) অনুমোদন প্রদান করা হয় (সংযুক্তি-১)।

২। বিষয়োক্ত প্রকল্পের অনুকূলে পরিবেশগত ছাড়পত্র প্রাপ্তির লক্ষ্যে বাংলাদেশ গেজেট অনুযায়ী পরিবেশগত ছাড়পত্র ফি বাবদ ৮৫,০০,০০০.০০ (টাকা পঁচ লক্ষ) টাকা, ট্রেজারি চালান নং 253 তারিখঃ ১৯-১১-২০১৭ এবং পরিবেশগত ছাড়পত্র ফি এর উপর ১৫% ভ্যাট বাবদ ৮৭৫,০০০.০০ (টাকা পঁচাত্তর হাজার) টাকা, ট্রেজারি চালান নং 254 তারিখঃ ১৯-১১-২০১৭ এর মাধ্যমে সোনালী ব্যাংক লিমিটেড, কাওরান বাজার শাখা, ঢাকায় জমা প্রদান করা হয়েছে। আলোচ্য প্রকল্পের অনুকূলে পরিবেশগত ছাড়পত্র প্রাপ্তির লক্ষ্যে অনলাইনে আবেদনের হার্ডকপি (ফাইল নং ৪৭৫০০), দুইটি ট্রেজারি চালানের মূল কপি, পরিবেশগত ছাড়পত্রের জন্য পূরণকৃত নির্ধারিত আবেদন ফরম (ফরম-৩), স্থানীয় কর্তৃপক্ষের অনাপত্তি ছাড়পত্র এবং পরিবেশ অধিদপ্তরের অনুমোদিত ToR-এ উল্লেখকৃত Terms and Conditions অনুযায়ী প্রকল্পের EIA প্রতিবেদনের ০২(দুই) কপি এতদসঙ্গে প্রেরণ করা হলো।

৩। এমতাবস্থায়, Summit LNG Terminal Co. (Pvt.) Ltd. কর্তৃক স্থাপিতব্য Offshore LNG FSRU moored at STL (Submerged Turret Loading) নির্মাণ প্রকল্পের অনুকূলে পরিবেশগত ছাড়পত্র (Environmental Clearance) প্রদানের প্রয়োজনীয় ব্যবস্থা গ্রহণের জন্য অনুরোধ করা হলো।

ধন্যবাদান্তে
আপনার বিশ্বস্ত।

(রুখসানা নাজমা ইছহাক)
মহাব্যবস্থাপক (পরিকল্পনা)

সংযুক্তিঃ বর্ণনামত।

অনুলিপি (জ্যেষ্ঠতার ক্রমানুসারে নয়) :

- ১। মহাপরিচালক, পরিবেশ অধিদপ্তর, পরিবেশ ভবন, ই-১৬ আগারগাঁও, ঢাকা।
- ২। ব্যবস্থাপনা পরিচালক, আরপিজিসিএল।
- ৩। উর্দ্ধতন মহাব্যবস্থাপক, এলএনজি সেল, পেট্রোবাংলা।
- ৪। ব্যবস্থাপনা পরিচালক, Summit LNG Terminal Co. (Pvt.) Ltd.
- ৫। উপ-ব্যবস্থাপক (সমন্বয়) টু ব্যবস্থাপনা পরিচালক, জিটিসিএল।
- ৬। অফিস কপি।

প্রধান কার্যালয়: প্লট নং-এফ-১৮/এ, শের-ই-বাংলা নগর প্রশাসনিক এলাকা, আগারগাঁও, ঢাকা-১২০৭।
Head Office: Plot No. F-18/A, Sher-E-Bangla Nagar Administrative Area, Agargaon, Dhaka-1207.



গ্যাস ট্রান্সমিশন কোম্পানী লিমিটেড (জিটিসিএল)
(পেট্রোবাংলার একটি কোম্পানী)
GAS TRANSMISSION COMPANY LTD. (GTCL)
(A Company of Petrobangla)

সূত্র নং-২৮.১৪.০০০০.১৭৭.৩২.০০৬.১৭/ ৭৩৫

তারিখ: ১৭-১২-২০১৭

ব্যবস্থাপনা পরিচালক
Summit LNG Terminal Co. (Pvt.) Ltd.
সামিট সেক্টর, ১৮ কাওরান বাজার বা/এ
ঢাকা-১২১৫

বিষয়: Summit LNG Terminal Co. (Pvt.) Ltd. কর্তৃক স্থাপিতব্য Offshore LNG FSRU moored at STL (Submerged Turret Loading) প্রকল্পের পরিবেশ সমীক্ষা কাজ সম্পাদনে নিয়োজিত পরামর্শক প্রতিষ্ঠান BETS Consulting Services Ltd.-কে প্রথম চলতি বিল প্রদান প্রসংগে।

- সূত্র: ১. জিটিসিএল-এর পত্র নং-২৮.১৪.০০০০.১৭৭.২৪.০১১.১৭/৭২৩ তারিখ: ০৪-১২-২০১৭।
২. BETS-এর পত্র নং-WSE-2117BAN/2017-12(01) তারিখ: ১০-১২-২০১৭।
৩. BETS-এর পত্র নং BETS/WSE-2117 BAN-2017-11(10) তারিখ: ২১-১১-২০১৭।

মহোদয়,

উপর্যুক্ত বিষয়ে আপনার অবগতির জন্য জানানো যাচ্ছে যে, Summit LNG Terminal Co. (Pvt.) Ltd. কর্তৃক স্থাপিতব্য Offshore LNG FSRU moored at STL প্রকল্পের পরিবেশ সমীক্ষা কাজ সম্পাদনের জন্য মোট ৬১৮,৩৩,৩৩৩.০০ (টাকা আঠার লক্ষ তেরিশ হাজার তিনশত তেরিশ) টাকা মাত্র ব্যয়ে পরামর্শক প্রতিষ্ঠান BETS Consulting Services Ltd.-এর সাথে চুক্তি সম্পাদিত হয়। চুক্তি মোতাবেক নির্ধারিত সময়ে প্রকল্পের পরিবেশ সমীক্ষা কাজ সম্পাদনের নিমিত্ত গত ২১-১১-২০১৭ তারিখে সূত্রস্থ (৩) নং পত্রের মাধ্যমে পরামর্শক প্রতিষ্ঠান কর্তৃক Draft EIA প্রতিবেদন দাখিল করা হয় যা পরীক্ষা করে ড্রাফট খাকায় তা সংশোধন করে চূড়ান্ত Draft EIA প্রতিবেদন দাখিলের জন্য জিটিসিএল কর্তৃক পত্র প্রেরণ করা হয়। পরবর্তীতে Draft EIA প্রতিবেদনের ভুলত্রুটিসমূহ সংশোধন করে পরামর্শক প্রতিষ্ঠান কর্তৃক গত ০৪-১২-২০১৭ তারিখে চূড়ান্ত Draft EIA প্রতিবেদন দাখিল করা হয় (Draft EIA প্রতিবেদনের কপি সংযুক্ত) যা সূত্রস্থ (১) নং পত্রের মাধ্যমে পরিবেশ অধিদপ্তর, কক্সবাজার জেলা অফিস বরাবর প্রেরণকরত: বিষয়ক প্রকল্পের অনুকূলে পরিবেশগত ছাড়পত্র প্রাপ্তির জন্য আবেদন করা হয়েছে।

