

Government of Assam Assam Inland Water Transport Development Society (AIWTDS),

CONSULTANCY SERVICES FOR ENVIRONMENTAL AND SOCIAL ASSESSMENT STUDIES FOR ASSAM INLAND WATER TRANSPORT PROJECT (Part of NW-2 & NW-16)

Assam Inland Water Transport Project (P157929)



# Volume-I Environmental Management Framework (EMF)

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# **Report Data Sheet**

# Project Data

- Client : Office of the Director, Inland Water Transport, Government of Assam
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# Abbreviation

AIPCL	Assam Inland Ports Corporation Ltd
AIWTCL	Assam Inland Water Transport Corporation Limited
AIWTDS	Assam Inland Water Transport Development Society
AIWTP	Assam Inland Water Transport Project
Aol	Area of Influence
CBO	Community Based Organizations
CE	Chief Engineer
	Cumulative Impact Assessment
	Control Inland Figherica Research Institute
	Central Initian Control Doord
CPCB	Central Pollution Control Board
CV	Curriculum Vitae
CWC	Central Water Commission
DBFOI	Design Build Finance Operate and Transfer
DIWTA	Directorate of Inland Waterway Transport Assam
DPR	Detailed Project Report
EA	Environmental Assessment
ECoP	Environmental Codes of Practice
EDC	Eco-Development Committee
EHS	Environmental. Health and Safety
EIA	Environmental Impact Assessment
FIC	Engineer-In-Chief
ENE	Environmental Management Framework
	Environmental Management Information System
	Environmental Management Plan
	Environmental Management 8 Manitaring Dragram
	Environmental Management & Monitoring Program
EOI	
ESE	Environmental, Social and Economic
ESHS	Environmental, Social, Health and Safety
FA	Financial Analyst
FBS	Fixed Budget Selection
FD	Finance Department
FRI	Forest Research Institute
FTP	Full Technical Proposal
GC	General Consultant
GCC	General Conditions of Contract
GIS	Geographic Information System
GoA	Government of Assam
JEMC	Joint Forest Management Committee
ID	Institutional Development
IR	Incention Report
IRS	Indian Register of Shinning
	Instructions to Consultants
	International Union for Concernation of Nature
	International Onion for Conservation of Nature
	Inland Waterways Authonity of India
	Internetional Deals for Description and Development
	International Bank for Reconstruction and Development
IDA	
IPP	Indigenous Peoples Plan
RAP	Resettlement Action Plan
JV	Joint Venture
LAD	Least Available Depth
LCS	Least Cost Selection
LU	Land Use
LT	Long Term
MIS	Management Information System
MoEF& CC	Ministry of Environment, Forests and Climate Change
MPR	Monthly Progress Report

NGO NPV NW O&M PIA PIANC PIU PPP QAP QBS QC QCBS QC QCBS QPR RE RET RET	Non-Governmental Organization Net Present Value National Waterway Operation and Maintenance Project Influence Area Permanent International Association of Navigation Congress Project Implementation Unit Public Private Partnership Quality Private Partnership Quality Assurance Procedure Quality Based Selection Quality Control Quality Control Quality Cum Cost Based Selection Quarterly Progress Report Resident Engineer Rare Endangered and Threatened Species
REGILARAR	Rehabilitation and Resettlement
RFP RH	Request for Proposals Risk Assessment & Hazard
SA	Social Assessment
SEESA	Strategic Environmental. Economic and Social Assessment
SIA	Social Impact Assessment
SMC	Safeguard Monitoring Consultant
SMF	Social Management Framework
SPMG	Social Management Plan State Project Management Group
ST	Short Term
STP	Simplified Technical Proposal
TSC	Technical Supervision Consultant
TL	Team Leader
	Training Needs Analysis/Assessment
TORs	Terms of Reference
VR	Village Road
WB	World Bank

# Team Involved in EMF Study and Report Preparation:

**EMF consultants**: The EMF study has been carried out by EIA Team of Arkitechno Consultants (India) Pvt Ltd as per the prescribed TOR of World bank. Time to time guidance is received from Experts and Team Leaders of World Bank, Environmental and Social Experts of AIWTDS and Environmental and Social Experts of General Consultants. The report is prepared and submitted to the World Bank, GC and AIWTDS for observations. AIWTDS has contracted Arkitechno Consultants (I) Pvt. Ltd to prepare the EIA for Component 1& 3. AIWTDS hired General consultants to review and provide guidance on the work of the EIA / SIA team as they carry out their work, as well as to prepare EMF.

**Environmental study team:** The environmental team comprised of Dr. Prajakta (Environment - Team Leader), Dr. Latha Bhaskar (Social - Team Leader), Mr. Ratnesh Kotiyal (EB Expert), Mr. Rakesh Kumar Satapathy (Environmental Engineer), Mr. Niranjan Kakati (River Hydrologist), Mr. Joshua Anand (Hydrologist , Sediment), Mr. Punit Lal Mahato (LU Expert), Mr. Adhikrao Yewale (Water Expert), Mr. Arun Roy (Statistician), Mr. Sanjeev Sharma (Air and Noise Expert), Mr. Ram Das Wani (RH Expert).

EIA team is thankful for the time to time guidance, support and understanding from World Bank, GC and AIWTDS. This definitely improved our knowledge and also the report quality.

# **Executive Summary of EMF**

# 1. Background

Governments of Assam intend to upgrade the existing Inland water transport system in state. To modernize and transform IWT in Assam, the World Bank is assisting the GoA through a phase-wise project which includes up gradation of ferry Infrastructure, last mile connectivity. Fleet modernization, institutional capacity development etc. for total 11 identified Terminal / Jetty / Landing point locations. However, in phase-I, three ghats/ landing points have been selected. The project includes civil works along with new construction activity; for which it has been categorized as Environment Category-A according to World Bank classifications.

Project development / civil intervention works during development may have interface with various physical, social and biological components of the environment, i.e. water quality, aquatic and terrestrial flora & fauna, air quality, noise levels etc. at all project development stages. All these environmental components will get affected due to development and operation of the terminals and a detailed environment and social impact assessment has been carried out to assess all the potential impacts of the project. Further the impacts of development can be due to its location or due to the nature of activities to be performed during its development and operation phase thus both these aspects should be looked into while carrying out EIA study.

As the complete lists of project activities and locations have not been finalized, a framework approach has been adopted. Under this approach, the present Environmental Management Framework (EMF) has been prepared to identify all the potential but generic negative environmental and social impacts, propose mitigation measures, provide basic screening criteria for selecting subprojects, implementation and provide institutional arrangements, grievance redressal mechanisms and monitoring, reporting and documentation measures for environmental and social safeguards compliance. The EMF covers all physical works activities as well as feasibility and other studies to be carried out under the project.

# 2. Project Description

# 2.1 Strategic Components and Action Plan of the Project

# 2.1.1 **Project Development Objective (PDO)**

The Project's Development Objectives are to: (a) Improve passenger ferry infrastructure and services in Assam, and (b) to improve the institutional capacity and framework.

# 2.1.2 **Project Components**

The project is focused primarily on improving ferrying of cross-river passengers on the Brahmaputra, and seeks to use the opportunity to establish a tenable foundation for development of a modern IWT sector in Assam. The long absence of adequate policy response and piecemeal investments in IWT in the state (as also nationally) have resulted in somewhat unorganised and weak condition for the sector, which is not predisposed to a linear scale-up. Despite the odds however, Assam manages to provide ferry services to about 5 million people annually, usually along with their vehicles/livestock/goods. In order to support the functioning but ill-equipped IWT sector therefore requires a more granular approach encompassing a range of supply and demand side factors. As such, the project is guided by a binding philosophy that admits wider, and even incremental interventions as long as they contribute to strengthening institutions and planning; operational efficiency and safety; and importantly sustainability. Estimated cost of the project is USD 135 million. Broadly, the project is structured through the following three components:

# 2.1.2.1 Component 1: Institutional and Safety Strengthening

# a. Technical assistance in sector planning;

An Integrated Strategic Development Plan (ISDP) for the state is being prepared. The exercise involves preparing an overall transport strategy for Assam, and more specifically preparing

investment plan to help mainstream Water Transport in the state including multi-modal integration and last mile connectivity. Studies on EIA and SIA will also be undertaken.

# b. Technical assistance in design and roll-out of new regulatory authority;

Complementing the investments in infrastructure, the project aims to strengthen the AIWT Sector through a supportive institutional framework. A wide-ranging consultancy on Institutional Strengthening and Business Plan (ISBP) is assigned to study the apparent system weaknesses in detail and develop prescription for more effective institutions. In doing so, the study has already provided the basis for legislation for an Independent IWT regulatory authority (RA) to carry out the safety, environmental and economic regulation of the sector (shipping, ports, and shipbuilding). An important emphasis of the sub-component while assessing sector laws and regulations is particular attention to Safety regulations for vessel and passenger movement, even more specifically for women and children. Recently, the bill has been passed by the state in November 2018 for establishing an independent regulatory authority for Inland Water Transport.

#### c. Business Planning for Assam Shipping Company and Assam Ports Company;

The operational and commercial functions of the government's shipping operations and terminal services have been decided to be vested in two new corporations, the Assam Shipping Corporation (ASC) and the Assam Ports Corporation (APC) respectively. The two new corporations will be constituted under the Companies Act (2013), subject to rigors of the market. The ISBP will develop a business plan for the two companies and guide them through the initial period of independent operation.

#### d. Navigation aids, including night navigation on some routes;

The sub-component would draw on national / international experience in assessing appropriate aids to navigation, their procurement and deployment to allow 24-hour services / night navigation on most vulnerable / trafficked routes / crossing points. Beginning with pilots at 2-3 crucial locations, deployment of navigation aids will be scaled up based on the investment strategy for the sector.

# e. Establishment of an emergency response system (policy, procedures, equipment, and management);

An important objective will be to support establishment of a Search and Rescue (SAR) organization/piloting emergency response system (policy, procedures, equipment, and management) as well as improving systems for emergency preparedness including climate and natural disasters.

# 2 Training of staff for roles in restructured industry.

The ISBP consultancy will also undertake a detailed assessment of capacity building needs of DIWTA staff from the point of view of their professional development, re-skilling and job mapping needs.

# 3 Component 2: Fleet Modernization

This will include financing of an incentive scheme (known as Jibondinga) to drive private sector fleet upgrading by scrapping of unsafe or obsolete vessels and replacement with new vessels or retrofitting newer vessels with new marine engines and safety equipment.

The objective of supporting an incentive scheme is to encourage investment in modern shipping technology including adoption of greener and safer technologies, through review of fiscal and other barriers affecting quality of boat construction and maintenance. GoA has prepared a draft proposal entitled '*Jibondinga*' – meaning water as source for life/livelihood for private country boat operators, which provides incentive both for new vessel acquisition as well as for retrofitting. The scheme considers special incentive to encourage women entrepreneurs and women self-help groups. Vessels design and specifications for procurement and retrofitting will be standardized to have better regulation as well as for ease of repair and maintenance.

The project will facilitate condition surveys of the existing govt. fleet, hull & machinery, deck and outfit items to trade suitability, impact stability (for the area of operation), loading and other conditions. Select vessels may be retrofitted. This will also include measures to "green" the vessel fleet, including on waste management practices, as well as fuel efficiency and fuel mix.

Potential pilot development of a CNG refuelling station for vessels, likely in Guwahati, will also be explored. A few medium-speed shallow draft Roll-On Roll-Off (Ro-Ro) passenger/cargo catamarans for selected major traffic routes are also planned for procurement.

The project would also like to improve connectivity between the many islands, villages and faroff chars by inducing additional floating stock which is customized to the specific demands. Discussion with the district administration and local governments during early preparation missions, particularly to the upper reaches of Brahmaputra (Dibrugarh, Jorhat, Majuli), had revealed serious connectivity constraints between numerous small islands and remote chars. These have had profound impacts on health (high maternal and infant mortality), education, jobs and trade. For example, many inhabited islands do not have medical facilities and people have to travel to other nearby bigger towns to access the services, which become critical during emergencies. Similarly, there are several riverine islands that are used by people only for their livelihood - cultivation and to keep their livestock, requiring people to travel between their village and the island on a daily basis, while the ferry services are limited and irregular. The project therefore will prepare specifications and support procurement of appropriate Vessels (preferably smaller and high speed) to operate as water ambulance emergency services, school ferry / regular ferry services, search and rescue boats.

# 4 Component 3: Improvement in terminal infrastructure

This would involve developing modern, scalable floating terminal (a mix of fixed and floating) infrastructure at major urban and rural ferry ghats; road accesses, terminal buildings and other amenities that is user friendly, specifically for physically challenged, women, children, old and infirm and passengers travelling for health facilities. Given the limited bridges / land connection across the banks and the regular demand to access markets to trade local produce etc., the project will also consider providing a few RO-RO / RO-Pax (about 5 pairs) landing stations.

In particular, the component will finance the design and construction of eight new priority terminals at four busy crossings plus approximately 20 terminals (10 routes) at other locations where upgrading is urgent. It would also provide standard designs for scalable infrastructure that can be adapted for other urban and rural ferry terminals (Ghats). The infrastructure improvements / designs will in particular adopt a 'working with nature' approach which ensures that project objectives are satisfied in a way that places natural ecosystem at centre stage thereby making solutions non-damaging and sustainable (limit dredging, utilize portable / modular infrastructure design adaptation for landing stations to enhance climate change resiliency, low draft vessel designs, etc.). The developments would offer opportunities for ecotourism development, rejuvenating the river waterfront and integration of quality ferry terminals in the urban context.

This EMF lays out the requirements to ensure that appropriate screening, and implementation of relevant environment management and mitigation measures as necessary, will be carried out for all the project components (1, 2 and 3).

# 5 Summary of Works

The components of the project that may potentially cause environmental and social impact and therefore relevant for the present analysis are the physical works. The summary list of potential physical activities is provided below:

• Up gradation of Terminals / Ghats / Ferry locations as per ISDP

In addition, the present EMF covers the feasibility and other studies to be carried out under the project.

Most of the proposed activities comprise rehabilitation, maintenance or repair works. The works on flood protection structures would not involve any structure large enough to trigger the dam safety policy. The activities will be screened to ensure none of the activities result in any irreversible or significant environmental or social, negative impact. Hence all the activities carried out under the project will fall under WB Environment Category A.

# 6 Safeguards Policies Triggered

Based on an assessment of the civil works involved the following safeguards policies are relevant for the project:

Name	Key Requirements	Project Applicability
OP 4.01 Environmental	Ensures sustainability and environmental feasibility of the project. Projects are classified into A B & C category	Triggers
Assessment	depending on the nature and extent of the impact.	
OP 4.04 Natural habitats	Ensures conservation of natural habitats and discourages disturbance of nay natural habitat due to project development by recommending adoption of alternative method/route/approach or adopting management measures	Triggers
OP 4.36	Ensures that project activities do not disturbs/interfere with	May be triggered
Forests	the forest, forest dwellers activities, fauna and flora of the forest. Prevents and discourages deforestation and impacts on rights of forest dependent people.	for Forest Triggers for tree
WBG Environmental, Health and Safety (EHS) Guidelines (general)	The applicability of the EHS guidelines should be tailored to the hazards and risks established for each project on the basis of the results of an environmental assessment	Applicable
WBG sector- specific EHS guidelines for Jetty, Harbours and Terminals.	The EHS Guidelines for ports, Harbours, and Terminals are applicable to marine and freshwater jetties, harbours, and terminals for cargo and passengers.	Applicable

# 7 Environmental and Social Safeguards Screening

As part of environmental and social assessment process, environmental and social safeguards screening exercises have been conducted. The screening exercise has identified the following potential impacts from the project activities:

# **Positive Impacts:**

- Improvement in IWT and north south connectivity in Assam
- Protection of human lives
- Poverty reduction through protection of livelihood and productive assets
- Protection of vulnerable population from extreme poverty, deprivation, social and economic inequalities that would impact positively on economic growth and human development index.
- Well-being of children
- Improvement in income and living standards.
- Protection of vulnerable groups from disasters
- Protection of villages and settlement from damages to housing and other physical assets.
- Reduction in temporary displacement.
- Decrease in area of land lost due to erosion.
- Improvement in local environmental and social conditions.
- Decrease in public health risk by reducing incidence of water borne and other disaster related diseases, and mental fears
- Protection against damages to crop and livestock.
- Increase in agricultural production and economic gain.
- Reduction in poverty through generation of employment opportunities for the locals.

# **Negative Impacts:**

- Water pollution
- Use of water for construction
- Elimination of washing areas/sites

- Leakages of chemicals etc.
- Land pollution may happen when solid waste material, camp site area, stone stacking area and removed vegetative cover is left unattended
- Noise and vibration due to use of machinery and movement of vessels
- Air pollution due to smoke and dust
- Traffic and public nuisance
- Removal of vegetation (mostly herbs and shrubs) during site clearance
- Land use change
- Health and safety issues of subprojects professional staff/labour and communities residing near project areas
- Access issues for communities residing near projects areas
- Threat to cultural environment due to influx of work force, may have impact on gender base violance
- Risk hazard
- Terrestrial and aquatic ecology

The EMF assess all of these potential negative environmental and social impacts and provide mitigation measures to address these impacts as well as lists down institutional arrangements to ensure that the mitigation measures are implemented.