পরামর্শক প্রতিষ্ঠান BETS Consulting Services Ltd কর্তৃক সূত্রস্থ (২) নং পত্রের মাধ্যমে চুক্তি পত্রের PCC Clause GCC 53.1 অনুযায়ী চলতি বিল (৪০%) বাবদ ভ্যাট, ট্যাক্সসহ ৬৭,৩৩,৩৩৩.০০ (টাকা সাত লক্ষ তেরিশ হাজার তিনশত তেরিশ) মাত্র-এর একটি Invoice-দাখিল করা হয়েছে। Summit LNG Terminal Co. (Pvt.) Ltd.-কর্তৃক বিল পরিশোধের পরবর্তী ব্যবস্থা গ্রহণার্থে জিটিসিএল কর্তৃক প্রত্যাশনপূর্বক পরামর্শক প্রতিষ্ঠান কর্তৃক দাখিলকৃত Invoice-টি এতদসংগে প্রেরণ করা হলো।

এমতাবস্থায়, Summit LNG Terminal Co. (Pvt.) Ltd. কর্তৃক স্থাপিতব্য Offshore LNG FSRU প্রকল্পের পরিবেশ সমীক্ষা (EIA) কাজের চলতি বিল (৪০%) বাবদ ৬৭,৩৩,৩৩৩.০০ (টাকা সাত লক্ষ তেরিশ হাজার তিনশত তেরিশ) মাত্র-এর বিলটি পরামর্শক প্রতিষ্ঠান BETS Consulting Services Ltd-কে পরিশোধের জন্য অনুরোধ করা হলো।

ধন্যবাদান্তে,

(মো. আতিকুজ্জামান)
ব্যবস্থাপনা পরিচালক
টেলিফোন: ৪৪৮২৭২০০।

সংযুক্তি: বর্ণনামতে।

অনুলিপি (জ্যেষ্ঠতার ক্রমানুসারে নয়):

- ১। ব্যবস্থাপনা পরিচালক, আরপিজিএল।
- ২। ঊর্ধ্বতন মহাব্যবস্থাপক (এলএনজি সেল), পেট্রোবাংলা।
- ৩। পরিচালক (অর্থ), জিটিসিএল।
- ৪। ব্যবস্থাপনা পরিচালক, BETS Consulting Services Ltd.
- ৫। উপ-ব্যবস্থাপক (সমন্বয়), ব্যবস্থাপনা পরিচালকের দপ্তর, জিটিসিএল।
- ৬। অফিস কপি

প্রধান কার্যালয়: প্লট নং-এফ-১৮/এ, শের-ই-বাংলা নগর প্রশাসনিক এলাকা, আগরাগাঁও, ঢাকা-১২০৭।
Head Office: plot No. F-18/A, Sher-E-Bangla Nagor Administrative Area, Agargaon, Dhaka-1207.

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার

পরিবেশ অধিদপ্তর

ফরম-৩

পরিবেশগত ছাড়পত্রের জন্য আবেদন পত্র

সহকারী পরিচালক
পরিবেশ অধিদপ্তর, কক্সবাজার জেলা অফিস
সায়মান রোড, জাওয়াতলা
কক্সবাজার।

জনাব,

আমি/আমার প্রস্তাবিত গ্যাস সংকলন পাইপলাইন নির্মাণ প্রকল্পের জন্য নিম্নে প্রদত্ত তথ্যাদিসহ কাগজ পত্র জমা দিয়া পরিবেশগত ছাড়পত্র প্রদানের জন্য আবেদন করিতেছিঃ

- ১। শিল্প প্রতিষ্ঠান বা প্রকল্পের নাম : Summit LNG Terminal Co. (Pvt.) Ltd. কর্তৃক স্থাপিতব্য Offshore LNG FSRU moored at STL (Submerged Turret Loading) প্রকল্প।
ক) শিল্প প্রতিষ্ঠান বা প্রকল্পের অবস্থানগত ঠিকানা : কক্সবাজার জেলা।
খ) অফিসের বর্তমান ঠিকানা : Summit LNG Terminal Co. (Pvt.) Ltd. সামিট সেন্টার, ১৮ কাওরান বাজার, ঢাকা-১২১৫।
- ২। (ক) প্রস্তাবিত শিল্প প্রতিষ্ঠান বা প্রকল্প
> নির্মাণ শুরু করার সম্ভাব্য তারিখ : জানুয়ারী-২০১৮
> নির্মাণ সমাপ্তির সম্ভাব্য তারিখ : সেপ্টেম্বর-২০১৮।
> শিল্প বা প্রতিষ্ঠানের ক্ষেত্রে পরীক্ষামূলক উৎপাদন ও অন্যান্য ক্ষেত্রে পরীক্ষামূলক উৎপাদন শুরু ও অন্যান্য ক্ষেত্রে প্রকল্প চালু হইবার তারিখ : প্রযোজ্য নয়।
(খ) বিদ্যমান শিল্প প্রতিষ্ঠান বা প্রকল্প শিল্প প্রতিষ্ঠানের ক্ষেত্রে পরীক্ষামূলক উৎপাদন শুরু ও অন্যান্য ক্ষেত্রে প্রকল্প চালু হইবার তারিখ : প্রযোজ্য নয়।
- ৩। উৎপন্ন হ্রবের নাম ও পরিমাণ(দৈনিক/মাসিক/বার্ষিক) : প্রাকৃতিক গ্যাস, দৈনিক প্রায় ১৭৫০০০ মিলিয়ন কিউবিক ফিট/ বছর
- ৪। ক) কাঁচামালের নাম ও পরিমাণ (দৈনিক/মাসিক/বার্ষিক) : প্রাকৃতিক গ্যাস, দৈনিক প্রায় ১৭৫০০০ মিলিয়ন কিউবিক ফিট/ বছর
খ) কাঁচামালের উৎস : কক্সবাজার জেলায় প্রস্তাবিত Regasified Liquefied Natural Gas (RLNG) Terminal.
- ৫। ক) দৈনিক পানি ব্যবহারের পরিমাণ : প্রযোজ্য নয়।
খ) পানির উৎস : প্রযোজ্য নয়।
- ৬। ক) জ্বালানীর নাম ও পরিমাণ (দৈনিক/মাসিক/বার্ষিক) : প্রাকৃতিক গ্যাস, দৈনিক প্রায় ১৭৫০০০ মিলিয়ন কিউবিক ফিট/ বছর
খ) জ্বালানীর উৎস : কক্সবাজার জেলায় প্রস্তাবিত Regasified Liquefied Natural Gas (RLNG) Terminal.

পৃষ্ঠা-১/২

৭। ক) দৈনিক সন্ধ্যা তরল বর্জ্যের পরিমাণ	ঃ প্রযোজ্য নয়।
ব) বর্জ্যের নির্গমন স্থল	ঃ Storage tank.
গ) দৈনিক সন্ধ্যা নিঃসরণযোগ্য গ্যাসীয় পদার্থের পরিমাণ	ঃ অতি অল্প পরিমাণ।
ঘ) গ্যাসীয় পদার্থের নির্গমন পদ্ধতি	ঃ উন্নুক্ত নির্গমন লাইন।
৮। মাপ, খতিয়ান উল্লেখপূর্বক মৌজা ম্যাপ	ঃ সংযুক্ত ম্যাপ ই আই এ (EIA) প্রতিবেদনের অধ্যায়-৩ এ সংযুক্ত।
৯। ক) রাজধানী উন্নয়ন কর্তৃপক্ষ/চট্টগ্রাম উন্নয়ন কর্তৃপক্ষ/খুলনা উন্নয়ন কর্তৃপক্ষ/রাজশাহী উন্নয়ন কর্তৃপক্ষ/স্থানীয় কর্তৃপক্ষ এর অনুমতিপত্র (প্রযোজ্য ক্ষেত্রে)	ঃ প্রকল্প সংশ্লিষ্ট স্থানীয় কর্তৃপক্ষের অনাপত্তি চ্যুতপত্র সংযুক্ত।
১০। ক) প্রস্তাবিত বর্জ্য পরিশোধনাগারের নক্সাসহ সময়সূচী	ঃ প্রযোজ্য নয়।
খ) বরাদ্দকৃত অর্থ	ঃ প্রযোজ্য নয়।
গ) জায়গার পরিমাণ	ঃ প্রযোজ্য নয়।
১১। উৎপাদন প্রক্রিয়ার ফ্লো-ডায়াগ্রাম	ঃ প্রযোজ্য নয়।
১২। ক) শিল্প প্রতিষ্ঠান বা প্রকল্পের লোকেশন ম্যাপ	ঃ প্রকল্পের লোকেশন ম্যাপ ই আই এ (EIA) প্রতিবেদনের অধ্যায়-৩ এ সংযুক্ত।
ব) লে-আউট প্রান (বর্জ্য পরিশোধনাগারের অবস্থান নির্দেশিত)	ঃ প্রযোজ্য নয়।
১৩। ক) আই ই ই/ই আই এ প্রতিবেদন (প্রযোজ্য ক্ষেত্রে)	ঃ ই আই এ (EIA) প্রতিবেদন।
খ) পরিবেশ ব্যবস্থাপনা পরিকল্পনা (প্রযোজ্য ক্ষেত্রে)	ঃ ই আই এ (EIA) প্রতিবেদনের অধ্যায়-৬ চূড়ান্ত।
১৪। সন্ধ্যাতা সমীক্ষা প্রতিবেদন (প্রযোজ্য ক্ষেত্রে)	ঃ প্রযোজ্য নয়।

(সীলমোহর)

Engr. Rukhsana Nazma Eshaque
General Manager (Planning)
Gas Transmission Company Ltd
Dhaka- 1000

(উদ্যোক্তার স্বাক্ষর)
নাম : রুকসানা নাজমা ইছহাক
পদবী : মহাব্যবস্থাপক (পরিকল্পনা)
ঠিকানা : গ্যাস ট্রান্সমিশন কোম্পানী লিমিটেড (জিটিসিএল)
প্লট নং এক-১৮/এ
শের-ই বাংলা নগর প্রশাসনিক এলাকা
আপারগাঁও, ঢাকা।
তারিখ : -১১-২০১৭

-ঃ ঘোষণা :-

আমি এই মর্মে ঘোষণা করিতেছি যে, আবেদনপত্র প্রদত্ত তথ্যাদি আমার জ্ঞানমতে সত্য এবং ইহাতে কোন তথ্য গোপন বা বিকৃত হয় নাই।

(উদ্যোক্তার নাম ও স্বাক্ষর)

Engr. Rukhsana Nazma Eshaque
General Manager (Planning)
Gas Transmission Company Ltd
Dhaka- 1000

পৃষ্ঠা-২/২

২৪

চালান ফরম

টিকিয়ার ফরম নং ১ (এস, আর ৩৭ প্রক্টব্য)

চালান নং ১৯.১১.২০১৭ তারিখ ১৯.১১.২০১৭

বাংলাদেশ ব্যাংক / সোনালী ব্যাংকের ..Dhaka.. জেলার Kawranbazar... শাখায় টাকা জমা দেওয়ার চালান

কোড নং 1 4 5 4 1 0 0 0 0 2 6 8 1

যাহার মাধ্যমে প্রদত্ত হইল তাহার নাম ও ঠিকানা	সে ব্যক্তি / প্রতিষ্ঠানের পক্ষ হইতে টাকা প্রদত্ত হইল তাহার নাম, পদবী ও ঠিকানা	জমা প্রদানকারী কর্তৃক পূরণ করিতে হইবে কি-বাকল জমা দেওয়া হইল তাহার বিবরণ	মুদ্রা ও স্টেম্পের বিবরণ / ড্রাকট, পেন্সি, অতিরিক্ত ও গেস্টের বিবরণ	টাকার অংক টাকা	বিভাগের নাম এবং চালানের পূর্ণাঙ্গনকারী কর্মকর্তার নাম, পদবী ও নম্বর।*
Md. Abdul Rasid Mob: 01731005410 Summit Centre, 18, Kawran Bazar C/A, Tejgaon, Dhaka - 1215	Gas Transmission Company Ltd. (GTCL) On behalf of Summit LNG Project.	EIA Fees	Cash	500,000/-	
টাকা (কথায়) Five Lacs Only.				500,000/-	
টাকা পাওয়া গেল					
তারিখ: ১৯.১১.২০১৭					

১৯.১১.২০১৭

১৯ NOV ২০১৭

মাহেশখালি
ব্যাংকের কার্যালয় / চালান নং ১৯.১১.২০১৭
Muhammad Mannun Khatun
Senior Officer Cash
Kawran Bazar Br. Dhaka.