A Social Management Plan (SMP) as a part of sub-project specific ESMP will be prepared to address construction related social impacts of the sub-projects. A Resettlement Policy Framework (RPF) will be developed as a part of SMFto allow application of OP 4.12 requirements. RPF defines objectives and principles of resettlement, including a screening mechanism for sub-projects to ensure that no such sub-projects would be selected, which involve acquisition of private land and significant resettlement impacts. In case the land is required from government departments, common community land and private titleholders; it will be acquired as voluntary donation. Inaddition to this, RPF includes mechanism for preparation of Resettlement Action Plans(RAPs) to efficiently mitigate and compensate low to moderate level social impacts, institutional arrangements to implement RAPs, monitoring and reporting of RAPs implementation and funding mechanism for them. During preparation of RAPs and ESMPs consultations will be conducted with potentially affected persons and other stakeholders, to ensure support of potentially affected and beneficiary communities, and other stakeholders. These stakeholders will be engaged during implementation of RAPsand ESMPs and monitoring of subproject results will be done via development of a citizen's engagement mechanism such as access to information, education and communication, feedback and grievance redressal mechanisms. These mechanisms will ensure transparency and accountability of project implementers and enhance positive impacts of the project.

The EMF identifies and categorizes all potential activities (subprojects) that may require physical works, identifies the instrument type that will be used to screen, assess, and mitigate the negative environmental impacts, details and extent of the stakeholder consultation that shall be needed for each assessment type, the disclosure requirements and the institutional, reporting and monitoring measures that shall be needed to ensure implementation of mitigation measures.

The EMF includes identification of all possible project-environment interactions, categorization of environmental impacts, identification of mitigation measures, a comprehensive environmental and social baseline, identification of stakeholders and details and results of a comprehensive stakeholder consultation exercise, institutional arrangements needed to ensure implementation of mitigation measures, monitoring, reporting and documentation regimes and table of costs associated with implementation of the EMF.

# 8 Screening Safeguards

The EMF categorizes subprojects on the basis of nature of activities, potential impacts on environment and or people. The EMF specifies types and extent of environmental and social assessments that will need to be carried out before initiating each subproject. The EMF includes social and environmental checklists that will be used to assess the potential impacts of each subproject on the basis of its scale/size, nature and potential negative impacts. These checklists

prescribe further screening and environmental and social management instruments to be prepared for subprojects which might have more expansive impacts.

# 9 Monitoring and Reporting

The project will employ a three tiered monitoring structure with focal persons nominated from the construction staff to monitor impacts during works phase. The environmental and social safeguards specialist will compile the monitoring checklists to prepare and collate regular environmental progress reports. In addition to this, annual third party validation will also be conducted to validate compliance with the EMF and RPF, and implementation of safeguard instruments such as RAPs, ESMP.

# 10 EMF Disclosure

The EMF shall be released on the IAs and project website, hard copies shall be sent to all institutional stakeholders and all their regional offices. The EMF shall be disclosed internally within the World Bank and shall be released on info shop. The EMF and RPF will be translated into local language and disclosed on the websites of IAs and the projects, and distributed among institutional stakeholders and affected and beneficiary communities at the early stage of sub-projects.

#### **11** Stakeholder Consultations

Stakeholder consultations have been carried out while finalizing the project details and during the preparation of EMF and RPF. These consultations have been carried out with institutional as well as grass-root stakeholders. The consultations have revealed that the project is considered to have a number of positive social and environmental impacts. However, in particular, the stakeholders suggested that mechanisms in EMF should ensure selection of sub-projects on the basis of community needs, regular consultations, participation, communication, access to information, grievance redressal of project affected and beneficiary communities and other stakeholders; and mitigation of environment and social/resettlement impacts in an effective manner.

#### 12 Grievance Redress Mechanism (GRM)

Complaints can be registered through multiple grievance uptake channels, such as a dedicated helpline, email, by letter to the GRCs (a divisional level or upper level GRC) or walk-ins and registering a complaint on grievance logbook to be provided at each project site/ghat or suggestion box. There will be specific procedures for Gender Based Violence (GBV) including confidential reporting with safe and ethical documenting of GBV cases. An SOP/Guidebook will be developed which will lay down procedures for handling grievances in a timely and effective manner.

A divisional level Grievance Redressal Committee (GRC) will be set up to resolve the complaints from the field. The GRC will comprise of Divisional Executive Engineer; Additional Deputy Commissioner of concerned district; Social Officer-PIU, representatives of the concerned Village Panchayat/Council President or his/her authorized representative and supporting NGOs for implementing the RAP. Grievances of PAPs in writing will either be brought to GRC for redressal by the supporting NGO or through multiple uptake channels. The GRC will respond to the grievance within 7 days. Grievances brought to the GRC shall be redressed within a period of one month (30 days) from the date of receipt of grievance. The decision of the GRC will not be binding to PAPs i.e., decision of the GRC does not debar PAPs taking recourse to court of law.

Petitioners who wish to submit an appeal to the higher authorities can directly appeal to the GRC at the PMU, which will comprise of the Project Director, Advisor (Administration), Social Development Specialist, member of the Assam IWT Regulatory Authority, representative from the Revenue Department and a recognised NGO. On receiving the complaint, the Advisor (Administration), designated as the Officer in charge of GRM at the PMU will issue an acknowledgement to the petitioner within 7 days. The case will be disposed by the PMU within 30 days of receiving the complaint. Details of the resolved cases will be documented and published on the website.

As per the provisions of the Assam Right to Fair Compensation and Transparency in Land Acquisition Resettlement and Rehabilitation Rules 2015 (Section 45) the state Government will

designate a Rehabilitation & Resettlement Authority to handle the disputes related to the payment of compensation for L.A and R&R issues.



#### **13** Institutional Arrangements

The Project implementation will be led by the Project Implementation Unit (PIU) that will be established within AIWTDS. The PIU will be headed by the Project Director (PD). The PIU consist of Environmental & Social Development Expert. These experts will assist PIU on issues related to environmental and social management and also provide trainings to the field personnel of PIU & DIWT responsible for monitoring of environmental compliance during both construction and O&M phases of the project.

The overall responsibility of environmental performance including EMP implementation of the Project will rest with the PIU. The General Consultants of PMU will take up the role of supervision and monitoring of the Project activities during the implementation phase. An independent third party monitoring will be done on a quarterly basis, engaging independent Consultants as Safeguard Monitoring Consultants (SMC)' further for monitoring the safeguard aspects.



Figure 1: Flow Chart - A: Organogram of the Project Proponent (Project Management Unit; AIWTDS)



# Flow Chart - B: Institutional Arrangements for Environmental & Social Safeguards Documents<sup>1</sup>

<sup>1</sup>Flow Chart- --- 8.1 to be followed for GRM procedure

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# Chapter 1 : Introduction

# 1.1 Background

Assam has approximately 1980 Km of navigable waterways of which the most important for transport purposes are the Brahmaputra and Barak Rivers. Brahmaputra from Dhubri to Sadiya was declared as National Waterway no. 2 vide National Waterway (Sadiya-Dhubri stretch of the Brahmaputra river) Act 1988 (40 of 1988). From Dhubri to Sadiya, the waterway extends for a distance of 891Km. The river Brahmaputra flows down the centre of Assam Valley. It receives a number of tributaries like Subansiri, JiaBharali, Dihing, BurhiDihing, Disang, Dhansiri andKopili.Important river stations/commercial centers along the river bank in NW-2 are Dhubri, Jogighopa, Pandu/Guwahati, Tezpur, Neamati, Dibrugarh, Sadiya and Saikhowa(Figure 1.1). Pandu /Guwahati is the most important river station on NW-2 and the stretch downstream of Pandu up to Bangladesh Border (260 kms) is the stretch where IWT operation is presently most active (Figure 1.2).





Figure 1-2: National Water Way 2 in Assam State along Brahmaputra River

IWT is operating 102 nos. ferry services on the river Brahmaputra, Barak and in its tributaries for the purpose of public utility out of which 79 nos. ferry services are in the Brahmaputra Valley and 23 nos. ferry services are in the Barak valley. Ferry services operate on 97 routes designated by the Directorate of IWT. In addition, there are numerous routes licensed by the local (village) and district councils. Most of the ferry terminals consist of no more than improvised moorings on the bank of the river, which require relocation with changing river conditions, often over substantial distances. In the absence of bank protection, the main ferry terminals in or close to the urban centres (provided with steel pontoon that improves access) also often require relocation

The facilities built at these terminals are not sufficient to meet the growing demand of IWT asthey lack in adequate facilities for berthing, parking and storage areas, and passenger comfort. The jetty facilities and surrounding areas are highly congested at some locations like South Guwahati, Dhubri, Neamati and Silchar with commercial and residential development leading to traffic congestion and inefficient use of port facilities, and also there is no space around the current jetty facility / infrastructure for further expansion.

In addition to river terminals, there are a number of landing stations along Silchar on Barak river, Majuli Island, Fakirganj, Jaleshwar, and Medartary, North Guwahati corridor which are very important for people leaving in the rural and remote areas. The landing stations i.e. ghats are berthing points of high importance for the local communities that they serve, yet lack proper infrastructure and other essential facilities such as toilets and drinking water, as well as basic safety features for users, and many are in a highly dilapidated state. They usually consist of one pontoon with shore connection for embark and debark passenger and cargo. They play an important role in the lives of the rural people, as without them vessels would not berth and they would not receive much needed food, medicines, fuel and other consumer essentials.

The Brahmaputra is a braided river system characterizing high sediment delivery and low sediment throughput. This is caused by its very low gradients making it very sensitive to rapid geometry (boundary and channel) changes, channel baring and flooding. The river layout often changes significantly during and after floods. In places where the river is constrained, such as Guwahati, where its width reduces to approximately 1km (and where it reaches its maximum depth of approximately 40m), the river flows within a well-defined area. However, generally it is 8 to 10km in width and in places 18-20km and occupying a large part of the valley floor. These areas contain numerous small islands or chars, some of which are permanently inhabited (Including Majuli Island, the world's largest inhabited River Island) and which in the dry season, create a wide channel meandering tendency.

Between the dry and wet seasons river height variation on Brahmaputra is on average 6.74m. High levels are reached between the months of May and September when water velocities are on average 2.80m/sec (10km/hour or 5.4knots). Extreme conditions often cause widespread flooding. The highest velocity recorded is 5.80m/sec (20.88km/h or 11.27knots) while river levels can, in some areas, reach 2.0m over and above the natural bank height (the danger level). Low river levels are experienced between the months of October to March when river velocities are at their lowest - typically 0.71m/sec (2.55km/h or 1.38knots).

Ferry services are provided by the Inland Water Transport (ITW) Directorate of Assam, a state organisation established in 1958; and, by the country boat operators – typically small independent and informal private businesses. Cross-river and Island ferry services are the single most important source of transport for a large section of the population, especially rural households in the Assam Valley. In year 2012-2013, the ferry trade on the Brahmaputra carried about 4.4 million passengers (approximately 60% of all the IWT passenger trade in the NE of India), 37,000 tons of light cargo, 17,000 vehicles; 4,31,500 motor cycles; 4,45,000 bicycles; 1,000 carts and 9,500 animals.

Annual growth for passenger traffic since 2007-08 has been over 5%. The IWT Directorate's share of this trade is approximately 38% and annual growth during the same

period has been approximately 3%. Most passengers are carried on country boatswith annual growth of approximately 6%.

Navigation is complicated by the braided nature of the rivers, which are characterized by high sediment delivery and - due to extremely low gradients - very low sediment throughput. This make the rivers extremely sensitive to flooding with rapid geometry (boundary and channel) changes. In total there are over 3,000 country vessels of between 5 and 40 AIWTDS that operate on the Brahmaputra, mainly in the Guwahati Division, Darrang to Dhubri Districts. Excluding landing pontoons, the IWT Division has 40 combined passenger/cargo vessels in service with dwt carrying capacities between 10 and 120 tons. Eighteen of these operate in the Dibrugarh Division (and are predominantly of wooden construction) and twenty-two in the Guwahati division, mainly steel hulled vessels. Many of the steel vessels have been in service for 40 years or more.

To modernize and transform IWT in Assam, the World Bank is assisting the GoA through a phase-wise project which includes up gradation of ferry Infrastructure and last mile connectivity, Fleet Modernization, institutional capacity development etc. for Total 11 identified Terminal / Jetty / Landing points locations in Phase I.

# **1.2** Strategic Components and Action Plan of the Project

# 1.2.1 Project Development Objective (PDO)

The Project's Development Objectives are to: (a) Improve passenger ferry infrastructure and services in Assam, and (b) to improve the institutional capacity and framework

#### 1.2.2 **Project Components**

The project is focused primarily on improving ferrying of cross-river passengers on the Brahmaputra & the Barak river, and seeks to use the opportunity to establish a tenable foundation for development of a modern IWT sector in Assam. The long absence of adequate policy response and piecemeal investments in IWT in the state (as also nationally) have resulted in somewhat unorganised and weak condition for the sector, which is not predisposed to a linear scale-up. Despite the odds however, Assam manages to provide ferry services to about 5 million people annually, usually along with their vehicles/livestock/goods. In order to support the functioning but ill-equipped IWT sector therefore requires a more granular approach encompassing a range of supply and demand side factors. As such, the project is guided by a binding philosophy that admits wider, and even incremental interventions as long as they contribute to strengthening institutions and planning; operational efficiency and safety; and importantly sustainability.

# 1.3 **Project Demand**

As per the technical module 1, the passenger traffic movement trend from 2014 to 2018 has more than doubled for Guwahati, Dibrugarh and Silchar combined as shown in the table 1.1 below:

Division	Passenger				
	2014-15	2015-16	2016-17	2017-18	
Guwahati	42,27,716	44,35,897	41,60,780	67,06,980	
Dibrugarh	19,22,662	23,21,536	19,88,949	95,68,648	
Silchar	29,13,436	28,03,852	28,54,207	32,53,643	
Total	90,63,814	95,61,285	90,03,936	1,95,29,271	

Table 1-1: Passenger traffic movement for the fiscal years 2014-15, 2015-16, 20	16-17
and 2017-18	

Also the cargo movement in the division is negligible through ferries as shown in the Table 1.2below.

2017-10						
Division	Cargo (MT)					
	2014-15 2015-16 2016-17 2017-18					
Guwahati	10,896.74	13,742.00	13,647.88	30,911.80		
Dibrugarh	4,645.10	9,481.68	24,268.80	11,614.50		
Silchar	1,212.40	992.80	794.10	600.80		
Total	16,754.24	24,216.48	38,710.78	43,127.10		

Table 1-2: Cargo traffic movement for the fiscal years 2014-15, 2015-16, 2016-17 and2017-18

The above statistics suggest that there is more need of passenger ferries in the area as compared to cargo ships.

During the site visit it was observed that the present number of the ferries shall not be able to support the increase in the population insurgence. Moreover, the annual flood activities in the region also lead to changes in the terminal locations. The ferries that are being employed currently are in a dilapidated condition which is adversely affecting the environment in the region. Hence this makes the up gradation of the inland water transport of the region to be of prime importance.

#### 1.4 Environmental Impact Assessment of the Project and Preparation of EMF

Project development / Civil Intervention works during development may have interface with various physical, social and biological components of the environment, i.e. water quality, aquatic and terrestrial flora& fauna, air quality, noise levels etc. at all project development stages. All these environmental components will get affected due to development and operation of the terminals and a detailed environment and social impact assessment should be carried to assess all the potential impacts of the project. Further the impacts of development can be due to its location or due to the nature of activities to be performed during its development and operation phase thus both these aspects should be looked into while carrying out EIA study.

Specific environmental assessments are planned to undertake for the major civil works interventions (the terminals / landing points / ghats development, the maintenance dredging, river training and other related work. Accordingly, environmental management plans depicting responsibility matrix and monitoring plan will be prepared. However, there would be additional Ghats development works interventions in the. Exact locations of these additional Ghats are yet to be finalized, and the exact designs are to be developed (although conceptual ideas and conceptual alternative locations are being discussed in Module 4 and Module 3).

For Component 1 on improvement of inland water ways, a detailed Environmental Impact Assessment (EIA) will be prepared and presented in separate cover. For Component 3 potential safeguards implications including improvement of river terminals and landing stations, minor civil works associated with modernization of the Existing infrastructure, river training, vessel fleet introduction as per sustainability programme, and future project preparation studies given that these interventions will be designed in detail only during project implementation, the environmental assessment will be carried out using a framework approach.