নোট : ১। স্টেম্প-এ নম্বরের পরিচয় দেওয়া হইলে স্টেম্পের নম্বর জাতিয়া হইবে।
২।* যে সকল স্টেম্পের অতিরিক্ত কর্তৃক পূর্ণাঙ্গন প্রদানের, সে সকল স্টেম্পের অযোগ্য হইবে।
উপসংহার নং/১০০০-১০০৪১৭৪-১, ৪০,১০০, ০০০ কপি, ২০০০।

Annexure-12 : Letter to Bangladesh Economic Zones
Authority (BEZA)



রূপান্তরিত প্রাকৃতিক গ্যাস কোম্পানী লিমিটেড

RUPANTARITA PRAKRITIK GAS COMPANY LIMITED
(A Company of Petrobangla)

সূত্রঃ ২৮.১৯.২২৪৯.৭০১.৪১.০১০.১৭/১৫৬

তারিখঃ ০৩/০১/২০১৮

নির্বাহী চেয়ারম্যান

বাংলাদেশ ইকোনোমিক জোনস অথরিটি (বেজা)

লেভেল-১২, মোনাম বিজনেস ডিস্ট্রিক্ট

১১১, বীর উত্তম সি. আর দত্ত রোড


কাওরানবাজার, ঢাকা-১২০৫।

বিষয় : কক্সবাজারের মহেশখালীতে Summit LNG Terminal Co. (Pvt.) Ltd. কর্তৃক বাস্তবায়িতব্য ভাসমান এলএনজি টার্মিনাল (FSRU) স্থাপন কার্যক্রম।

মহোদয়,

কক্সবাজারের মহেশখালীতে দৈনিক ৫০০ এমএমসিএফডি ক্ষমতাসম্পন্ন দ্বিতীয় ভাসমান এলএনজি টার্মিনাল স্থাপনের নিমিত্ত গত ২০ এপ্রিল ২০১৭ তারিখ জ্বালানি ও খনিজ সম্পদ বিভাগ ও Summit LNG Terminal Co. (Pvt.) Ltd. এর সাথে Implementation Agreement (IA) এবং পেট্রোবাংলা ও Summit LNG Terminal Co. (Pvt.) Ltd. এর সাথে Terminal Use Agreement (TUA) স্বাক্ষরিত হয়। স্বাক্ষরিত চুক্তি অনুযায়ী Summit, ১৫ বছর ধরে টার্মিনালটি পরিচালনা করবে এবং তদপরবর্তিতে পেট্রোবাংলাকে তা হস্তান্তর করবে। বর্ণিত টার্মিনালটি Co-ordinate N 21°33' 20.461207" ; E 91°48' 58.223383" এ গভীর সমুদ্রে স্থাপিত হবে এবং সমুদ্রতলদেশ হয়ে Tie-in point (Zero point: Co-ordinate N 21°34'22.81" ; E 91°51'47.71") পর্যন্ত অংশে সামিট Sub-sea Pipeline স্থাপন করবে। চুক্তি অনুযায়ী আগামী অক্টোবর ২০১৮ নাগাদ বর্ণিত টার্মিনালটি হতে জাতীয় ধীরে গ্যাস সরবরাহ করার লক্ষ্যমাত্রা নির্ধারিত রয়েছে। বর্তমানে প্রকল্পের জন্য পরিবেশ অধিদপ্তর হতে ছাড়পত্র গ্রহণের কার্যক্রম চলমান রয়েছে। পরিবেশ অধিদপ্তরের নির্দেশনা মোতাবেক প্রকল্প সংক্রান্ত সার্বিক বিষয়টি অবহিত করা হ'ল।

আপনার বিশ্বস্ত


(প্রকৌ. মোঃ কামরুল হোসেন)
ব্যবস্থাপনা পরিচালক

অনুলিপিঃ

১. সচিব মহোদয়ের একান্ত সচিব, জ্বালানি ও খনিজ সম্পদ বিভাগ, বাংলাদেশ সচিবালয়, ঢাকা।
২. উপ-মহাব্যবস্থাপক (সমন্বয়), চেয়ারম্যান শাখা, পেট্রোবাংলা, ঢাকা।
৩. উপ-ব্যবস্থাপক টু পরিচালক (অপারেশন এন্ড মাইন্স) ও এলএনজি সেল প্রধান, পেট্রোবাংলা, ঢাকা।
৪. দপ্তর নথি।

Annexure-13 : Draft National Oil Spill Contingency Plan

DEPARTMENT OF ENVIRONMENT
MINISTRY OF ENVIRONMENT AND FORESTS
GOVERNMENT OF BANGLADESH

National Oil Spill Contingency Plan

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1. Preface

- Preservation and Protection of marine environment, prevention and control of Pollution is a statutory duty of the Government of Bangladesh. Responsibilities of co-ordination in the event of an oil spill at sea, coastal areas and waterways of the nation is of utmost importance as this issue not only involves the health, ecology and environment of the nation, but resources of neighboring countries as well. As such, a national contingency plan is required for each nation, which would outline all the steps to be taken in cases of spillage incidents and contingencies and act as a guide for regional coordination.
- The contingency plan would act as a reference of instructions on all types of contingencies so the responsible agencies can act simultaneously in synchrony on a common ground.
- The plan would include all methods of pollution control and remedial measures for reference.
- The plan would comprehensively list all contact points for emergencies with enlisted resources to make instantaneous and adaptive plan for a response, considering both national and international correspondents.

2. Record of amendments

No.	Date	Amendment	Amending Authority

3. Record of supplements

No.	Document Ref No.	Title	Author

4. Abbreviation and acronyms

Provided following is the list of abbreviated terms and their explanation as utilized in this document:

Abbreviation/Acronyms	Expansion
DoE (DOE)	Department of Environment
MoEF	Ministry of Environment and Forests

5. General

Oil spills are one of the gravest detrimental incidents that can occur to the environment. They are long-lasting disasters that can affect large areas of land, coast and sea and underlying plant and animal ecology. Oil spills can have several different effects. Initially it smothers organisms physically, particularly heavy oils. Smothering may restrict an organism's respiration, feeding and thermal regulation. Chemicals associated with oil may be absorbed into the organism's organs, tissues and cells which can put the organism's life at risk. In case of large spills, significant change can be observed in the ecosystem. There may be loss of important organisms which bind the ecosystem together by its individually specialized functions. This can have disastrous effects on dependent organisms and the food chain. Spilt oil may also cause loss of habitat for organisms.

Bangladesh, specifically, is at high risk of damage in instances of oil spills. The country's delta has sensitive and precious ecology at the mangrove forest and coasts. Being a river-prolific country, there is high traffic movement in the waterways, both inland and deep sea. The pollution from blow-out, collision, stranding, and other marine accidents can threaten marine life in the inter-tidal zones, fisheries, sea birds, recreational beaches and tourism with subsequent loss of revenue. The preparation of a National Contingency Plan is, therefore, necessary to identify the national capabilities and resources in order to establish an organizational structure to combat marine pollution so that focal points and lead agencies are identified.

6. Role of the Government: Department of Environment

As mandated after several consecutive consensus, it has been decided that the Ministry of Environment and Forests – specifically the Department of Environment – will play the key leadership role in coordinating response to incidents such as oil and chemical spills. Since the primary objective of the Department has always been safeguarding the nation's people and environment against possible pollution activities, it is natural that the Department possesses trained manpower, expertise and networking resources to initiate an effective response. With determination of 14 most important stakeholders in the coalition for disaster response, the team will use this contingency plan as reference.

The logical basis of DoE being the default coordinating responder is due to its background of primary responsible party for environmental protection. In 1977, Environment Pollution Control Board with 16 members headed by a Member of the Planning Commission and Environment Pollution Control Cell headed by a Director with staff complement of 26 was established. This was followed in 1977 by the establishment of the Environment Pollution Control Project, in 1985 by the establishment of the Department Pollution Control and finally, in 1989 by the restructured and renamed the Department of Environment (the Department) the activities of which are overseen by a Director General. The Department discharges its responsibilities through a head office and six Divisional offices located in Dhaka, Chittagong, Khulna, Bogra, Barisal and Sylhet. Of late, the Government has set up 21 new offices at district level with the creation of 468 new positions. Currently DOE staffs 735 highly

trained specialized technical experts who can take swift decisions in times of crises. As the department acts as a communicating and technical bridge between different sectors of the government and the private authority sector, its networking capabilities and response action is strong.

The legislations that enable the department to take action include (but not limited to) the following:

- The Environment Conservation Act (ECA), 1995
- The Environment Conservation Rules (ECR), 1997
- The Environment Court Act, 2000

7. Scope

The contingency plan is action-oriented, covers aspects such as reporting, communication, alerting, assessment, operations, administration, finances, public relations and arrangements. The plan assigns the responsibility for various tasks to be undertaken by the relevant government departments and agencies, identify trained personnel, equipment, and resources, and means of access to the same. Physical resources may be specialized multi-purpose pollution combating equipment such as vessels, aircraft and communication systems. The plan also provides the framework of co-ordination of integrated response by various government departments and agencies to protect the environment from the deleterious effects of pollution by oil.

8. Objectives

The objectives of the plan are:

- a) To develop appropriate and effective systems for the detection and reporting of spillage of oil.
- b) To ensure prompt response to prevent, control, and combat oil pollution.
- c) To ensure that adequate protection is provided to the public health and welfare, and the marine environment.
- d) To ensure that appropriate response techniques are employed to prevent, control, and combat oil pollution, and dispose of recovered material in an environmentally accepted manner.
- e) To ensure that complete and accurate records are maintained of all expenditure to facilitate cost of recovery.

9. Resource Agencies

The government departments and agencies who will act as resource agencies as required to support the actions of the coordinating authority are:

- A. Bangladesh Navy
- B. Bangladesh Coast Guard
- C. Ministry of Shipping
- D. Ministry of Petroleum and Natural Gas
- E. Department of Agriculture

- F. Major Port Authorities
- G. Coastal Administrative Authorities
- H. Bangladesh Petroleum Corporation (BPC)
- I. Oil Refineries
- J. Mercantile Marine Department (MMD)
- K. Directorate General of Shipping (DGS)
- L. Institute of Marine & Fisheries Science, Chittagong University (IMFS-CU)
- M. Any other concerned agency

10. Organization

The Ministry of Forest and Environment, specifically the Department of Environment, will be the nodal ministry for crisis management in case of an oil spill disaster.

During a crisis all the agencies will co-operate by providing resources and expertise. They will be coordinated by requests of central authority. Responsibility of individual agencies will be defined in a more elaborate plan according to specialization of those agencies.

For instances, the port authorities will be responsible for the response of accidents within port limits. Oil and petroleum exploration and production corporations will be responsible for instituting preventive, precautionary, and other measures for monitoring, controlling and combating an oil spill contingency in their area of operations. The Bangladesh Navy and Coast Guard will make their facilities and resources available to address the situation, such as – aircrafts, ships, logistics support, and manpower. Ministry of Shipping will provide waterways resources necessary, such and tug boat or assessment boats and Ministry of Petroleum and Natural Gas will arrange tank barges and store recovered oil. Director General of Shipping, Ministry of Shipping, will be responsible for all negotiations with the vessel, cargo owners, and insurers and will also conduct all negotiations regarding compensations and indemnification. Ministry of Environment and Forest/or Agriculture will provide scientific advice regarding species at risk, shore-line sensitivity, restriction of fishing activities, use of dispersant chemicals, beach cleaning methods, etc. Ministry of Finance will provide authorization for expenditure and funds for initial response and ensure adequate financial records are maintained.