# 1.4.1 Need of the EMF Study

- Provides guidance to sub-borrowers and FIs to ensure the EA process is carried out in compliance with national legislation and OP 4.01
- Provides an environmental and social screening process to allow for identification, assessment and mitigation of potential impacts by proposed works at the time the detailed aspects are known
- Used as a reference document for assessing the potential environmental and social impacts of investment alternatives

- Serves as guidelines for the development of sub-project/site-specific Environmental Management Plans (EMPs), Environmental Assessments (EAs), environmental audits, etc.
- Is an integral part of the project Operational Manual and applicable to all FIs investments, regardless of its funding source or implementing agency

### **1.4.2** Objectives of the EMF Study:

An Environmental Management Framework (EMF) has been developed to:

- (i) Support informed and integrated decision making
- (ii) Contribute to environmentally sustainable development by anticipating potential impacts and by providing early warnings in respect of threshold limits, cumulative impacts, identifying already existing impacts
- (iii) Scope of potential impacts assessments
- (iv) Delineation of project study area for impact assessment and its components as per project components
- (v) ensure all relevant environmental and social issues are mainstreamed into the design and implementation of the proposed subcomponents or subprojects in Component 1andComponent 3,
- (vi) consider in an integrated manner the potential environmental and social risks, benefits and impacts of the proposed subprojects and identify measures to avoid, minimize and manage risks and impacts while enhancing benefits,
- (vii) Establish procedures for screening all proposed sub-projects for their potential adverse environmental and social impacts
- (viii) Outline training and capacity-building arrangements needed to implement the EMF provisions
- (ix) Ensure compliance with national and World Bank requirements, and guide conducting the detailed EIAs of the subprojects where required.

# 1.4.3 Coverage of the EMF

This EMF presents detailed guidelines for the major activities to be carried out for EIA (including EMP) of specific projects / subprojects that have not yet been fully designed and planned during the project preparation stage, and for which construction will only get underway or beyond of project implementation. These guidelines will cover:

- (i) Environment Screening (identification of possible impacts)
- (ii) Description of Surrounding Environment (establishment of "baseline environment" against which impacts of the proposed sub-project would be evaluated) after identifying influence area for different sub-projects
- (iii) analysis of alternatives
- (iv) identification of major sub-project activities during both construction and operational phases
- (v) Assessment, prediction and evaluation of impacts of project activities on the baseline

environment

- (vi) carrying out public consultations
- (vii) Identification of mitigation measures and preparation of impact specific environmental management plans (EMP) including monitoring requirements.

More specifically, the present EMF includes the following coverage for Components 1 and 3 of the proposed project:

For Component 1 activities, independent EIA consultant has been engaged by AIWTDS to carry out the detailed EIAs of river terminals and landing stations. Terms of reference for carrying out these EIA studies are given in Chapter 6.

For additional activities under Component 1 and 3 with potential safeguards implications, this EMF outlines basic screening criteria, assessment process, and institutional responsibilities and budget to ensure that appropriate EHS management measures are defined, incorporated into civil works packages, implemented and monitored as applicable.

Expected issues for these components are as follows:

- For the potential civil works under Component 1 and 3 related to upgrading and modernizing the existing Terminals / ghats / Landing Points, specific scope of activities is defined, and is expected to prepare a full EIA. Also, basic construction management practices should be observed. Annexure1outlines basic generic construction management Environmental Codes of Practice (ECoPs) which are expected to be broadly applicable to the proposed works, and would be reviewed and adapted.
- For Component 1, 2 and 3 investment activities- including the river training, and vessel fleet introduction potential negative impacts are expected to be minor.
- Nonetheless, this EMF lays out the requirements to ensure that appropriate screening, and implementation of relevant Environment management and mitigation measures as necessary, will be carried out for all the project components (1 and 3). ECoPs are expected to be broadly applicable to the proposed works, and would be reviewed and adapted.
- Annexure 2 is for requirements to ensure that appropriate screening during site visit. Please Refer Screening Exercise for all possible ghats as depicted in Annexure 3.
- Future project preparation studies under Component 3i.e. additional ghats modernisation and development of Terminal / ghats / Landing Points including river maintenance dredging or other investments on additional IWT corridors in Assam would likely entail impacts. Therefore, in parallel to detailed feasibility and design studies, independently commissioned EIA studies in line with applicable World Bank safeguard policy and national requirements on environmental and social assessment and mitigation will be carried out through this project. This EMF specifies the institutional mechanisms to ensure this.

# 1.5 EMF Study Scope and Methodologies

This Environmental Management Framework has been prepared by EIA and SIA Consultant on behalf of AIWTDS and submitted to the World Bank for the project. The EMF methodology for Component B (river terminals and landings) consists of;

# A. The consideration of the following reports / findings prepared earlier and submitted to AIWTDS;

- 1. Reconnaissance field visit and initial scoping and screening of the identified proposed investment sites to determine the key environmental parameters and aspects that are likely to be impacted by the project activities (Covered in screening and scoping).
- 2. Environmental screening has been carried out for all the proposed terminals and landing stations. The purpose of such screening is to get a preliminary idea about the degree and extent potential environmental impacts of a particular sub-project, which would subsequently be used to assess the need for and scope of further detailed environmental assessment. (Covered in screening and scoping).
- 3. Collecting and analysis of baseline environmental data with the help of secondary literature review and field data collected (Covered in screening and scoping).
- 4. Review of the project details and meeting / discussions / workshops with various stakeholders including local communities (Covered in screening and scoping and EMF).
- 5. Review of the policy and regulatory requirements (Covered screening and scoping and EMF).

- 6. Consultations with the stakeholders including beneficiary/affected communities and developing the consultation process (Covered in screening and scoping and EMF).
- 7. An initial environmental impact assessment and potential impacts with mitigation measures of the project activities and its management plan (Covered in screening and scoping).
- **B.** Preparation of National / International / World Bank (OP/BP) policy and regulatory framework.
- **C.** Identification of all possible project components in relation to environmental studies
- **D.** Future stakeholder consultations and its requirements as per TOR
- **E.** Preparation of framework for environmental impact assessment matrix and Its management plan as per the project components / activities
- **F.** Framing the scope of work for EIA and EIA contents and framing the detailed Terms of Reference for EIA study
- **G.** Institutional framework/mechanisms for the proposed project as suggested in Chapter 7
- **H.** Environment management and monitoring programme

# 1.6 Contents of EMF Report

- Chapter 2- Administrative and legal (regulatory) framework: Reviews the prevailing WB policies and national regulatory requirements relevant to environmental assessment.
- Chapter 3- Project Description: Presents a simplified description of the project, its various components and other salient information relevant for environmental assessment.
- Chapter 4- Stakeholder's consultation and EIA requirement: Major findings of stakeholder consultation.
- Chapter 5- Impact identification and application of environmental management framework: This framework is prepared to give a generic idea of the possible impacts of the project for each type of such future civil intervention
- Chapter 6- Terms of Reference for project EIA: TOR & scope of work for the EIA studies for priority and future investments
- Chapter 7- Institutional Framework: Institutional framework/mechanisms for the proposed project
- Chapter 8– Environmental management &monitoring programme (EMMP): Environmental management and monitoring programme

# Chapter 2 : Administrative and Legal (Regulatory) Framework

The Article 48-A of the Constitution of India states that every state shall endeavour to protect and improve the environment to safeguard the forest and wildlife of the country. At the same time, it shall be the fundamental duty of every citizen of India under Article 51-A (g) of the Constitution of India, to protect and improve the natural environment including forests, lakes, rivers and wild life.

India has well defined institutional and legislative framework. The legislation covers all components of environment viz. air, water, soil, terrestrial and aquatic flora and fauna, natural resources, and sensitive habitats. India is also signatory to various international conventions and protocols. The environmental legislations in India are framed to protect the valued/critical environmental components and comply with its commitment to international community under various conventions and protocols. World Bank has also defined its Environmental and Social safeguard operational policies.

This assessment is about the applicability of above laws and regulations, conventions, protocols, and safeguards. The applicability of legislation to the navigational channel (waterway)improvement will be assessed under separate EIA being carried out for waterways and NW-2 as a whole.

#### 2.1 National Policies and Requirements

The Government of India has framed various laws and regulations for protection and conservation of natural environment. The legislations are broadly divided under following categories.

- Environmental Protection
- Forests Conservation
- Wild Life Protection

The umbrella legislation under each of above category is highlighted below:

**The Environment (Protection) Act 1986** was enacted with the objective of providing for the protection and improvement of the environment. It empowers the Central Government to establish authorities charged with the mandate of preventing environmental pollution in all its forms and to tackle specific environmental problems that are peculiar to different parts of the country. Various rules are framed under this Act for grant of environmental clearance for any developmental project, resources conservation and waste management.

**The Forest Conservation Act 1980** was enacted to help conserve the country's forests. It strictly restricts and regulates the de-reservation of forests or use of forest land for non-forest purposes without the prior approval of Central Government. To this end the Act lays down the pre-requisites for the diversion of forest land for non-forest purposes.

Wild Life (Protection) Act 1972 amended 2003 was enacted with the objective of effectively protecting the wild life of this country and to control poaching, smuggling and illegal trade in wildlife and its derivatives. It defines rules for the protection of wild life and ecologically important protected areas.

The MoEF&CC and the pollution control boards (CPCB - Central Pollution Control Board and SPCBs - State Pollution Control Boards) together form the regulatory and administrative core of the part. Other Ministries/Statutory Bodies/Departments responsible for ensuring environmental compliance and granting various clearances includes state ministry /dept. of environment, regional offices of MoEF&CC and state forests/wildlife departments.

# 2.1.1 Applicable National Environmental Legislation

As per the nature of the project, screening has been done to identify the legislations applicable to the project. Legislations applicable to the project are further divided into the legislations framed by Govt. of India and Regulations applicable for vessels plying in inland waterways framed by IWAI and Ministry of Shipping, GoI. Regulations of Govt. of India applicable to the project are given in Table 2.1 and legislations framed for vessels plying in inland waterways by IWAI and Ministry of Shipping, GoI are given in Table 2.2. All the legislations will be covered in EIA as per the requirement. The studies will be carried out adhered to the National regulations and state regulatory requirements.

# 2.2 State of Assam Environmental Legislation

Landside activities such as riparian land use development for ports and jetties or for industries that may wish to use IWT are largely regulated by state governments. The State of Assam has the largest network of navigable waterways of the nation. The proposed AIWTP will assist Assam in enhancing inland water transport and improve the capacity of its institutions to administer, regulate and deliver safe and efficient IWT services in the sector. The State Pollution Control Board is an autonomous state organization No index entries found. The State of Assam Pollution Control Board is empowered with the provisions of the following Federal Acts and Rules:

# 2.2.1 The Water (Prevention and Control of Pollution) Act 1974

This is an Act of the Central Government of India that Assam has signed onto. It directed the creation of the State Pollution Control Board, Assam.

# 2.2.2 The Air (Prevention and Control of Pollution) Act 1981

The Air (Prevention & Control of Pollution) Assam Rule, 1991, framed under Air (Prevention & Control of Pollution) Act, 1981. The Air (Prevention & Control of Pollution) Amendment Act, 1987.

# 2.2.3 The Environmental (Protection) Act 1986

- The Environment Protection Rules, 1986 (2000)
- The Hazardous Waste (Management & Handling) Rules, 1989 and its Amendments.
- The Manufacture, Storage and Import of Hazardous Chemical Rules, 1989 and its Amendments.
- The Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1986.
- The Biomedical Wastes (Management and Handling) Rules, 1998, and its Amendments.
- The Municipal Solid Wastes (Management and Handling) Rules, 2000.
- The Recycled Plastics Manufacture and Usage Rules, 1999,
- The Noise Pollution (Regulation & Control) Rules, 2000,
- Batteries (Management and Handling) Rules, 2001.
- Ozone Depleting Substances (Regulation) Rules, 2000.
- The Public Liability Insurance Rules, 1991.

# <u>All the legislations will be covered in EIA as per the requirement. The studies will be carried out adhered to the National regulations and state regulatory requirements</u>.

	Key Requirement	Applicability	Type of permit	Administrative	Responsibility
Name			and stage of	Authority and	
			applicability	indicative time frame	
Environmental Brote	ation Logiclations			for grant of permission	
Environment	To protect and improve	Canaidarad nat Applicable	Environment	MaEE8CC 8	ANA/TDS/ Contractor for
Protection Act-1986	overall environment	(EIA Notification 2006 doos	Clearance		Alwids/ Contractor for
and Rules there	Requires prior	not classify	Clearance	SEIANSEAG	clearances as
under including FIA	environmental clearance	terminals/ietties/ floating	Construction		applicable
Notification 14 <sup>th</sup> Sep	for new. modernization on	terminals on river or	stage for EC for		
2006 and	and expansion projects	dredging in the river as a	borrowing earth		Contractor should also
amendment till date	listed in schedule 1 of EIA	project requiring	as applicable		be responsible for EMP
	Notification, 2006	environmental clearance.			implementation and
		The applicability of this			compliance to
		legislation should be			environmental clearance
		reassessed periodically			conditions.
		from the concerned			Contractor for EC for
		authonity during NVV-2			Contractor for EC for
		implementation stages to			borrowing of earth.
		ensure conformity with			
		changes in the regulations			
		if any).			
		Borrowing of earth for road			
		construction as may be			
		required will require prior			
		environment clearance			
Ain (Durana ting and		under mining category.	0	0000	O sector star
Air (Prevention and	An act to prevent and	Applicable.	Consent to	SPCB	Contractor should
Act 1081 1087	control All pollution	amission from operation of	& Consont to		conditions for sotting up
Aci, 1901, 1907		construction equipment like	Operate (CTO)		each facility batching
		batching plants, hot mix			plant, hot-mix plant, DG
		plants. DG sets. and			set as prior to its
		similarly, during operation			establishment from
		stage backup power			SPCB CTO should be
		generation, material			taken by contractor for

Table 2.1. Summar	v of Environmental and C	Sther Logislation with /	nnlicability Scrooning
Table 2-1. Summar	y of Environmental and C	Juner Legislation with F	Applicability Screening

Name	Key Requirement	Applicability	Type of permit and stage of applicability	Administrative Authority and indicative time frame for grant of permission	Responsibility
		handling related aspects.			batching plant, hot-mix plant & quarry site as required prior to operation and it should be renewed before the expiry of permit.
					obtain CTE/CTO for each proposed facility under the project before its handover. Contractor and AIWTDS should be responsible to comply with the conditions as mentioned in CTO
Water Prevention and Control of Pollution) Act, 1974, 1988	An act to prevent and control water pollution.	Applicable. It is applicable for the projects having potential to generate effluent during any stage of the project. Effluents are expected to be generated during both the construction and operation phase of the project	Consent to Establish & Consent to Operate	SPCB	CTE should be taken by Contractor for disposal of sewage and construction of septic tank/soak pit prior to start of construction from SPCB. Compliance to the conditions mentioned in the CTE should be done by Contractor CTE/CTO for each proposed facility under the project should also be obtained by contractor along with CTE / CTO under Air Act. AIWTDS should ensure the conditions specified in CTO are complied with

Name	Key Requirement	Applicability	Type of permit and stage of	Administrative	Responsibility
			applicability	indicative time frame	
Noise Pollution (Regulation and Control Act) 2000 and amendment till date	Ambient Noise Standards for different areas and zones	Applicable due to generation of noise during construction and operation stage	No permits issued under this act	SPCB & CPCB	Contractor and AIWTDS to ensure compliance to Ambient Noise Level Standards.
Hazardous & Other Wastes (Management and Trans boundary Movement) Rules, 2016	Protection to general public against improper handling storage and disposal of hazardous waste. The rules prescribe the management requirement of hazardous wastes from its generation to final disposal.	Applicable. Project has potent to generate hazardous waste (Waste Oil) during both construction and operation phase.	Authorization for storage and handling hazardous waste	SPCB & MoEF&CC	Contractor should obtain authorization for handling, storage and disposal of hazardous waste (Waste Oil) along with CTE/CTO for air and water act. Also compliance to the conditions mentioned in authorization should be ensured by contractor and AIWTDS
MSIHC Rules, 1989 Chief Controller of Explosives,	Usage and storage of hazardous material	Applicable only for storage of highly inflammable liquids like HSD/LPG	Specific permit is required for storage of Fuel. Also, precautions defined under the material safety datasheets should be followed for use of hazardous substances listed under the schedules attached to this notification if any proposed to be used. Safety audit and other requirements	MoEF&CC and DC	Contractor and AIWTDS. Compliance to the rules should be ensured

Name	Key Requirement	Applicability	Type of permit and stage of	Administrative Authority and	Responsibility
			applicability	for grant of permission	
			should have to be		
			complied if		
			storage quantity		
			exceeds the		
			threshold limit		
The motor vehicle	To enforce standards for	Applicable	All vehicles used	State Transport	State Motor Vehicles
act 1988	vehicular pollution.		for construction	Authority	Department, AIWTDS
			and buses during		
			operation phase		
			comply with the		
			provisions of this		
			act.		
The Bio Medical	To control storage,	Applicable	No specific	Disposal through	Contractor and AIWTDS
Waste Management	transportation and	Applicable for the disposal	permit is	authorized disposal	Compliance to the rules
Rules, 2016	disposal of Bio Medical	of bio-medical waste from	required. Just	agency	should be ensured
	Waste.	first aid centres and	comply with the		
		dispensaries	nandling and		
			requirements of		
			the rule		
Construction and	To manage the	Applicable Applies to all	Approval required	Local Authorities.	Contractor and AIWTDS.
Demolition Waste	construction and	those waste resulting from	from local	Segregation,	Compliance to the rules
Management Rules,	demolition waste	Construction, remodelling,	authorities, if	management and	should be ensured
2016		repair & demolition of any	waste generation	disposal of waste as per	
		civil structure of individual	is >20 tons in a	rules.	
		or organization who	day or 300 tons		
		demolition waste such as	per project in		
		building material rubble	monu		
		debris.			
E-Waste	To manage the E-waste	Not Applicable as project	To obtain	SPCB	Not Applicable
(Management)	but not covering lead acid	will not fall any of the	authorization		
Rules, 2016	batteries and radioactive	categories. (Rule applies to	trom SPCB.		

	Key Requirement	Applicability	Type of permit	Administrative	Responsibility
Name			and stage of	Authority and	
			applicability	for grant of permission	
	waste	every manufacturer,	Filing of return		
		producer, consumer, bulk	and maintenance		
		consumer, collection	of records in the		
		centres, dealers, e-retailer,	forms given in the		
		refurbisher, dismantler and	Rules		
		recycler involved in			
		manufacture, sale, transfer,			
		storage and processing of			
		e-waste or electrical and			
		electronic equipment listed			
		in Schedule I. including			
		their components,			
		consumables, parts and			
		spares which make the			
		product operational)			
Plastic waste	To manage the plastic	Applicable Rule applies to	No authorization	Local bodies	Contractor and AIWTDS.
Management Rules,	waste generated	every waste generator,	to be obtained.		Compliance to the rules
2016		local body, Gram	Waste		snould be ensured
		importors and producer	management and		
		importers and producer.	he done Fee to		
			be paid to local		
			bodies, if		
			applicable		
The Batteries	To regulate the disposal	Applicable	No specific	MoEF&CC	Contractor and AIWTDS.
(Management and	and recycling of lead acid	Applicable for disposal of	registration		Compliance to the rules
Handling) Rules	batteries	used lead acid battery if	required.		should be ensured
2010		likely to be used in any	Compulsion to buy		
		equipment during	and sale through		
		construction and operation	registered vendor		
Forest Concervation	and Wildlife Protection Le		oniy.		
The Forest	To protect forest by	Forest area is not identified	Forest Clearance	Forest Department	NOC should be obtained
(Conservation) Act	restricting conversion	in the reconnaissance	/ Permission for	MoFF&CC	from forest department
	. coming controloion		,		

	Key Requirement	Applicability	Type of permit	Administrative	Responsibility
Name			and stage of	Authority and	
			applicability	for grant of permission	
1980 and amendments The Forest (conservation) Rules 1981 and amendments till date	of forested areas into non- forested areas and deforestation	visits. All the sites will be confirmed for the forest areas from the relevant sources like forest departments in the respective districts. Also tree cutting is envisaged at some locations for which NOC from forest department as per applicable rules of the state. (it will be required as per current rules of the state for cutting of the	tree cutting.		prior tree cutting. Compensatory plantation should be carried out as per state forest policy. 1:8 is recommended for thus project if any forest diversion is proposed. NOC should be obtained by contractor. All the conditions mentioned in Forest NOC should be complied with
Biological Diversity Act, 2002	Conservation of biological diversity, sustainable use of its component s and fair and equitable sharing of the benefits arising out of the use of biological resources, knowledge and for matters connected therewith or incidental thereto	Not Applicable	No permit issued under this Act.	National Biodiversity Authority and State Biodiversity Board	Not Applicable
Wild Life Protection Act, 1972, 1993	To protect wildlife through notifying National Parks and Sanctuaries and buffer areas around these zones	Not Applicable as no development is being undertaken within the buffer zone of the Eco sensitive zone notified under this act.	Wildlife clearance	Chief Conservator Wildlife, Wildlife Wing, Forest Department, MoEF&CC	Necessary permission should be obtained for any intervention if planned at any stage within the buffer zone of eco sensitive zones.
Safety and Other Rel	lated Legislations				
Chemical Accidents (Emergency Planning,	Requirementofpreparation of on-site andoff-siteDisaster	Not Applicable. The project does not involve handling of any	No permits issued under this act	Central, State & District Crisis Group	Not Applicable

	Key Requirement	Applicability	Type of permit	Administrative	Responsibility
Name			and stage of applicability	Authority and indicative time frame	
				for grant of permission	
Preparedness s and	Management Plans for	hazardous chemical during			
Response) Rules,	accident-prone areas.	both construction and			
1990		lead to continuous			
		intermittent or repeated			
		exposure to death, or			
		injury.			
Public Liability and	Protection from liability	Not Applicable. The project	No permits	Collector of the Area	Not applicable
Insurance Act 1991	arising due to accidents	does not involve storage of	issued under this		
	from nandling of	any chemicals (HSD)	act. Owner of		
		during construction	take out		
		damig concaraction	insurance		
			policies providing		
			for contracts of		
			insurance so as		
			he is insured		
			ayanist hability to		
			handling any		
			such hazardous		
			material		
Explosive Act 1884	Safe transportation,	Not Applicable as no	Permission for	Chief Controller of	Not applicable
& Explosive Rules,	storage and use of	explosive (as described in	storage and	Explosives	
2006	explosive material	in the construction and			
		operation stage of the			
		project.			
Petroleum Rules,	Use and Storage of	Applicable as storage of	License to store	Chief Controller of	Contractor / AIWTDS.
2002	Petroleum products	HSD/LPG or any other	petroleum	Explosives/D C	Compliance to the rules
		petroleum product may be	beyond		should be ensured
		nequired for the project	quantity		
Central Motor	To minimize the road	Applicable, for all the	No permit issued	Motor Vehicle	Contractor to follow
Vehicle Act 1988	accidents, penalizing the	vehicles at site during	under this Act	Department (Licensing	Rules for all the

	Key Requirement	Applicability	Type of permit	Administrative	Responsibility
Name			and stage of	Authority and	
			applicability	indicative time frame	
and amendment Central Motor Vehicle Rules, 1989 and amendments till date	guilty, provision of compensation to victim and family and check vehicular air and noise pollution.	construction & operation phase		authority, registration authority &State Transport Authorities)	construction vehicles being used at site during construction purpose. AIWTDS should follow the rules for all its vehicles at site during operation phase and should also monitor that loading & unloading vehicles also complied these rules Compliance to the rules
The Gas Cylinder Rules 2004	To regulate the storage of gas / possession of gas cylinder more than the exempted quantity	Applicable if contractor store more than the exempted quantity of gas cylinder.	License to store gas cylinder more than the regulated quantity	Chief Controller of explosives	Should be ensured Contractor. Compliance to the rules should be ensured
Ancient Monuments and Archaeological Sites and Remains Act, 1958	Conservation of cultural and historical remains found in India. According to this Act, area within the radii of 100m and 300m from the "protected Property" are designated as "protected area" and "controlled area" respectively. No development activity (including building, mining, excavating, blasting) is permitted in the "protected area" and development activities likely to damage the protected property is not	Applicable only if any intervention is planned within 300 m of archaeological protected sites falling along the NW-2	No objection certificate	Archaeological Dept. Gol, Indian Heritage Society and Indian National Trust for Art and Culture Heritage (INTACH).	May be Applicable. Umananda Island is also an archaeologically important site. But, since it is yet to be notified as a protected archaeological site, it has remained a Government-owned area and the civil administration itself can handle the matters related with this island. But the island's location remained within the regulated area of the protected monuments of Urvasi Island.

Name	Key Requirement	Applicability	Type of permit and stage of applicability	Administrative Authority and indicative time frame for grant of permission	Responsibility
	permitted in the "controlled area" without prior permission of the Archaeological Survey of India (ASI).				necessitating the National Monuments Authority's clearance.
Guidelines for evaluation of proposals / requests for ground water abstraction for drinking and domestic purposes in Notified areas and Industry / Infrastructure project proposals in Non- notified areas, 2012	To regulate extraction of ground water for drinking and domestic purpose	Applicable if ground water is extracted for meeting drinking/domestic water needs of employees and visitors at proposed facility& vessels	No objection certificate	Central ground Water Authority/Board & MoEF&CC	Contractor / AIWTDS should obtain NOC from CGWA/CGWB prior digging any bore well during construction & operation phase. Compliance to the rules should be ensured by AIWTDS and contractor

# Table 2-2: Regulations Applicable on Vessels/Barges Plying in Inland Waterways

Name	Key Requirements	Applicability	Authority
Prevention of Collision on National	Regard to precautions required by the ordinary	Applicable for all the vessel plying in	IWAI,
Waterways Regulations, 2002	practice of Seamen and limitation of the vessel	NW	AIWTDS
National Waterways, Safety of	Ensuring safety of navigation and shipping on the	Applicable for all the vessel plying in	IWAI,
Navigation and Shipping Regulations,	national waterways	NW	AIWTDS
2002			
The National Waterway Act, 1982	Provision for regulation and development of that river Applicable for all the vessel plying i		IWAI,
	for purpose of shipping and navigation on the NW-2	NW	AIWTDS
	and for the matters connected therewith or incidental		
	thereto		
New Inland Vessel Act, 2015 & Rules	Economical and safe transportation through inland	Applicable for all the vessel plying in	IWAI,
Under IV Act	waters	NW	AIWTDS
#### 2.3 World Bank Policies and Requirements

The World Bank has developed a number of Safeguard Policies to ensure that all possible impacts are considered and mitigation measures are spelled out prior to the implementation of any proposed project. These policies ensure that the quality of operations is uniform across different settings worldwide. If the decision is taken that a Safeguard Policy should be applied, mitigation measures and plans must be developed and in place before the implementation of a proposed project.

The Bank requires environmental screening and classification for all investment projects proposed for Bank finance, to help and ensure that they are environmentally and socially sound and sustainable. Screening and classification take into account the natural environment (air, water, and land); human health and safety; social aspects (including especially involuntary resettlement and presence of Indigenous Peoples); cultural property; and trans-boundary and global environmental aspects.

The objectives of environmental screening and classification are: to evaluate the environmental risks associated with a proposed operation; to determine the depth and breadth of Environmental Assessment (EA); and to recommend an appropriate choice of EA instrument(s) suitable for a given project. The Bank recognizes that environmental screening and classification is not absolute and involves professional judgment on a case by case basis. When screening, careful consideration needs to be given to potential environmental impacts and risks associated with the proposed project. Judgment is exercised with reference to the policy expectations and guidance; real impacts on the ground; and established regional and Bankwide precedence and good practice.

The applicable WB safeguard policies are described below. In the following section, a table is provided indicating how each policy applies to the proposed investments under Component A and B.

#### 2.3.1 Environmental assessment (OP/BP 4.01)

The World Bank requires environmental assessment (EA) of projects proposed for Bank support to ensure that they are environmentally sound and sustainable, and thus to improve decision making. The Bank Policy OP/BP 4.01 considers that EA is a process whose breadth, depth, and type of analysis depend on the nature, scale, and potential environmental impact of the proposed project. EA evaluates a project's potential environmental risks and impacts in its area of influence; examines project alternatives; identifies ways of improving project selection, siting, planning, design, and implementation by preventing, minimizing, mitigating, or compensating for adverse environmental impacts and enhancing positive impacts; and includes the process of mitigating and managing adverse environmental impacts throughout project implementation. EA takes into account the natural environment (air, water and land); human health and safety; social aspects (involuntary resettlement, indigenous peoples and physical cultural resources); and trans-boundary and global environmental aspects. The Bank Policy also envisages that the borrower Government is responsible for carrying out the EA and the Bank advises the borrower on the Bank's EA requirements.

The present EMF has been prepared in compliance with this OP/BP.

World Bank's operational policy 4.01 (OP 4.01) categorize the project into Category A, B & C on the basis of nature and extent of the impacts anticipated from the project. Scope of Environmental assessment studies depends on the category in which the project falls and is defined below.

**Category A -** Projects with significant environmental impacts and requiring a full Environmental Assessment (EA),

**Category B -** Projects with moderate environmental impacts and requiring a lesser level of environmental assessment,

**Category C** - Projects which require no environmental analysis. Proposed Project involves augmentation of navigation capacity of NW-2 by developing various facilities like terminals, jetties, navigation aids etc. along the NW-2.

Components to be impacted due to project development are quality of life, livelihood, terrestrial and aquatic ecology, air quality, water quality, economy of the country, noise levels etc. Also it is anticipated impacts are both positive and negative but will be significant. Thus the project is classified as Category A as per WB policy and requirements and a detailed environment and social assessment study has been undertaken for the project

#### 2.3.2 Natural Habitats (OP 4.04)

The Policy highlights the importance of conservation of natural habitats, like other measures that protect and enhance the environment, for long-term sustainable development. The Bank therefore supports the protection, maintenance, and rehabilitation of natural habitats and their functions in its economic and sector work, project financing, and policy dialogue. The Bank also supports, and expects borrowers to apply a precautionary approach to natural resource management to ensure opportunities for environmentally sustainable development. The Bank-promotes and supports natural habitat conservation and improved land use by financing projects designed to integrate into national and regional development the conservation of natural habitats and the maintenance of ecological functions. Furthermore, the Bank promotes the rehabilitation of degraded natural habitats. The Bank does not support projects that involve the significant conversion or degradation of critical natural habitats.

#### 2.3.3 Forests (OP/BP 4.36)

This Policy recognizes the need to reduce deforestation and promote sustainable forest conservation and management in reducing poverty. The Bank believes that forests are very much essential for poverty reduction and sustainable development irrespective of their location in the world. The Bank assists borrowers with forest restoration activities that maintain or enhance biodiversity and ecosystem functionality. The Bank also assists borrowers with the establishment and sustainable management of environmentally appropriate, socially beneficial, and economically viable forest plantations to help meet growing demands for forest goods and services. The Bank does not finance projects that, in its opinion, would involve significant conversion or degradation of critical forest areas or related critical natural habitats. Furthermore, the Bank does not finance projects that contravene applicable international environmental agreements.

#### 2.3.4 Physical Cultural Resources (OP 4.11)

The World Bank's This policy addresses physical cultural resources, which are defined as movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Physical cultural resources may be located in urban or rural settings, and may be above or below ground, or under water. Their cultural interest may be at the local, provincial or national level, or within the international community. The Bank assists countries to avoid or mitigate adverse impacts on physical cultural resources from development projects that it finances. The impacts on physical cultural resources resulting from project activities, including mitigating measures, may not contravene either the borrower's national legislation, or its obligations under relevant international environmental treaties and agreements. This OP part is covered in SMF report.

#### 2.3.5 Environment, Health and Safety Guidelines

The Environment, Health, and Safety (EHS) Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities or project by existing technology at reasonable costs. In addition, there are also industry specific EHS guidelines. The guidelines that are relevant to the Project are: EHS Guidelines for Ports, Harbour, and Terminals, and EHS Guidelines for Shipping.

Table 2-3: Environmental Safe Guard Policies to AIWT Project				
Name	Key Requirements	Project	Remarks	Management
00 4.04		Applicability		Plans
OP 4.01 Environmental Assessment	Ensures sustainability and environmental feasibility of the project. Projects are classified into A, B & C category depending on the nature and extent of the impact. Category	Triggers	Project classified as Category A considering nature of activities and impacts	Environment Management Plans including guidelines and management plans for tree plantation, waste management, Emergency response and budgetary provision for development of EHS management system and Responsible carrier Programme.
OP 4.04 Natural habitats	Ensures conservation of natural habitats and discourages disturbance of nay natural habitat due to project development by recommending adoption of alternative method/route/approach or adopting management measures	Triggers	Triggered for Gangatic dolphins, Tortoise habitat.	Environment management plan and Tree Plantation Management Plan
OP 4.36 Forests	Ensures that project activities do not disturbs/interfere with the forest, forest dwellers activities, fauna and flora of the forest. Prevents and discourages deforestation and impacts on rights of forest dependent people.	May be triggered for Forest Triggers for tree cutting	Forest area is not identified in the reconnaissance visits. All the sites will be confirmed for the forest areas from the relevant sources like forest departments in the respective districts. Tree cutting is involved. Permission will be required for felling these trees from forest department.	do -
WBG Environmental, Health and Safety (EHS) Guidelines (general)	The applicability of the EHS Guidelines should be tailored to the hazards and risks established for each project on the basis of the results of an environmental	Applicable	This guideline applies to facilities or projects that generate emissions to air at any stage of the project life- cycle	Projects with significant sources of air emissions, and potential for significant impacts to ambient air

Name	Key Requirements	Project Applicability	Remarks	Management Plans
WBG sector-	assessment The EHS Guidelines	Applicable	The following	quality, prevent or minimize impacts Jetties.
specific EHS guidelines for Jetty, Harbours and Terminals.	for ports, Harbours, and Terminals are applicable to marine and freshwater jetties, harbours, and terminals for cargo and passengers.	Арріїсаріе	section provides a summary of EHS issues primarily associated with jetty and terminal construction and operations, along with recommendations for their management as part of a comprehensive environmental management system for a given project	harbours and terminals selected through a systematic, documented environmental assessment process that includes rigorous consideration of siting and alternatives, their direct and indirect environmental impacts