From the government's representation, the Department of Environment will be the nodal ministry for crisis management in case of an oil/chemical spill disaster, and the Director General will be the Chairman of the Crisis Management Group (CMG). Other members of the Crisis Management Group that stand constituted in case of an oil/chemical spill disaster shall be the Secretary for Environment, Foreign Secretary, Secretary of Environment and Forests, Shipping, Petroleum and Natural Gas, Urban Development, Science and Technology, Agriculture, Industry and commerce, and the Defence Secretary. Apart from that, Head of Bangladesh Navy, Head of Bangladesh Coast Guard, Chairman of the concerned ports and the DG of Energy will also be members of the group. The group may co-opt any other concerned heads of department and experts, as it may deem necessary. The CMG shall be functional as soon as a crisis situation develops.

The Director General, Department of Environment as a central coordinating authority has the overall responsibility to ensure that appropriate response is made to any incidence in the waterways of Bangladesh and the Bay of Bengal. Additionally, the director's interest will also involve any

international incident in the waterways of neighboring nation or the participating parties in the South Asian Seas Region. He will direct the various aspects of the operations and will be assisted by the Commanders of Bangladesh Navy, Bangladesh Coast Guard, Port Authorities and other stakeholders as required, depending on the proximity of the scene of contingency. The Regional Pollution Response Officer (RPRO) will be the On-Scene Responder (OSR) and act as the representative of the Regional Authority to co-ordinate all activities at the scene of pollution through the relevant authority in the vicinity of the region/area. The On-Scene Responder will pass on regular reports to the relevant regional heads and the Coast Guard/Navy Headquarters, of his assessment, and of resources and assistance required. All Bangladeshi flag ships, oil/chemical handling facilities in ports, coastal oil refineries and offshore oil platforms operating in the maritime zones of Bangladesh shall have onboard, the DoE approved oil pollution emergency plan.

The port authorities will be responsible for the response to accidents within the port limits. They will keep the DoE representatives informed and request for any additional assistance through the Regional Communication/Operations Centre. The responsibility for combating oil/chemical spill contingencies on shore would be that of the local DoE and relevant government offices for prevention and control of water pollution. The oil/chemical and petroleum exploration and production agencies will be totally responsible for instituting preventive, precautionary, and other measures for monitoring, controlling and combating an oil spill contingency in their area of operations. Detailed delineation of functional responsibility for monitoring, controlling and combating marine pollution by spillage of oil into the sea is as given at **Appendix A**. DoE will designate an officer as Pollution Response Officer (PRO) for different national regions who will lead the initial response team to the scene of incidence within her/his area of jurisdiction under the overall guidance of the Regional Pollution Response Officer. He will be responsible for the following:-

- a) Directing the employment of needed resources for prevention of pollution, containment, cleanup, and disposal of any pollutants, and restoration of the site.
- b) Providing a focal point of information for all agencies concerned.
- c) Preparing cost analysis and detailed report covering all aspects of the spill.
- d) Collecting samples for possible analysis.
- e) Following responsibilities will be allocated to various agencies for implementation of the National Oil/Chemical Spill Contingency Plan:
- f) The Bangladesh Navy/coastal state authorities/port authorities will make the facilities of their communication/operation centers available to receive and disseminate reports of marine pollution accidents.
- g) The Bangladesh Navy and the Coast Guard will provide fixed wing aircrafts or helicopters to conduct aerial surveillance or provide logistic support in movement of men and materials to the incident site. They will also provide ground to air communication link at the site for use by the on-scene responding officer.
- h) The Port Authority will provide tugs and pollution control equipment at the incident site within port limits.
- i) Ministries of Shipping, and Petroleum and Natural Gas will provide tankers or tank barges for storage of recovered oil or oil in water emulsions, and will arrange for storage and eventual disposal of recovered oil.
- j) Director General of Shipping, Ministry of Shipping, will be responsible for all negotiations with the vessel, cargo owners, and insurers and will also conduct all negotiations regarding compensations and indemnification.

- k) Ministry of Environment and Forest/or Agriculture will provide scientific advice regarding species at risk, shore-line sensitivity, restriction of fishing activities, use of dispersant chemicals, beach cleaning methods, etc.
- l) Ministry of Finance will provide authorization for expenditure and funds for initial response and ensure adequate financial records are maintained.
- m) Coastal regional authorities / district administration / departments / public works / civil defence departments will provide personnel and equipment, as required, for shoreline clean-up and ensure safety and protection of the local population and resources.

The outline organization for combating a national oil spill contingency is given at **Appendix B**. The detailed functions of various concerned departments and agencies are given at **Appendix C**.

11. Command and Control

The overall command and control of conducting operations to combat an oil spill incident will be exercised by the Director General, Department of Environment.

12. Reporting and Alerting Procedures

When an incident occurs which could result in marine pollution, it is to be reported to the respective regional DoE office and regional operation center which will record the details and contact the respective agency or departments for necessary action, who will then relay the same to the Regional Communication Centre (RCC). The format of the report is at **Appendix D**. The Annexure to the appendix gives the pollution report and message report in accordance with the International Maritime Organization's directives. Bangladeshi flag ship masters, offshore platform operators and pilots of the ports operating in the maritime zones of Bangladesh are to report incidents without any delay to DoE and RCC as per the format in the NOSCOP.

13. Assessment

The regional offices of DoE, Port Authorities, Bangladesh Navy and Bangladesh Coast Guard are to prepare for combating a major oil spill up to 10,000 tonnes. The requirement of combating a major oil spill above 10,000 tonnes will be undertaken by pooling all available resources and equipment in the country. The rapid assessment of the threat presented by the marine accident is essential. If an actual spill has occurred, then the designated Regional Officer, On Scene Officer should, if possible, conduct aerial surveillance of the oil slick and from weather and hydrographic data, predict probable trajectory of the oil slick. If the oil slick is moving offshore towards the open sea, then monitoring on a regular basis is the preferred control option. If the oil slick is moving onshore, then the response could be either containment and recovery, chemical dispersion or shoreline cleanup. The On-Scene Officer must evaluate whether the required response is within the local resource capability or requires resources/equipment from other agencies and accordingly advise all key stakeholders.

14. Regional Contingency Plan (RCP) / Local Contingency Plan

The waterways of the nation and the marine area is divided into separate sectors which are under jurisdiction of relevant local authorities. While the national plan outlines response in grander scale, the local authorities will delineate their own adapted versions of contingency plans so that all details are planned out beforehand, following the guidance of national plan.