### 2.4 Relevant International Environmental Convention

Name	Key Requirements
Guideline, Standard and recommendations as published by Environmental Committee of PIANC	International Maritime Dangerous Goods Code (IMDG Code) Dredging Management Practices for the Environment (WG 100-2009) Dredging Material as a Resources (WG 104-2009) Environmental Impact Assessments of Dredging and Disposal Operation (WG 10-2006) Biological Assessment Guidance for Dredged Material (WG 8-2006) Ecological and Engineering Guidelines for WetlandRestoration in relation to the Development, Operation and Maintenance of Navigational Infrastructure (WG 7-2003) Management of Aquatic Disposal of dredged material (WG 1-1998) Dredged Material Management Guide 1997. Guidelines for sustainable Inland Waterways and Navigation WG 6-2003 Environmental guidelines for aquatic, near shore and upland confined disposal facilities for contaminated dredged material WG 5-2002 Dredging the environmental facts-where to find what you need to know? PIANC-IADC-WODA brochure-PIANC-IADC-CEDA IAPH1999
International Maritime Organization Conventions	Initial Assessment of Environmental Effects of Navigation and Infrastructure Projects (WG 143 -2014) Sustainable Waterways Within the Context of Navigation and Flood Management (WG 107 -2009) Climate Change and Navigation (TG3 -2008) International Labour Organization (ILO) Code of Practice for Safety and Health in Ports (2005); General Conference of the International ILO Convention concerning Occupational Safety and Health in Dock Work, C-152, (1979)

#### Table 2-4: Relevant International Conventions

Name	Key Requirements
	General Conference of the ILO Recommendation concerning Occupational Safety and Health in Dock Work, R-160 IMO Code of Practice for Solid Bulk Cargo (BC Code) International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk (IBC Code) International Code for the Safe Carriage of Grain in Bulk (International Grain Code) Code of Practice for the Safe Loading and Unloading of Bulk Carriers (BLU Code) International Maritime Dangerous Goods Code (IMDG Code)
IFC, World Bank Group	General Environment Health & Safety Guidelines Environment Health and Safety Guidelines for Ports, Harbours and terminals
MARPOL Convention	The International Convention for the Prevention of Pollution from Ships (MARPOL) is the main international convention covering prevention of pollution of the marine environment by ships from operational or accidental causes. The MARPOL Convention was adopted on 2 November 1973 at IMO. The Protocol of 1978 was adopted in response to a spate of tanker accidents in 1976-1977. As the 1973 MARPOL Convention had not yet entered into force, the 1978 MARPOL Protocol absorbed the parent Convention. The combined instrument entered into force on 2 October 1983. In 1997, a Protocol was adopted to amend the Convention and a new Annex VI was added which entered into force on 19 May 2005. MARPOL has been updated by amendments through the years. The Convention includes regulations aimed at preventing and minimizing pollution from ships - both accidental pollution and that from routine operations - and currently includes six technical Annexes. Special Areas with strict controls on operational discharges are included in most Annexes. <b>Annex I: Regulations for the Prevention of Pollution by Oil (entered into force 2 October 1983)</b> Covers prevention of pollution by oil from operational measures as well as from accidental discharges; the 1992 amendments to Annex I made it mandatory for new oil tankers to fit double hulls, which was subsequently revised in 2001 and 2003. <b>Annex II: Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk (entered into force 2 October 1983) Annex II: Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Form (entered into force 1 July 1992). Annex IV: Prevention of Pollution by Sewage from Ships (entered into force 27 September 2003)</b> Contains requirements to control pollution of the sea by sewage; the discharge of sewage into the sea is prohibited, except when the ship has in operation an approved sewage treatment plant or when the ship is discharging comminute and disinfected has to be discharged at a distance of more than 12 nautical miles from the neare

Name	Key Requirements
	Annex V: Prevention of Pollution by Garbage from Ships (entered into force 31 December 1988)
	Deals with different types of garbage and specifies the distances from land and the manner in which they may be disposed of; the most important feature of the Annex is the complete ban imposed on the disposal into the sea of all forms of plastics.
	Annex VI: Prevention of Air Pollution from Ships (entered into force 19 May 2005)
	Sets limits on sulphur oxide and nitrogen oxide emissions from ship exhausts and prohibits deliberate emissions of ozone depleting substances; designated emission control areas set more stringent standards for SOx, NOx and particulate matter. A chapter adopted in 2011 covers mandatory technical and operational energy efficiency measures aimed at reducing greenhouse gas emissions from ships.
Basel convention, 1989	Covers the transboundary movements of hazardous waste. India has already ratified the convention and framed rules under the Environment (Protection) Act, 1980 to ensure compliance within its jurisdiction. These, to the extent applicable to the project activities, will be followed.
Hong Kong Convention, 2007	This convention focusing on the recycling and dismantling of ships, has yet to be ratified by India and many other large ships breaking countries. However, the relevant project activities will be made compliant with its salient features after analysis during subsequent studies.
Convention on the	<b>Article I:</b> Contracting Parties shall individually and collectively promote the effective control of all sources of pollution of the marine environment, and pledge themselves especially to take
prevention of marine pollution by dumping of wastes and other matter, 1972	all practicable steps to prevent the pollution of the sea by the dumping of waste and other matter that is liable to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the sea.
(London convention)	<b>Article II:</b> Contracting Parties shall, take effective measures individually, according to their scientific, technical and economic capabilities, and collectively, to prevent marine pollution caused by dumping and shall harmonize their policies in this regard

### 2.5 Environmental Standards & Guidelines

Project involves various activities, which may interfere with various environmental components. Thus it is required to control those activities so as the concentration of pollutant in environment should not exceeds its assimilation capacity. CPCB has issued some standards for disposal of effluents and quality of surface water body which should be referred and adhered to with regards to prescribed discharge standards at any point of time. India does not have any standard yet for disposal of dredged material, water quality in and around harbour/ports/terminals, thus standards issued by other renowned bodies are referred. Suggested list of standards is listed below and given in detail at Annexure 2.1.

- Standards for discharge of effluent in inland surface water bodies and Marine Coastal Areas (Source: G.S.R 422 (E) dated 19.05.1993 and G.S.R 801 (E) dated 31.12.1993 issued under the provisions of E (P) Act 1986)
- Classification of Surface water Bodies on basis of Quality (Source: Guidelines for Water Quality Management-CPCB, 2008)
- Water Quality Standards for Coastal Waters, SW-IV & V-Harbour and Navigation & controlled waste disposal (EIA Guidance Manual for Ports & Harbours, MoEF&CC, Gol)
- Standards for permissible level of water quality indicators (Source: Assessment of the Environmental Impact of Port Development, United Nations, New York, 1992)
- Permissible limit for off-shore dumping of dredged material (Source: Assessment of the Environmental Impact of Port Development, United Nations, New York, 1992)
- Criteria for harmful bottom sediments (Source: Assessment of the Environmental Impact of Port Development, United Nations, New York, 1992)
- Approximate Quantity of Suspended Sediments Generated by Dredging or Dumping Operations (Source: Assessment of the Environmental Impact of Port Development, United Nations, New York, 1992)

#### 2.6 Public consultation and disclosure requirements by World Bank

The Bank reaffirms its recognition and endorsement of the fundamental importance of transparency and accountability to the development process. Accordingly, it is Bank's policy to be open about its activities and to welcome and seek out opportunities to explain its work to the widest possible audience. According to 'OP 4.01: Environmental Assessment' of World Bank, the following conditions applies to the proposed subprojects.

Consultations: For all Category A and B projects the consultation will be carried out with the project affected groups and local nongovernmental organizations (NGOs) about the project's environmental aspects to take their views into account. For Category A projects, the borrower stakeholder consultation with these groups will be at least twice: (a) shortly after environmental screening and before the terms of reference for the EA are finalized; and (b) once a draft EA report is prepared. In addition, the borrower should consult with such groups throughout project implementation as necessary to address EA-related issues that affect them.

Disclosure: For a Category A project, the borrower will provide relevant information on project interventions in a timely manner prior to consultation and in a form and language that are understandable and accessible to the groups being consulted. The borrower will provide a summary of the proposed project's objectives, description, and potential impacts for the initial consultation. For consultation after the draft EA report is prepared, the borrower shall provide a summary of the EA's conclusions. In addition, for a Category A project, the borrower makes the draft EA report available at a public place accessible to project-affected groups and local NGOs. The borrower also will ensure that EA reports for Category A subprojects are made available in a public place accessible to affected groups and local NGOs. The document needs to be translated into Assam language. Public availability of the EA report for Category A project in the borrowing country and official receipt by the Bank are prerequisites to Bank appraisal of these projects.

In addition, consultations will have public consultations while preparing EMF. Community-level focus group discussions and meetings will also be held at various terminal and landing station locations.

### Chapter 3 : Project Description

### 3.1 **Project Component**

The following section provides a summary of the key design features of the Proposed Scheme. All of the elements described form part of the 'Proposed Scheme' and will be considered within the EIA. The design is currently under development, and hence draft is preferred. The details below therefore represent current best assumptions on the design, construction and operation of the Proposed Scheme. A location plan showing the Proposed Scheme route and key elements of the proposed design as per the technical feasibility studies at identified Terminal Area / Ghats / Jetties is provided in the subsequent chapters.

The project is focused on improving ferrying of cross-river passengers on the Brahmaputra, and seeks to use the opportunity to establish a tenable foundation for development of a modern IWT sector in Assam. The long absence of adequate policy response and piecemeal investments in IWT in the State (as also nationally) have resulted in somewhat unorganised and weak condition for the sector, which is not predisposed to a linear scale-up. Despite the odds however, Assam manages to provide ferry services to about 5 million people annually, usually along with their vehicles/livestock/goods. In order to support the functioning but ill-equipped IWT sector therefore requires a more granular approach encompassing a range of supply and demand side factors. As such, the project is guided by a binding philosophy that admits wider, and even incremental interventions as long as they contribute to strengthening institutions and planning; operational efficiency and safety; and importantly sustainability. The Project has three main components and eight sub-components collectively intended to tackle the regulatory, operational and infrastructure challenges of the sector.

# COMPONENT 1: Institutional, regulatory and safety strengthening. This component will include;

# Technical assistance: sector planning, design and roll-out of new Regulatory Authority, business planning for Assam Shipping Company and Assam Ports Company; training of staff to fulfil new roles in the restructured industry;

The subcomponent has essentially provided for technical assessments / studies to form basis for sector level strategic plans and institutional reforms. An Integrated Strategic Development Plan (ISDP) for the State is being prepared. The exercise involves preparing an overall transport strategy for Assam, and more specifically preparing investment plan to help mainstream Water Transport in the State including multi-modal integration and last mile connectivity. Studies on Environment Impact Assessment (EIA) and Social Impact Assessment (SIA) are also being undertaken.

Complementing the investments in infrastructure, the project aims to strengthen the Assam Inland Water Transport (IWT) Sector through a supportive Institutional Framework. A wideranging consultancy on Institutional Strengthening and Business Plan (ISBP) is assigned to study the system weaknesses in detail and develop prescription for more effective institutions. In doing so, the study has already provided the basic legislation for an Independent IWT regulatory authority (RA) to carry out the safety, environmental and economic regulation of the sector (shipping, ports, and shipbuilding). An important emphasis of the sub-component while assessing sector laws and regulations is particular attention to Safety regulations for vessel and passenger movement, even more specifically for women and children. Recently, the Bill has been passed by the State in November 2018 for establishing an independent regulatory authority for Inland Water Transport.

Further, the operational and commercial functions of the government's shipping operations and terminal services have been decided to be vested in two new corporations, the Assam Shipping Corporation (ASC) and the Assam Ports Corporation (APC) respectively. The two new corporations will be constituted under the Companies Act (2013), and subject to rigors of the market. The ISBP will develop a Business Plan for the two companies and guide them through the initial period of independent operation.

Another important element supported under the component is sector capacity. The capacity of institutions needs to improve to deliver roles effectively in the upgraded sector. The consultancy studying institutions (ISBP) will undertake a detailed assessment of capacity building needs of DIWTA staff from the point of view of their professional development, re-skilling and job mapping needs. In particular, building capacity to undertake regular surveys and charting of the river, recording and analysis of data, which in turn helps institutionalize knowledge on river navigation is of immense importance. The project therefore proposes to setup a new hydrography unit under the Directorate of IWT Assam.

## Safety management: river navigation aids, night navigation technology on some routes, and emergency response system (policy, procedures, vessel and equipment).

The sub-component would draw on national / international experience in assessing appropriate aids to navigation, their procurement and deployment to allow 24-hour services / night navigation on most vulnerable / trafficked routes / crossing points. Beginning with pilots at 2-3 crucial locations, deployment of navigation aids will be scaled up based on the investment strategy for the sector.

An important objective will be to support establishment of a Search and Rescue (SAR) Organization/piloting emergency response system (policy, procedures, equipment, and management) as well as improving systems for emergency preparedness including climate and natural disasters.

COMPONENT 2: Fleet safety improvements and modernization (estimated cost USD 25 million). This will include financing of:

GoA incentive scheme (known as Jibondinga) to assist industry transition to the new regulatory regime. It is designed to support the scrapping and replacement of unsafe or obsolete private vessels and replace them with new vessels, or retrofit existing but acceptable vessels with modern marine engines and safety equipment;

The objective of supporting an Incentive scheme is to encourage investment in modern shipping technology including adoption of greener and safer technologies, through review of fiscal and other barriers affecting quality of boat construction and maintenance. GoA has prepared a draft proposal entitled '*Jibondinga*' - meaning water as source for life/livelihood for private country boat operators, which provides incentive both for new vessel acquisition as well as for retrofitting. The scheme considers special incentive to encourage women entrepreneurs and women self-help groups. Vessels design and specifications for procurement and retrofitting will be standardized to have better regulation as well as for ease of repair and maintenance.

## Procurement of new vessels for the Assam Shipping Company and retrofitting of existing public vessels.

To begin with, the project is assisting the Assam Govt. to procure 20 passenger ferries with the capability of carrying motorcycles in two sizes. One can carry 50 passengers and 25 motorcycles the other 100 passengers and 50 motorcycles. Allowance has also been made for the carriage of substantial amount of hand carried cargo in line with local custom and practice. To ensure substantially improved stability the two-wheelers will be carried below the gunwales of the vessels. The vessels will be built to the class rules of a major classification society to ensure they are both robust and safe. The vessels are intended for operation as ferries across the river though they will have the capability to provide longer haul services to tourist travelling between Kaziranga National Park and Guwahati as well.

Simultaneously, the project has initiated condition surveys of the existing govt. fleet, hull & machinery, deck and outfit items for their suitability, impact stability (for the area of operation), loading and other conditions. Select vessels may be retrofitted. This will also include measures to "green" the vessel fleet, including adoption of good waste management practices. A few medium-speed shallow draft Roll-On Roll-Off (Ro-Ro) passenger/cargo catamarans for selected major traffic routes are also planned for procurement.

The project would also like to improve connectivity / access to basic services for many islands, villages and far-off chars by using additional floating stock which is customized to specific needs. Discussion with the district administration and local governments during early preparation missions, particularly to the upper reaches of Brahmaputra (Dibrugarh, Jorhat, Majuli), had revealed serious connectivity constraints to basic public services such as health and education for numerous small islands and remote chars. These have had profound impacts on health (high maternal and infant mortality), education, jobs and trade. For example, many inhabited islands do not have medical facilities and people have to travel to other nearby bigger towns to access services, which become critical during emergencies. For this, the project plans to utilize the existing Govt. fleet, which may no longer be suited for intensive passenger ferrying but could be usefully converted into mobile clinics, schools / library and for other such important services. These vessels will be suitably retrofitted and customised to their intended use.

# COMPONENT 3: Improvement in terminal infrastructure. This will finance: Provision of priority terminals for the Guwahati and Majuli Island ferry routes;

In particular, this will finance the design and construction of few priority terminals at identified busy crossings (such as Guwahati, Majuli etc.) plus a few others (mostly country side) where upgrading is urgent. It would also provide standard designs for scalable infrastructure that can be adapted for other urban and rural ferry terminals (ghats). The infrastructure improvements / designs will in particular adopt a 'working with nature' approach which ensures that project objectives are satisfied in a way that places natural ecosystem at centre stage thereby making solutions non-damaging and sustainable (limit dredging, utilize portable / modular infrastructure design adaptation for landing stations to enhance climate change resiliency, low draft vessel designs, etc.). The developments would offer opportunities for ecotourism development, rejuvenating the river waterfront and integration of quality ferry terminals in the urban context.

#### Provision of terminals on several other mainly rural routes, to be selected.

This will provide standard designs for modular and scalable infrastructure that can be adapted for other urban and rural ferry terminals. It also includes ancillary infrastructure such as road access, terminal buildings and other amenities for the physically challenged, women, children, old and infirm.

The total cost of the project is estimated at US\$ 150 million. The IBRD support is estimated at US\$120 million while the Govt. of Assam share will be US\$ 30 million.

#### Priority physical works under the project (planned for first 18 months)

In the initial phase, the project will make the following investments (physical works) under the three broad project components.

Project Component	Sub Component	Physical Investments planned
Component1: Institutional, regulatory and safety strengthening	a. Technical assistance: sector planning, design and roll-out of new Regulatory Authority, business planning for Assam Shipping Company and Assam Ports Company; training of staff to fulfill new roles in the restructured industry	Upgradation of crew training centre

#### Table 3.1 Proposed Initial Phase Investment

	b. Safety management: river navigation aids, night navigation technology on some routes, and emergency response system (policy, procedures, vessel and equipment)	
Component 2: Fleet safety	a. GoA incentive scheme (known as Jibondinga) to assist industry transition to the new regulatory regime	Vessel improvement works for private boat operator (engine, hull etc.)
improvements and modernization	b. Procurement of new vessels for the Assam Shipping Company and retrofitting of existing public vessels	<ul> <li>Procurement of 20 new public vessels</li> <li>Retrofitting of few govt. vessels</li> </ul>
Component 3: Improvement in terminal infrastructure	a. Provision of priority terminals for the Guwahati and Majuli Island ferry routes	<ul> <li>2 terminals at Guwahati (LachitGhat and North Guwahati)</li> <li>1 terminal at Majuli (Aphalamukh)</li> </ul>
	b. Provision of terminals on several other mainly rural routes, to be selected	

# 3.2 Review and Analysis of the Suitability of Terminal / Identified ghats / Landing point

#### 3.2.1 Identified Priority Ghats for Development

23 Terminals / Landing Points / Ghats of 12 ferry lines has been considered for comprehensive approach towards framework preparation based on the feasibility report by the ISDP Consultant. In south bank these are namely, Guwahati Gateway Ghat, Sonaram Ghat, Uzan Bazar Ghat, Nagarbera(Upstream), Nagarbera (Downstream), Jaleshwar, Medertary/ South Salmara, Fakirganj, Neamati, Gandhi Ghat, Berenga. In north bank the ghats/ terminals are namely, North Guwahati, Rajaduar, Umananda Island, Nagarbera (Upstream), Nagarbera (Downstream), Dhubri (At three points), Kamalabari, Aphalamukh, Dudhpatil & Gangapur/ Kanakpur. However the EMF will be revised as per the revised components and concept plan.

This EMF is setting the processes and protocols for Assam IWT project. It will preferably analyse the environmental impacts of IWT and IWT impacts on environment and set the guidelines for future perspectives and investments. It will be an organized approach to appraise the present status of the project, gap analysis and future interventions in terms of environmental sustainability in IWT sector in Assam.

#### 3.2.2 Present Scenario at each Ghat / Jetty / Landing point location

Each of the pre identified jetty locations as highlighted elsewhere in the foregoing clauses was frequented by the EIA and SIA team experts over the period from 18 to 21 June, 04 July to 21st September 2018, 2<sup>nd</sup> to 9<sup>th</sup> October to obtain the available base line information on the requisite parameters concerning EIA and SIA requirements. Of the pre identified jetty locations, 14 jetty sites on 8 inland water routes on the lower reach of the Brahmaputra come under the

administrative control of Guwahati Division of AIWTD and 4 jetty sites on 2 inland water routes on the upper reach of the Brahmaputra, connecting Majuli island with the mainland Jorhat, come under the administrative control of Dibrugarh Division of AIWTD. The rest 2 inland water routes offering 4 terminals on the Barak River are under the administrative control of Silchar division of AIWTD. The geo-referenced locations of the existing Ghats / Jetty / Landing points are shown in Figure2.1. Present scenario at each existing Ghat / Landing point location is discussed in the following section comprehensively.

Given that the river geometry vis-à-vis river morphology forms the rule curve that governs the activities of the IWT sector, IWAI is seen carrying 'thalweg survey' along the Brahmaputra to keep watch on the requisite water depth for uninterrupted navigability in the river, with provision of dredging to required depth as and when need arises. Given no bathymetric survey data for the Ghats, IWT Assam is seen keeping the Ghats live by frequently shifting and repositioning the location of the Ghats while the inland water traffic services are run either by limited number of government vessels or by vessels owned by private players on lease of the IWT route(s) of the government. Unplanned ghats activities in the form of tea stalls, eateries and other vending of the kind are seen near a jetty. Further, given no plying of vessels at night, there shows no significant night navigational sign facilities in place even as it is essential as well as mandatory for a national water way in the Brahmaputra designated some three decades back (NW II). Given the standard norms vis-à-vis other safeguard issues, the present scenario is not very encouraging and warrants further review. The present scenario, location details along with pictorial highlights of all the ghats are presented in Annexure 3.

#### 3.2.3 Limitations Observed at Jetty

Though the present jetty at each identified location has been catering to the need of the people merely with skeletal services, the IWT operation along the Brahmaputra-Barak is not up to the design and expectation. Observed limitations are attributed to inadequacies in i) Passenger Waiting Area, ii) Parking area at berth, iii) Toilet facilities, iv) Vehicle parking area and v) Access to the Public Road System. Approach roads at many of the terminals are not worthy. Absence of rescue team with vessel equipped with modern gadgets speaks of another limitation observed at present jetty. The most significant limitation assigned to a jetty is the restricted land holding owned by the AIWTDS at the jetty location, which appears as impediment in jetty improvement or expansion. Another significant limitation seen at the jetty location is the ever increasing river bank erosion, giving rise to impediment in jetty development.

The ghats of today used for inland waterway transport across the main rivers need to be converted (or re-habilitated/replaced) into regular and reliable ferry liner services. The ferry lines have to be operated at defined (and controlled and enforced!) safety, technical and nautical conditions by respective vessels, served at corresponding terminals. The ferry lines and the terminal shall to be operated by skilled professionals. Establishment of maintenance and repair facilities and equipment at acceptable standards, and training and capacity building, are prerequisites and need to be considered already be the priority module planning. These planning principles are applicable for all and every ferry line under the integrated Assam inland water transport concept. Furthermore the concepts and the corresponding terminal designs and ferry liner service concepts have to consider urban and economic developments appropriately. In particular, the urban waterfront development project at Guwahati, the Smart city project, and the Panbazar bridge project need to be considered for integrated approaches at Guwahati. Same for e.g. development projects of fixed river crossings at e.g. Silchar or Dibrugarh or Dhubri, in order to prevent for duplication of investment related to planning and implementation of transport or urban infrastructures.





#### 3.3 Proposed Development

The proposed development includes for various harbours and landside works to provide. It is Consultants general understanding that terminal buildings and infrastructure shall be planned considering where feasible local architectural design and construction methods with locally available materials. The basic infrastructure requirement is analysed and calculated on the basis of ghats capacity parameter, number of maximum passengers and the recommended vessel parameters in ISDP Module 4 report. ISDP has prepared draft concept plan for priority 1 ghats. However, the EMF will be revised as per the revised components and concept plan. Below are the project components highlights.

#### 3.3.1 Project Activities

The following main components are considered to form the basic infrastructure required at Terminal / Ghat / Landing point locations:

#### 3.3.1.1 Harbour Work

- Dredging
- Manoeuvring at the jetty
- Erosion Control Measures / River Training
- Navigation
- Fixed / floating Pier or Jetty Structure
- Berthing area
- Access bridges
- Turning Circles to Access Bridges
- Ticket (Service) Counter
- Administration and Security
- Passenger Waiting Area
- Parking Area at berth
- Toilet facilities

#### 3.3.1.2 Landside Work: Terminal & Infrastructure

- Delivery Parking
- Vehicle parking area & Access to the Public Road System

#### 3.3.1.3 Maintenance Pontoon and Fuelling Station

- Maintenance
- Fuel Stations
- Garage with equipment
- Safety equipment

#### 3.3.1.4 Environmental Services to be provided by Ghat and Ferry Operations Management

- Wastewater: Handling/Treatment/Disposal
- Solid Waste Collection, Recycling and Disposal
- Managing Hazardous Waste
- Health clinics / First aid
- Solar energy

These components along with the ferry line (start to end points) are further will be taken into consideration for the quantification of resources and possible impacts assessment during EIA studies.

### Chapter 4 : Stakeholder's Consultation and EIA Requirement

Participatory consultation is both an essential criteria and important strategy for an integrated environmental and social analysis process, the project design and its implementation. The purpose of the stakeholder consultation is to identify the views of local communities, major institutional and other stakeholders, and to assess any mitigation measures which may be undertaken to minimize any adverse impacts of the proposals under consideration. "Public consultation" refers to the process by which the concerns of local affected persons and others who have plausible stake in the environmental impacts of the project or activity are ascertained with a view to taking into account all the material concerns in the project or activity design as appropriate. All Category 'A' projects or activities shall undertake public consultation.

Consultation is a two-way process of dialogue between the project authority and its stakeholders. Stakeholder consultation is really about initiating and sustaining constructive external relationships over time. Consulting stakeholders entails an implicit "promise" that, at a minimum, their views will be considered during the decision-making process. This does not mean that every issue or request must be acted upon, but it does mean being clear with people about aspects of the project are still open to modification based on their input, and which are not. It also means taking feedback received during the consultation process seriously and making best efforts to address issues raised through changes to project design, proposed mitigation measures, or development benefits and opportunities. Inevitably there will be limitations in considering and upholding the stakeholders' inputs in the process of project formulation.

#### 4.1 Requirements and Scope of Stakeholder consultation

The consultation process has been conceived, planned, and initiated with the following key objectives:

- To provide key project information and create awareness among various stakeholders about project intervention;
- To share the terms of reference of the current EMF and EIA;
- To have interaction for primary and secondary data collection with project beneficiaries, affected, and other stakeholders;
- To identify environmental and social issues such as displacement, safety hazards, employment, and vulnerable persons;
- To begin establishing communication and an evolving mechanism for the resolution of social and environmental problems at local and project level;
- To involve project stakeholders in an inclusive manner; and
- To receive feedback from primary stakeholders on mitigation and enhancement measures to address the environmental and social impacts of the project.

Requirements for consultation may be legal or regulatory requirements, internal corporate policy requirements or conditions of the lenders. Scoping of consultation is to find if there are issues of environmental concern or issues requiring special attention for high risk groups or vulnerable groups associated with environmental concerns. For projects that have environmental and social impacts, consultation will not be a single conversation but a series of opportunities to create understanding about the project among those it will likely affect or interest, and to learn how these external parties view the project and its attendant risks, impacts, opportunities, and mitigation measures. Listening to stakeholder concerns and feedback can be a valuable source of information that can improve project design and outcomes and help the authority to identify and control external risks.

#### 4.2 Identification of Stakeholders

Before beginning a stakeholder consultation process, it is useful to think about who needs to be consulted, over what topics, and for what purpose? Getting clear answers for these questions up front can save time, reduce costs, and help keep expectations in check. For projects with multiple stakeholder groups and issues, preparing a more formal Stakeholder Engagement Plan in advance is advisable. Stakeholder consultation will encompass all major emerged issues

concerning the project vis-à-vis environmental issues to give justice to the studies. In accordance with the provisions as stipulated in the National Waterway Act 2016, Environment (Protection) Act 1986, Water (Prevention and Control) 1974 & 1975 and other relevant Acts, Rules, Instruments etc., the tools are prepared to obtain the requisite data to frame the consultation report.

#### 4.2.1 Different stakeholders identified

Before initiating any formal move for the studies, the stakeholders are identified for consultation. Inland waterway commuters including residents of the areas flanked by the Brahmaputra or Barak river in and around the jetty location, form the prime stakeholders who are actively or passively influenced by the jetty vis-à-vis IWT. Ferry operators, Tenants, local amenity service providers are stakeholders in the project. State WRD is big stakeholder since all the Ghats are exposed to floods and erosion and treated by structural interventions by WRD Assam as their mandate.

#### 4.2.2 Local business associations

Local business associations which have interest over IWT in promoting their business activities, community groups who have stake over their livelihoods by ferrying their products for selling and NGOs frequenting the Ghats for upholding their part of activities are also stakeholders.

#### 4.2.3 Regulators, transport network providers, and regional and local panning bodies

Key stakeholders also encompass the agency(s) associated with the operation of transport network which includes government ferry operators as well as other private players running the transport network on lease from the government. Affairs related to inland water transport in state are regulated, in terms of the clauses stipulated in the relevant Acts, Rules or Instruments, by AIWTD for running vessels at the jetty while IWAI is poised to keep the IWT route navigable round the year. Thus, the IWT regulators in the government are also stakeholders to include at the consultations. Given that some regional and local bodies like panchayat or urban portals are also used to run the shows, they may be consulted to obtain their part of known in the IWT sector, in framing, analysing and making inferences to incorporate in the consultation report.

Primary stakeholders	secondary stakeholders	Structured Consultation			
Primary stakeholders include	Secondary stakeholders include	Structured Consultation at the			
People having direct impact.	<ul> <li>village representatives</li> <li>women's group,</li> <li>voluntary organizations NGOs,</li> <li>field level officers and staff</li> </ul>	<ul> <li>subproject sties,</li> <li>district and divisional levels</li> </ul>			
	Government officials.				

#### Table 4-1: Stakeholder Consultation at all Stages of Project

#### 4.2.4 Consultation Report

As a prelude to screening and scoping, numbers of field visits were made by the experts of the EIA portal. Findings in the wake of consultations with the stakeholders, highlighted elsewhere in the foregoing chapters, form the seed of the consultation report. From the consultations, it is gathered that not a single water vessel in this part of the country is equipped with any modern gadgets with closed sanitary and waste water systems with coverage for any oil or other emulsions, noise covered and sulphur free diesel consuming engines.

From the findings of the consultations, an inference is drawn to suggest that the awareness about the importance of environmental safeguards during project implementation and thereafter, is seen lacking among the stakeholders including the project authority.

During field visits, local people were consulted regarding the impact of the work on the environment. It was observed that the fringe communities have very little awareness on the quality of environment and they are more concerned about the speedy development of the river terminal. Even when the structural interventions like piers of staging in intake point of water supply project or of RCC jetty, bridges, foundation sub structures of the towers in the river or remains of abandoned hydraulic structures pose environmental threats to IWT, inviting vessel accidents, none of the stakeholders are seen worried.

As a matter of fact, the other day (05/09/2018) one motorized 'bhutbhuti' plying between Guwahati and North Guwahati remained stranded in the mid Brahmaputra due to engine failure but the vessel was later broken into pieces after hitting the piers of JICA funded staging at the intake point of North Guwahati Water Supply Project under construction. From consultations at jetty sites, the emerging focus is around the structural interventions created by state WRD along the rivers to address the river training needs.

Porcupine screens laid on the river bed in the proximity of a river terminal are very active threats to inland water vessels frequenting the Ghats. From consultations around the issues of the kind, it is suggested that there should be strong coordination among the stakeholders to know each other's activities at jetty or along the river route to avoid mishap. Given that long stretches of the Brahmaputra and Barak River are vulnerable to river bank erosion; there is ample scope for river training works at terminals to be executed by state WRD and IWT in convergence mode for sustainable and better results.

#### 4.2.4.1 Key Findings of the Consultations

All the stakeholders and community correspondents appreciated the project. The concern of the consultation participants were mainly focused on improvement and extension of terminals, safety and security of passengers, impact on livelihood, dredging and environmental issues including management of dredged materials. The summary of points discussed in these consultation meetings.