15. Spill Control and Cleanup Procedure

An accurate assessment of spill incident is essential before appropriate spill control and clean up procedures can be activated. Generally, containment and recovery are preferred but in some instances it may be necessary to use chemical dispersants. Details of the various methods of oil spill clean-up are available in manuals and publications on oil pollution control held with the regional pollution response officers. The cleaning up of shoreline beaches will be the responsibility of the respective coastal agencies. DoE would, however, advise and assist the authorities and local agencies for clean-up and disposal of oil as appropriate.

Disposal of recovered oil is a difficult process. The recovered oil is to be stored in temporary pits till it is transferred to reception facilities.

Details of the vessels / pollution control equipment held, other effort/facilities available, organizational structure / composition of local action group and important telephone numbers, etc. gained from the various local contingency plans received so far would need to be updated by the respective authorities from time to time based on induction of equipment / vessels / manpower, etc. keeping all concerned informed.

16. Disposal of Oil

Recovered oil is to be stored in temporary pits till it is transferred to reception facilities. The Guidelines of Disposal of Oil is placed at **Appendix 'CB'** for reference.

17. Record Keeping and Preparation of Claims

In order that claims may be processed with minimum delay, it is essential that accurate records are maintained to support claims. It should be noted that claims should be based on expenses actually incurred, that these are made as a direct result of an incident, and that the expenses incurred are reasonable. In the case of economic loss, documentation supporting the claims should demonstrate how the claim has been calculated.

The following aspects are to be considered while assessing cost of an oil spill combating and operating, and preparation of claims:

- a) Delineation of the area affected describing the extent of pollution and identifying areas most heavily contaminated. This may be best presented as a map or chart accompanied by photographs.

- b) Summary of events including a description of the work carried out in different areas and of the working methods chosen in relation to the circumstantial evidence linking an oil pollution with the ship involved in the incident (e.g. chemical analysis).
- c) Labour costs (numbers and categories of laborers, rates of pay days, hours worked, total costs etc).
- d) Data on which work was carried out (weekly or daily costs).
- e) Material costs (Consumable materials, utilized fuel, food, shelter facilities, etc).

18. Important Information

The details, important telephone numbers, and other relevant information as listed below are to be updated and kept readily available for smooth implementation of national/regional/local contingency plans.

- (i) Essential information:
 - (a) Important telephone numbers and other details - **Appendix E**
 - (b) Data in respect of vessels available for combating oil spills - **Appendix F**
 - (c) Details of pollution response equipment held by the Bangladesh Coast Guard - **Appendix GA**
 - (d) Details of pollution response equipment held by the Bangladesh Navy - **Appendix GB**
 - (e) Details of pollution response equipment held by other agencies - **Appendix H**
 - (f) Details of vessels held with other agencies - **Appendix J**
 - (g) Details of aircraft available for combating oil spills - **Appendix K**
 - (h) Check off lists - **Appendix L**
 - (i) Guidelines for shoreline cleanup - **Appendix BV**
 - (j) Guidelines for use of dispersants - **Appendix BW**
 - (k) Details of rates for hire of Manpower - **Appendix BU**
 - (l) List of Approved Dispersants - **Appendix BX**
 - (m) Details of weather in the South Asian Seas - **Appendix BY**
 - (n) Details of International Resource Agencies - **Appendix CA**
 - (o) Various Powers delegated to ICG officers in respect of pollution response - **Appendix CC**
 - (p) Details of Bangladesh Disaster Resource Network - **Appendix CD**
 - (q) Registered used/waste oil Re-processors - **Appendix CK**
- (ii) Apart from the above, the following other important information is placed at appendix for easy reference.
 - (a) List of MPAs - **Appendix CE**
 - (b) Details on Coastal wetlands - **Appendix CF**
 - (c) Classification of Mangroves of Bangladesh - **Appendix CG**
 - (d) Coral Reefs in MPAs - **Appendix CH**
 - (e) Institution / organization involved in MPAs - **Appendix CJ**
 - (f) Boom Selection Matrix - **Appendix CL**
 - (g) Skimmer Selection Matrix - **Appendix CM**

- (iii) Additional details of the vessels / pollution control equipment held, other effort/facilities available, organizational structure / composition of local action group and important telephone numbers, etc. are at **Appendices M to BT**.

19. Capacity Development

DoE shall conduct joint response exercises and training programs among the resource agencies to maintain the response preparedness level. The joint exercises and training programs may also be conducted with neighboring countries to fulfill the requirement of regional oil spill contingency plan. A financial plan needs to be developed to ensure that all logistical support are in place available during crisis.

20. Salvage

UNCLOS Article 221 and important provisions of the convention are placed at **Appendix BZ**.

Appendix A - Functional Responsibilities Allocated to Ministries / Department

Ministry / Department / Agency	Responsibilities as per Allocation of Business Rules	Functional Responsibilities Allocated
1	2	3

Appendix B - Oil Spill Response Organization

- A. Bangladesh Navy
- B. Bangladesh Coast Guard
- C. Ministry of Shipping
- D. Ministry of Petroleum and Natural Gas
- E. Department of Agriculture
- F. Major Port Authorities
- G. Coastal Administrative Authorities
- H. Bangladesh Petroleum Corporation (BPC)
- I. Oil Refineries
- J. Mercantile Marine Department (MMD)
- K. Directorate General of Shipping (DGS)
- L. Institute of Marine & Fisheries Science, Chittagong University (IMFS-CU)
- M. Any other concerned agency

Appendix C - Detailed Functions of Various Concerned Departments and Agencies

1. Department of Environment

- a) The Department of Environment shall be the administrative agent for implementation of the contingency plan and for coordinating with other ministries of the Government.
- b) Mapping of ecologically sensitive areas in the coastal and offshore region in consultation technical experts.
- c) Review of the sensitivity mapping listed by other agencies.
- d) Carry out investigations of oil/chemical pollution and monitoring during spills and also deployment of research vessels for this purpose, whenever necessary.
- e) To organize research on impact of pollution on marine life based on actual oil pollution incidents.
- f) Determining policy for usage of dispersants in the areas of the territorial waters over which the Government of Bangladesh exercises jurisdiction.