Stakeholders Type	List of concerned raised	Responses and mitigation measures under the Project – Summary
Shopkeepers	<ul> <li>Shopkeepers opined in favour of the project but they want to see the launch Ghat improved with more facilities such as toilets, sufficient space for shops on a designated area so that</li> <li>They will be bound to shift their structure frequently. They expressed that the project will increase their business opportunities and new venture of business will be open after completion of the project.</li> </ul>	<ul> <li>Toilets and drinking water facilities will be included in the design of launch Ghats and river terminals.</li> <li>The designs of terminals will also include shops and while leasing out these shops, priority will be given to the affected communities.</li> </ul>
Physically Disabled	<ul> <li>There is no special facility for the disabled people in the ferry terminals and water vessels.</li> <li>Wheel chair and bed facilities are available only for patients and for emergency situation.</li> <li>There are no doctors permanently on duty. Disabled persons want proper safety and security in terminal and launch as well. Disable persons do not know the facilities about river transports.</li> <li>Most of the people think that road transport is easier than river transport especially for the disables persons as they cannot swim. They want separate space/seat for them in the launch/ferry and easy riding facility such as smooth way, wheel chairs, etc.</li> <li>If such facilities are provided for the disable people then they may</li> </ul>	<ul> <li>Ramps will be provided at the terminals for embark and debark of disabled people.</li> </ul>

#### Table 4-2: Summary of consultation meetings

Stakeholders Type	List of concerned raised	Responses and mitigation measures under the Project – Summary
	comfortably use the river transport.	
Fishermen	<ul> <li>Fishermen communities are mostly living along the river or within one km from the river.</li> <li>They want modern signalling system and safety and security during fishing. Some time they are to face trouble from pirates or even some politically influenced persons who made them bound to pay money for fishing. They welcomed the project but requested to keep in mind about fish moving routes, season and fishing areas during dredging so that their livelihoods will not be disturbed.</li> </ul>	<ul> <li>Navigational signals will be provided along the navigational channels.</li> <li>Spawning areas of fish, migratory routes and commercial areas for fishing will be avoided for dredging and dredge material placement</li> </ul>
Launch and Ferry Workers	<ul> <li>Launch and ferry workers expressed their views in favour of the project.</li> <li>They are concern about dredging and signalling system in the river routes as there are some incidents of collision among the water vessels. Improved signalling system may decrease accidents.</li> <li>They want sufficient personal protective equipment (PPE) for their safety in the launch and other water vessels. PPE can also be available for the passengers</li> </ul>	<ul> <li>Safety measures are included in the project planning and such as provision of river information, VHF equipment and search lights</li> </ul>



Consultation at Dudhpatil Ghat



**Consultation at Fakirganj Ghat** 



**Consultation at Gandhighat** 



**Consultation at Kacheri Ghat** 



**Consultation at Medartary Ghat** 

#### 4.3 Institutional Stakeholder Consultation for Screening and Scoping Report

Institutional stakeholder consultation is conducted on 8<sup>th</sup> October 2018 as per world bank requirement at screening and scoping stage. The aim of institutional stakeholder's consultation is to inform all relevant stakeholders of the proposed scheme, to identify available information, and to identify stakeholders' issues and concerns at screening and scoping stage. It will be helpful to consider the maximum comprehensive assessment of all environmental aspects in EIA Study. The important stakeholders included:

- Directorate of Fisheries, MeenBhawan, Gopinath Nagar, Guwahati 781016
- Directorate of Tourism, Station Road, Guwahati 781001
- Member Secretary Assam Pollution Control Board, Bamunimaidam, Guwahati -781021
- PWD /PMGSY, Ground Floor, Block B, Assam SecretariatDispur, Guwahati 781006
- Irrigation Department, Chandmari, Guwahati-781 003
- Deputy Director of IWAI, Pandu Port Complex, Pandu, Guwahati 781012
- Scientist, Central Inland Fisheries Research Institute, ICAR-CIFRI Regional Center, HOUSEFEED Complex, Dispur (Last Gate), Guwahati-781006
- Assam Science Technology & Environment Council, BigyanBhawan, Near IDBI Building, G.S. Road, Guwahati-781005
- Guwahati University, GopinathBordoloi Nagar, Jalukbari, Guwahati 781014
- Merchant Navy, 12, Janapath Ln, South Sarania, Ulubari, Guwahati 781007
- General consultants
- GMC, Panbazar, Guwahati 781001
- Tata Institute Of Social Science, Tetelia Road, Assam Engineering College Campus Jalukbari, Guwahati 781013
- Guwahati IIT, Surjyamukhi Road, North, Amingaon, Guwahati 781039
- ASTC, Paltanbazar, Guwahati-781008
- KPMG, AdvantNavis Business Park, 5th & 6th Floor, Tower A, Plot No. 07, Sector 142,Noida Express Way, District GautamBudh Nagar

- Senior Engineers Forum Guwahati(NE Region), BeltolaBasistha Road, Guwahati 781028
- Wildlife Institute ofIndia(WII), Aaranyak, Samanwoy Path Survey, P.O. Beltola Guwahati 781028.
- Brahmaputra Board, NH37, Basishta, Guwahati, Assam 781029
- village council (gram Panchayat) (At Project areas)
- Local fisherman (Project Areas)
- Operators (Project Areas)
- Traders (Project Areas)

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The major Comments/Suggestions and its reply is tabulated below in Table No. 4.3. All other details like Advertisement in Newspaper in local and English language, Attendance sheets, Letters submitted to stakeholders are enclosed in Annexure 4.

	Name and			_
SI. No.	Designation	Department	Comments/Suggestions	Remarks
01.	Dr. DhrubajyotiRajb anshi Assistant Professor (9613903267)	Guwahati College	<ul> <li>The presentation is more generalized rather than that of to the point and specific</li> <li>More points should be included in the parameters for screening part because location wise they are vast diversity which had full attention.</li> </ul>	The presentation is prepared for the screening and scoping. The main objective was to receive the comments from participants which can be taken into consideration for EIA studies. During EIA presentation in Public domain all the points will be presented in detail as per qualitative and quantitative analysis as studied.
02.	Mr. Mukul Chandra Lahkar (9435014466)	Brahmaputra Board	Please send the presentation by mail for study in the dept. and give comments. Email: mukullahkar28@gmail.com	Noted. Is sent on the same of the Stakeholder's consultation on 8 <sup>th</sup> October 2018.
03.	L. Nath (9864066886)	IWT	<ul> <li>When the project implemented the following points are to addressed</li> <li>Green engineer is to be filled (like solar engine, water jet engine also be a filled with vessels.</li> <li>Bio toilet for pollution free option</li> <li>All ferry services are to be declared as pollution free zone.</li> <li>Community participation.</li> </ul>	<ul> <li>All the sustainable solutions like green engine, solar light panel installation on the top of the pontoons and static structures at Ghats, STP with zero discharge system, closed fuelling system will be implemented for the pollution free operations at Ghat locations. These are already taken into considerations.</li> <li>Proper solid waste management at Ghat locations will be implemented with community participations.</li> <li>Policy and protocols will be displayed at public</li> </ul>

# Table 4-3: Comments/Suggestions and its reply during Institutional Stakeholders Consultation

SI. No.	Name and Designation	Department	Comments/Suggestions	Remarks
				domain to follow the conditions during travelling and operations at Ghat Location.
04.	Mr. DigantaTalukdar Junior Engineer (9435340085)	IWT division, Guwahati	Safety of water animals	Ecology and biodiversity will be studied in detailed during EIA and locations where most frequently the aquatic fauna like Gangetic Dolphins and tortoise are found will be mapped. Accordingly the management plan will be prepared which will be strictly followed and implemented during construction and operation phase.
05.	Mr. Srimanta J. Baruah Executive Engineer (9435045100)	GMC	The river banks are prone to erosion in summer. Situation in winter. The river terminal/ Ghats should be designed considering these two aspects. Otherwise people have to suffer and business will hampered.	The jetty / pontoons are proposed as floating structures which are as per the seasonal variation and water level fluctuations during dry, wet and winter season of the region. It will definitely mitigate the seasonal relocation of the jetty operation system and throughout the year passengers can take advantage of the ferry.
06.	S. Ahmed Junior Engineer (9706054324)	IWT, Assam	River water protection to be minimized by using Bio disaster safety tank for Human social waste.	<ul> <li>All the sustainable solutions like green engine, solar light panel installation on the top of the pontoons and static structures at Ghats, STP with zero discharge system, closed fuelling system will be implemented for the pollution free operations at Ghat locations. These are already taken into considerations.</li> <li>Proper solid waste management at Ghat locations will be implemented with community participations.</li> <li>Policy and protocols will be displayed at public domain to follow the conditions during travelling and operations at Ghat Location.</li> </ul>
07.	R. K. Dutta Junior engineer	IWT	Sustainable garbage management.	Eco-friendly Erosion Control measures will be

SI. No.	Name and Designation	Department	Comments/Suggestions	Remarks
	(9085158544)		<ul> <li>Protect erosion by permanent structure with proper plantation.</li> <li>Pollution management/ control by proper way.</li> </ul>	<ul> <li>suggested in EIA like Geotube embankment, piling up the geo-bags, Geotextile Embankments etc after feasibility.</li> <li>All the sustainable solutions like green engine, STP with zero discharge system, closed fuelling system will be implemented for the pollution free operations at Ghat locations. These are already taken into considerations.</li> <li>Proper solid waste management at Ghat locations will be implemented with community participations.</li> <li>Policy and protocols will be displayed at public domain to follow the conditions during travelling and operations at Ghat Location.</li> <li>EMP will be prepared</li> </ul>
08.	Mr. SujitRanjanNath Junior Engineer (9435734276)	IWT	<ul> <li>Protection of river water animals.</li> <li>Protection of both bank erosions with plantation</li> <li>Pollution control of river water.</li> </ul>	<ul> <li>Ecology and biodiversity will be studied in detailed during EIA and locations where most frequently the aquatic fauna like Gangetic Dolphins and tortoise are found will be mapped. Accordingly the management plan will be prepared which will be strictly followed and implemented during construction and operation phase.</li> <li>Eco-friendly Erosion Control measures will be suggested in EIA like Geo- tube embankment, piling up the geo-bags, Geo- textile Embankments etc. after feasibility.</li> <li>All the sustainable solutions like green engine, STP with zero discharge system, closed fuelling system will be implemented for the pollution free operations at Ghat locations. These are already taken into</li> </ul>

SI. No.	Name and Designation	Department	Comments/Suggestions	Remarks
09.	Mr. D. K. Chakravarty A.E.E (9613074344)	IWT	<ul> <li>Should be Eco Friendly.</li> <li>Attention for oil spillage, garbage disposal etc.</li> <li>Strong and sustainable protection for river ecology.</li> </ul>	<ul> <li>considerations.</li> <li>Ecology and biodiversity will be studied in detailed during EIA and locations where most frequently the aquatic fauna like Gangatic Dolphins and tortoise are found will be mapped. Accordingly the management plan will be prepared which will be strictly followed and implemented during construction and operation phase.</li> <li>Ecofriendly erosion control measures will be suggested in EIA like Geo- tube embankment, piling up the geo-bags, Geo- textile Embankments etc. after feasibility.</li> <li>All the sustainable solutions like green engine, STP with zero discharge system, closed fuelling system will be implemented for the pollution free operations at Ghat locations. These are already taken into considerations.</li> <li>Safety aspects will be covered as per the MORPOL, IWAI, EHS Ports protocols.</li> </ul>
10.	DibyaMomin Student (8257847041)	Tata Institute Of Social Science	<ul> <li>What happens to the flora being displaced?</li> <li>0 KM barrier- how will it keep fauna like Dolphin &amp; fish away?</li> <li>In case of an oil spill how prepared is everyone?</li> <li>Suggestions: An integrated understanding of the endemic species found at the location.</li> </ul>	<ul> <li>Appropriate protocols and procedures will be prepared for sighting of dolphins and other endangered wildlife species within the vicinity of the dredging site. The objective of the protocols and procedures will be aimed at having no or minimal impacts on the respective wildlife species.</li> <li>As per convention, Ships are required to carry a shipboard oil pollution emergency plan. Operators of offshore units under the jurisdiction of Parties are also required to have oil pollution</li> </ul>

SI. No.	Name and Designation	Department	Comments/Suggestions	Remarks
				similar arrangements which must be coordinated with national systems for responding promptly and effectively to oil pollution incidents. Ships are required to report incidents of pollution to authorities and the convention details the actions that are then to be taken. The Convention calls for the establishment of stockpiles of oil spill combating equipment, the holding of oil spill combating exercises and the development of detailed plans for dealing with pollution incidents. Parties to the convention are required to provide assistance to others in the event of a pollution emergency and provision is made for the reimbursement of any assistance provided. MARPOL implementation plan will be prepared. Suggestion Noted and will be covered in EIA report
11.	Mr. ParthaJyoti Das 9435116558	Aaranyak	Methodology of assessment of import on "Aquatic Biodiversity" needs to be properly explained.	<ul> <li>Noted.</li> <li>Appropriate protocols and procedures will be prepared for sighting of dolphins and other endangered wildlife species within the vicinity of the dredging site. The objective of the protocols and procedures will be aimed at having no or minimal impacts on the respective wildlife species.</li> </ul>
12.	ER. OFFR DebajitBharadw aj 3 <sup>rd</sup> Marine Engineer officer 9706110022	Merchant Navy	Implantation of MARPOL Annexure I to VI	MARPOL implementation plan will be prepared and will be incorporated in safety aspect of EIA report.
13.	Dr. ArnabSarma Sr. River Engineer (9706768066)	General Consultants	<ul> <li>The Baseline survey regarding the environment may kindly be provided.</li> <li>The EIA must come up with clear comments on how to go for preparation of EMP</li> </ul>	<ul> <li>Noted. Will be covered in EIA in Baseline Environmental assessment for one season.</li> <li>Full EMP with implementation plan and</li> </ul>

SI. No.	Name and Designation	Department	Comments/Suggestions	Remarks
			<ul> <li>Water quality issues were the terminal.</li> <li>Sourcing of construction materials from nearby areas (of Ghats) are of concern. Thus, alternative arrangements must be suggested.</li> </ul>	<ul> <li>responsibility matrix will be costing will be prepared and incorporated in EIA report.</li> <li>Water quality issues at the terminal will be addressed and mitigation plan will be prepared.</li> <li>Noted. Construction material management plan will be prepared and added in Alternative assessment chapter under construction technology.</li> </ul>
14.	Mr. Kaustubh Rakshit Technical Superintendent (9435009229)	IIT GUWAHATI	<ul> <li>What are the parameters you have studied in water quality analysis?</li> <li>How you address the problem</li> <li>What are the parameters you have studied in air quality parameter?</li> <li>Do you study the flood?</li> <li>How many samples you have studied for each location</li> </ul>	<ul> <li>Parameters for air and water quality studied are as per TOR given by World Bank.</li> <li>We will carry out qualitative and quantitative baseline and impact assessment for all parameters and accordingly suggest mitigation measures.</li> <li>Environmental modelling will be carried to assess the incremental pollution load in air and noise levels.</li> <li>Flood management is already covered in the EIA scope.</li> </ul>
15.	Mr. Sanjeev Sarma NV expert (9818922344)	EQMS	<ul> <li>Is the analysis of alternative was done during environmental screening exercise as yes. Then what is the criteria matrix.</li> </ul>	Yes. Covered in Screening and scoping report.
15.	Miss Hitakkhi Kalita Student (8399841363)	Tata Institute of Social Science, Guwahati	<ul> <li>How will be river ecosystem affect if the ferry will start?</li> <li>How new ferry's will lead to sustainable development?</li> </ul>	<ul> <li>River ecosystem will be studied during EIA and addressed in the impact assessment chapter.</li> <li>Environmental modelling will be carried to assess</li> </ul>
16.	Sk Aref Abdal Student (9563215420)	Tata Institute Of Social Science, Guwahati	<ul> <li>This project might effect upon river ecosystem will be disrupted by this project what will be the measures regarding this?</li> <li>If the number of ferry Ghats increase. So river water bodies will be polluted by the oil spillage. How are you looking after this? What will be the</li> </ul>	<ul> <li>the incremental pollution load in air and noise levels.</li> <li>MARPOL implementation plan will be prepared and will be incorporated in safety aspect of EIA report.</li> <li>As per convention, Ships are required to carry a shipboard oil pollution</li> </ul>

SI. No.	Name and Designation	Department	Comments/Suggestions	Remarks
			<ul><li>measures?</li><li>Ferries can be the cause of Shoreline erosion.</li></ul>	emergency plan. Operators of offshore units under the jurisdiction of
17.	PaporiSarmah Student (9085306473)	Tata Institute Of Social Science, Guwahati	<ul> <li>How is the increased no. of ferries going to affect the river ecosystem, as well as the surrounding areas( near the Ghats)</li> </ul>	Parties are also required to have oil pollution emergency plans or similar arrangements which must be coordinated
18.	Nacha (8415083416)	Tata Institute Of Social Science, Guwahati	<ul> <li>Environment becomes the home of biotic and abiotic species. So, my comment is that if inland water transports will cheapest sources of transportation but if we see in other side. It will be the sources of pollution to the water which is the basic sources of living for both. So, my comment is that how we can control the polluting of the water.</li> </ul>	<ul> <li>with national systems for responding promptly and effectively to oil pollution incidents. Ships are required to report incidents of pollution to authorities and the convention details the actions that are then to be taken. The Convention calls for the establishment of stockpiles of oil spill combating equipment, the holding of oil spill combating exercises and the development of detailed plans for dealing with pollution incidents</li> <li>Erosion control plans will be prepared and implemented after technical feasibility</li> </ul>
19.	Mr. Balin das Superintending Engineer (8811023706)	ASTC	<ul> <li>IWTD may operate hybrid vessels to minimize water pollution</li> <li>Hybrid- Electric + Solar Diesel + Electric</li> <li>They may sought for Govt. assistance (found central+state as these version scheme and Govt.) to provide fund to control pollution.</li> </ul>	Noted. This will be definitely taken into consideration while vessel design proposals
20.	A. HarshaVardhan Consultant (7738830613)	KPMG	<ul> <li>Objective is integrated strategic development plan</li> <li>-For this travel &amp; traffic pattern should also be considered in your scope.</li> <li>To reach ferry sites, people use road transport hence ferry timings should be integrated with bus timing for case in travel.</li> <li>If ferry uses fossil fuel, then care should be taken for possible oil</li> <li>Spill/leakages.</li> </ul>	<ul> <li>Noted.</li> <li>Travel and Traffic pattern is already a scope in EIA study.</li> <li>Compact fuelling system is approached to avoid oil spills</li> </ul>
21.	Dr. Abdul Wakid Project	Wildlife Institute Of	As per our (WII, Aaranyak) survey conducted in Feb	Appropriate protocols and procedures will be

SI. No.	Name and Designation	Department	Comments/Suggestions	Remarks		
	scientist(WII),He ad- GDRCD(Aarany ak) (8811023545)	India(WII), Aaranyak	march 2018. These are 900 endangered Ganges River Dolphin in Brahmaputra. Since dolphin in a Schedule- I species under WPA A72, and very sensitive to underwater noise pollution and water pollution, Therefore, I strongly suggest to conduct a detail study on the potential impacts of the proposed activities to the river dolphin, associated aquatic species (fish, plankton, turtle, aquatic birds)and their habitats in EIA studies. The study area needs to be increased to 10 km upstream to 10 km downstream of the prepared sites.	<ul> <li>prepared for sighting of dolphins and other endangered wildlife species within the vicinity of the dredging site. The objective of the protocols and procedures will be aimed at having no or minimal impacts on the respective wildlife species.</li> <li>Detailed primary surveys and impacts with mitigation measures will be carried out with the help of local experts who has already worked on Brahmaputra River ecology and Gangetic Dolphins and Tortoise habitation.</li> <li>For secondary data collection to have broad idea 10 km stretch is already considered in EIA studies.</li> </ul>		
22.	K. G. Devkruri Consultant (9435405572)	Senior Engineers Forum Guwahati(NE Region)	<ul> <li>River ecosystem has two components</li> <li>Aquatic River</li> <li>Terrestrial Land base</li> <li>Write fixing the Ghats study of flood plains and demarcation of the plains to be made and the area prone to erosion and Porcupine crunched showed be taken in consideration</li> <li>Navigation infrastructure "Fair way" to be kept in view writes carrying out drawing activities.</li> <li>As water transport is cheaper and depth from Bangladesh to Neamati (Brahmaputra)and Neamati to Dibrugarh has been designed (2.5m of 2m) the hydrology and hydrolyse of different segments having pool, Riffle,Head water and channel(Brahmaputra is a braided channel) needs study at different stages of River Flood.</li> <li>It should be born in mind that after that greater of</li> </ul>	<ul> <li>Both Aquatic and terrestrial ecosystem will be assessed during Planning, construction phase and operation phase of IWT project. Flood area are be marked and accordingly the Ghat designs are proposed.</li> <li>River morphologist will assess the changes in River channel and accordingly the design team will take the technical inputs for Ghat master plan.</li> <li>Vessel type is already studied in detail as per the requirement, river morphology, channel depth.</li> </ul>		

SI. No.	Name and Designation	Department	Comments/Suggestions	Remarks
			<ul> <li>1950; the entire configuration of Brahmaputra is under constant change because of different hydrological condition. Already embankment constructed along both banks of Brahmaputra, has an impact on river flow, aquatic creature and agriculture.</li> <li>While making "Fair water way", the impact of making the water way for the designed draught of vessel should be kept in view.</li> <li>IWT has two missions-Ferry service and transport via Bangladesh.</li> </ul>	

It can be noted from the above discussion and recommendations that the stakeholders shown their concern for aquatic biology especially towards Dolphin conservation which is IUCN recognized endangered species. Also the water quality disturbance and oil spillage is sensitive issue. All the issues will be taken into consideration during detailed EIA study and complied with best mitigation measures.