2. Bangladesh Navy and Bangladesh Coast Guard

- a) To monitor occurrence and support alleviating significant spillage of oil/chemical at sea/coastal areas.
- b) To keep DoE and stakeholders apprised of the development on receipt of information about oil/chemical spill.
- c) To decide upon the nature and extent of actions required and to advise the regional headquarters/local action groups/authorities concerned regarding the action to be taken by the latter in consultation with apex committee on control of marine pollution / task force on oil/chemical spills.
- d) To arrange for chartering of tankers for oil transshipment operations, if required.
- e) If the resources available with the regional headquarters/port authorities /other agencies/local action groups are inadequate, to mobilize all available and necessary resources and direct the same towards the concerned regional headquarters/local action groups/authorities.

3. Regional Coast Guard Commanders

- a) Receiving reports of oil pollution at sea.
- b) Coordinating the activities of RCC when activated.
- c) Keeping the Director General of DoE and Head of Coast Guard apprised of developments.
- d) Processing and coordinating claims of the affected parties and participating agencies with a view to complete and forward for processing by DG shipping.
- e) Mobilizing Coast Guard resources to support OSR action at spill area.
- f) Maintaining the RCP and forward revised plans to members as may be required by RCC.
- g) Receiving periodic reports from resource agencies on account of pollution equipment and material with a view to have an up to date inventory list in the Coast Guard.
- h) Providing the administrative infrastructure to the RCC for conduct of routine and operational tasks.
- i) Providing additional sampling effort during spills when requested by OSR.
- j) Maintaining a list of national and international agencies that may be called upon to assist for pollution response at the discretion of RCC.
- k) Arranging for periodical exercises in pollution response.
- l) Providing sensor data to RCC/OSR as required.

m) Pre-designating a Coast Guard OSR.

4. Bangladesh Naval/Bangladesh Air Force Authorities

- a) Augment aerial surveillance capability of Coast Guard as necessary in the area when oil spill has occurred.
- b) To make arrangements for oil transshipment operations from any tanker which has caused or is causing or is expected to cause oil spillage.
- c) Promulgate general cautionary messages.

5. Department of Agriculture

- (a) To arrange for suitable fishing vessels on which oil dispersant equipment can be mounted if the local action group concerned is unable to mobilize this requirement locally.
- (b) Sensitivity mapping of the sea areas within the territorial waters of the state with specific information on fish breeding grounds.

6. Ministry of Petroleum and Natural Gas

- a) To assist for chartering of tanker/s when required by the regional headquarters in consultation with DG shipping for the oil transshipment operations.
- b) To make available to the regional headquarters concerned anti-pollution equipment and chemicals as are available with them.
- c) To assist in the storage ashore of oil transhipped from wrecked or damaged tanker.
- d) To assist in the assessment of the value of the oil transhipped.

7. Directorate General of Shipping

- a) To assist DoE on monitoring pollution from ships.
- b) Collection of evidence relating to oil pollution, and collating evidence collected by DoE, Navy, Coast Guard or other agencies relating to oil pollution with a view to prosecuting a polluter.
- c) To take administrative and legal action for processing claims compiled by DoE and other agencies relating to any other oil pollution incidents.
- d) To serve as a legal advisor to the RCC/OSR in matters related to oil pollution and response at sea.
- e) To advise the appropriate receiver of wrecks as regards to action to be taken.
- f) To arrange for chartering of tankers when oil/chemical transshipment operations are considered necessary by RCC.
- g) To take whatever action is necessary to realize the claims from parties responsible for the spillage.

8. Port Authorities

- (a) To be in charge of the overall co-ordination of actions in the area within port limits as regards to anti-oil/chemical pollution. In this connection, the major port authority concerned is to arrange for the preparation of a Local Contingency Plan in consultation with the DoE regional offices.
- (b) To identify a suitable tug when required for the operations.
- (c) To identify surface crafts, (i) on which dispersant spraying equipment can be mounted, and (ii) which can be used for rigging the boom.

- (d) To ensure that actions are taken by the various authorities under the overall legal responsibility of the receiver of wrecks and dock concerned.
- (e) To ensure that at least the following minimum equipment are kept available locally at all times:
 - Inflatable boom
 - Dispersant spraying equipment capable of being mounted on surface craft.
 - Suitable dispersant chemicals of the nature and quantity estimated as requirement of the Local Action Group as part of the Local Contingency Plan.
 - Oil skimmer equipment
 - Surface craft on which above dispersant equipment can be mounted and can be used for rigging boom, etc.
- (f) To arrange for training of personnel expected to be engaged in above operations.
- (g) To arrange for periodical exercise under the guidance of the RCC to keep equipment and personnel on continuous readiness for oil spill response operations.
- (h) To consult the DG, DoE, the DG Shipping, or any other authority, when further advice/ assistance is required.

9. Coastal Oil Refineries and Crude Unloading Terminals

- (a) To assist the local action group in the implementation of the Local Action Plan.
- (b) To assist the local action group in obtaining from their headquarters available additional equipment and chemicals if and when required.
- (c) To assist in chartering of tankers to undertake transportation / transshipment operations.
- (d) To arrange for the storage of oil transhipped.
- (e) To make assessment of the value of oil transhipped and cost of refining or disposal as the case may be.

10. Bangladesh Mineral, Oil and Gas Corporation

- (a) The corporation can decide their own requirement of equipment and facilities keeping in view the Government/Coast Guard suggestions from time to time regarding the type of equipment suitable in Bangladeshi conditions.
- (b) Periodically forwarding a list of response inventory to the RCC for scrutiny, evaluation and updating holdings.
- (c) Providing response equipment, material, trained personnel, and ships when required by the RCC/OSR as on available basis and without affecting their operations or their safety.
- (d) The corporation will also immediately respond to combating oil pollution around its installations up to 500 mts. and will continue to provide equipment, material, trained manpower, sampling efforts, and vessels as may be required by RCC/OSR when such oil spill will spread beyond 500 mts according to capability.
- (e) Providing data on crude oil and oil discharges.
- (f) Providing data on subsea pipe lines which may be required by RCC/OSR.
- (g) Providing oil transshipment facilities as applicable.
- (h) Provide staging facilities for helicopters in the offshore areas when engaged in pollution response in the vicinity of the corp.

11. Receiver of Wrecks

- a) To assist Local Action Groups in whatever manner necessary and possible.

Appendix D - Oil Spill Report Form

Particulars of Person/Organization Reporting Incident

A	Title	
B	Company	
C	Telephone/Fax Numbers	
D	Date/Time	
E	Spill Location	
F	Type and Quality of Oil Spill	
G	Cause of Spill	
H	Response to Spillage, if any	
I	Any Other Information	

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