#### 4.4 Stakeholder Consultation Stages

As per the World Bank Mandates, procedures and guideline requirements, the stakeholders' consultation is to be conducted at various stages of the project viz., at screening scoping stage, EMF stage i.e. TOR stage, Draft EIA stage (district level). Accordingly the future stakeholder consultation framework for the project as part of TOR and EMF is given in Chapter 6, under section 6.2.18.

# Photographs of Workshop at Screening and Scoping Stage on 8<sup>th</sup> October 2018 at 11:00 am in AIWTDS Premises



**Reception Counter for Workshop Material Distribution** 



Inauguration of Workshop by AIWTDS Officers



Inauguration of Workshop by Consultants



Presentation and Discussion Forums in Workshop

### Chapter 5 : Detailed Impact Identification and Application of EMF

This Framework is prepared to give a generic idea of the possible impacts of the project for each type of such future civil intervention. The Environmental Management Framework can be utilized for preliminary identification of the impacts and carrying out the impact assessment study. Also the terms of reference to carry out the EIA studies, for each type of possible future facilities are appended to provide guidance to carry out the EIA study for each of the planned intervention. This will aid parallel but sufficiently advanced to incorporate the findings of EIA into the process of preparation of detailed feasibility studies or detailed engineering studies as and when these future major civil works interventions are planned.

The baseline / environmental profile of the project area on the basis of secondary sources and preliminary site visits / functional area expert surveys are presented in Annexure 5. It helped us to assess the general scenario of the project environment setting and identification of possible impacts and preparation of Environment Management Framework.

For all development components like Terminal / Jetty / Ghat Development, Maintenance Area Development and River Training Works Impact Identification and Management Framework is prepared and presented herein Table 5.1. This exercise can be interconnected with the Terms of Reference prepared for EIA studies of Present and Future development project sites in IWT.

#### 5.1 Impact Identification and EMF for all Development Interventions

Impact identification and EMF application for the development interventions are carried out to set the management framework for following main activities as listed below;

- 1. Environmental and Social Impacts Anticipated Due to Development and Operation of Terminals / Ro-Ro-Jetty / Passenger Jetty / Ghats
- 2. Environmental and Social Impacts Anticipated Due to Development and Operation of Repair & Maintenance facility

The section is described in Table 5.1.

 Table 5-1: General Impact Assessment Matrix for Terminal Facility/ Ro-Ro Jetties and Passenger Ferry<sup>3</sup>/ Repair & Maintenance facility

 (Abbreviations: H-High, M-Medium, L-Low, LT-Long Term, ST-Short Term, RET - Rare Endangered and Threatened Species, -ve-Negative, +ve-Positive)

	Major		Magnitud	Duration	Type		Respo	onsibility
Activity	Components	Major Impacted Area	e of Impact	of Impact	of Impact	Mitigation/Study required	Executio	Monitoring
Bro-Construct	ion Phase		of impact				n	
Natural Hazards	<ul> <li>Flood</li> <li>Erosion</li> <li>Sedimentation</li> <li>Accidental oil spill</li> </ul>	<ul> <li>Subject to a wide variety of natural phenomena such as windstorms, floods, earthquakes, and other hazards.</li> <li>The frequency and severity of floods, storms, droughts, and other weather-related disasters is expected to increase, as is the risk from associated changes</li> </ul>	Н	LT	-ve -ve	<ul> <li>Hazard mitigation is at the core of disaster resistance and supports achieving resilience.</li> <li>mitigation design strategies and technologies serve double duty</li> <li>Building design will often be influenced by the level of seismic resistance desired.</li> <li>Floating pontoons instead of permanent structures</li> <li>River training</li> <li>Erosion control measures</li> <li>Stopping of encroachments</li> </ul>	Design / Feasibility Consulta nt	AIWTDS / PIU
Terminal facilities and land use planning	<ul> <li>Change in Land use and surrounding area setting</li> </ul>	<ul> <li>lack of access roads</li> <li>Unregulated development around jetty facilities</li> <li>Lack of parking area</li> <li>lack of adequate passenger facilities;</li> <li>encroachment of the jetty facilities by the squatters</li> </ul>	H H H H	ST ST ST St	+ve +ve +ve +ve +ve	<ul> <li>Design and provide adequate facilities in the terminal designs.</li> <li>As a part of the engineering designs, a long term terminal plan should be developed for planning of terminal facilities with adequate buffer areas around the port facilities.</li> <li>AIWTDS will need to coordinate with the relevant government agencies for hinterland and multimodal transport to maximize the benefits of IWT sector</li> </ul>	Design / Feasibility Consulta nt	AIWTDS / PIU
Demolition of existing structures	Land     clearance	<ul> <li>LU Change</li> <li>Demolition waste generation</li> <li>Loss of commercial</li> </ul>	H H	LT ST ST	-ve -ve -ve	<ul> <li>Arrangement should be made for segregation of waste into recyclable and non-recyclable waste</li> </ul>	contractor	AIWTDS / PIU

<sup>&</sup>lt;sup>3</sup>Under consideration for future development under AIWT Project

Major			Magnitud	Duration Type			Responsibility	
Activity	Components	Major Impacted Area	e of Impact	of Impact	of Impact	Mitigation/Study required	Executio n	Monitoring
		and residential components • Loss of livelihood	Μ	ST	-ve	<ul> <li>Non-recyclable waste generated should be disposed regularly through authorized agency. Recyclable waste should be sold to authorized vendors.</li> <li>Construction waste generated should be segregated at site into recyclable, reusable &amp; rejected fraction. Recyclable should be sold to authorized vendor, reusable waste should be stored at site for usage and rejected fraction and debris should be disposed at designated waste disposal site.</li> <li>Any waste oil generated from construction machinery that should be stored on concrete platform and disposed off to authorized recyclers.</li> </ul>		
Resource Mobilization	Procurement of construction material, transportation of construction material to site	Air and noise pollution Storage of hazardous materials and construction materials on site Visible impact	L H H	ST ST	-ve -ve -ve	<ul> <li>Aggregates will be sourced from existing licensed quarries. Copies of consent/approval/rehabilitation plan for a new quarry or use of existing source will be obtained by contractor and submitted to AIWTDS.</li> <li>Hazardous waste like used oil from DG sets shall be stored in HDPE containers and shall be stored on paved surfaces in isolated location to prevent its spillage and contamination of soil. Used oil shall be disposed off through authorized vendors only.</li> <li>Movements of vehicles carrying construction materials shall be restricted to the designated haulage roads only.</li> </ul>	Contracto r	AIWTDS / PIU

	Major		Magnitud Duration Type		Responsibility			
Activity	Components	Major Impacted Area	e of Impact	of Impact	of Impact	Mitigation/Study required	Executio n	Monitoring
						<ul> <li>Resources shall be procured from the nearby and local vendors</li> <li>Proper construction management plan along with route analysis the resources will be transported to sites</li> <li>Storage sites will be dedicated on site and care will be taken during loading and unloading</li> </ul>		
Land Environment change	<ul> <li>Levelling of terminal site &amp; Removal of</li> </ul>	<ul> <li>Air and Noise pollution</li> <li>Soil erosion</li> </ul>	м Н	ST	-ve -ve	• Excavation and filling operations for access roads to the terminals should be carried out in parallel	contractor	AIWTDS / PIU
	vegetation <ul> <li>Terrestrial</li> <li>Fauna-Flora</li> </ul>	<ul> <li>Disturbance to existing Aquatic fauna</li> <li>Tree cutting</li> </ul>	L	ST St	-ve -ve	<ul> <li>so as to minimize the soil erosion</li> <li>Excavated soil should be used within the site for levelling</li> </ul>		
	Aquatic Fauna- Flora	Disturbance to avifauna coming on	L	ST	-ve	<ul><li>purpose</li><li>Compaction of soil for access</li></ul>		
	Avi Fauna	<ul><li>the sites occasionally</li><li>Soil Excavation</li><li>Alteration of visual</li></ul>	H H	St St	-ve -ve	roads shall be undertaken by sprinkling the water to minimize the erosion		
		<ul><li>aspects</li><li>Shifting of Fauna from</li></ul>	L	St ST	-ve -ve	Water sprinkling to be carried out for dust suppression		
		the area	L	ST	-ve	<ul> <li>Top soil should be stripped and preserved under covered conditions for landscaping purpose in later stage.</li> <li>Green belt area should be developed as per the Green Belt management Plan</li> <li>Rest area should be provided for workers at site and sleeping/lying down at site should be strictly prohibited to prevent accidents</li> <li>Movement of construction vehicles shall be restricted to the designated haulage roads only to prevent compaction of soil in other areas.</li> <li>Sedimentation tanks shall be</li> </ul>		

	Major		Magnitud			Responsibility		
Activity	Components	Major Impacted Area	e of Impact	of Impact	of Impact	Mitigation/Study required	Executio n	Monitoring
						<ul> <li>provided with storm water drain to arrest the sediments and these sediments shall be removed and stored with remaining excavated soil</li> <li>Design of the Ghats will be in</li> </ul>		
						assurance with the EB expert recommendations and mitigation measures		
Construction F	Phase				1	11		
Construction	Piling	Alteration of	Н	LT	-ve	Baseline study to assess the	Contractor	AIWTDS /
of berths and jetties, transfer bays	Removal of bed sediments & their	<ul> <li>Nyarology of the river</li> <li>Soil erosion/bed scouring</li> </ul>	Н	LT	-ve	condition of anticipated components to be affected (water quality, noise levels, soil quality,	, GC, Env. Expert, AIWTDS	PIU
& slipway	transportation • Operation of Construction machinery	<ul> <li>Soil quality (depositing the bed sediments &amp; storage of construction</li> </ul>	Μ	LT	-ve	<ul> <li>river bed sediments, aquatic ecology, river morphology)</li> <li>Impact analysis of affected components and suggesting</li> </ul>		
	<ul> <li>Handling of heavy machinery &amp;</li> </ul>	material) <ul> <li>Aquatic ecology</li> <li>(UG noise &amp; loss of</li> </ul>	Н	ST	-ve	<ul> <li>mitigation measures</li> <li>Identification of RET species and eco-sensitive zones in the study</li> </ul>		
	equipment Transportation of raw	<ul> <li>habitat)</li> <li>Water quality (high turbidity &amp; suspension</li> </ul>	Н	ST	-ve	<ul><li>area and assessment of impacts on the same</li><li>Study of erosion at banks and</li></ul>		
	materials & construction	of bed sediments) <ul> <li>Occupational</li> </ul>	Н	ST	-ve	provision of bank and bed protection measures		
	debris	Health & safety	н			Management plan for disposal of		
		Ambient &		ST	-ve	debris and river bed sediments		
		levels	М	ST	-ve	management plans consisting of		
		Air Quality		•		environmental budget for the		
						measures made, institutional		
						EMP & grievance		
						readressal system		
Construction	Transportation	Terrestrial ecology	L-H	LT	-ve	Baseline study to assess the	Contractor	AIWTDS /
of terminal	& storage of	including avifauna		<b>a</b>		condition of anticipated	, GC, Env.	PIU
building /	raw materials	Air Quality     Noise levels	M	SI	-ve	components to be affected	Expert,	
Buildina	Constructionde	<ul> <li>increased pollution.</li> </ul>	L-M	ST	-ve -ve	water quality, noise levels soil		
	Major		Magnitud	Duration	Type		Respo	nsibility
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Activity	Components	Major Impacted Area	e of Impact	of Impact	of Impact	Mitigation/Study required	Executio n	Monitoring
access road, smalloffice/bui lding, toilet, winch house, repair bayswinches &trolleys and workshops & buildings	<ul> <li>bris</li> <li>Removal of vegetation and tree cutting from side</li> <li>Utilization of village roads for transportation of men and material</li> <li>Debris disposal</li> <li>Construction activities involving excavation, constructing structures etc.</li> </ul>	<ul> <li>traffic on internal &amp;village road, increased accidents chances,</li> <li>Existing Infrastructure</li> <li>Alteration of drainage &amp; topography pattern</li> <li>Water quality (contaminated runoff from site)</li> <li>Aquatic ecology (water pollution due to contaminated run-off, washing of machinery/vehicle, discharge of sewage, spillage of chemicals or oil etc)</li> </ul>	L-M L-M L	ST ST ST	-ve -ve -ve	<ul> <li>quality, river bed sediments, aquatic ecology)</li> <li>Impact analysis of affected components and suggesting Mitigation measures</li> <li>Identification of RET species and eco-sensitive zones in the study area and assessment of impacts on the same</li> <li>Preparation of environment management plans consisting of environmental budget for the measures made, institutional mechanism for implementation of EMP &amp; grievance readressal system</li> </ul>		
Setting up construction labour camp and plant site	<ul> <li>Removal of vegetation</li> <li>Setting up the plant</li> <li>Discharge of sewage</li> <li>Generation of Waste</li> <li>Temporary land acquisition</li> </ul>	<ul> <li>Air Quality</li> <li>Noise levels</li> <li>Terrestrial ecology including avifauna</li> <li>Water quality (contaminated runoff from site)</li> <li>Aquatic ecology (water pollution due to contaminated run-off, washing of machinery/vehicle, discharge of sewage, spillage of chemicals or oil etc)</li> <li>Socio-economy (increased pollution, traffic on internal &amp; village road, increased</li> </ul>	L L L	ST ST ST ST	-ve -ve -ve -ve	<ul> <li>Baseline study to assess the condition of anticipated components to be affected (terrestrial ecology, air quality, water quality, noise levels, soil quality, river beds sediments, aquatic ecology)</li> <li>Impact analysis of Affected components and suggesting mitigation measures</li> <li>Identification of RET species and eco-sensitive zones in the study area and assessment of impacts on the same</li> <li>Preparation of environment management plans consisting of environmental budget for the measures made, institutional mechanism for implementation of EMP &amp; grievance</li> </ul>	Contractor , GC, Env. Expert, AIWTDS	AIWTDS / PIU

	Major		Magnitud	Duration	Type		Responsibility		
Activity	Components	Major Impacted Area	e of Impact	of Impact	of Impact	Mitigation/Study required	Executio n	Monitoring	
		<ul> <li>accidents chances, employment generation)</li> <li>Existing Infrastructure</li> <li>Increase in crime in area</li> <li>Alteration of drainage &amp; topography pattern</li> </ul>	L L	ST ST ST	-ve -ve -ve	<ul> <li>readressal system</li> <li>Restoration Plan for sites</li> </ul>			
Maintenance Dredging Impacts	Dredging while piling, maintenance dredging	<ul> <li>Dredging activities may cause several negative impacts on the aquatic habitat and fauna due to generation of high sediment flows, disturbance of benthic habitat, noise and emissions from construction machinery, and accidental spillage of fuels.</li> </ul>	Н	ST	-ve	<ul> <li>River bed sediment material will be tested at all the dredging sites during preparation of EIA to ensure there is no contamination;</li> <li>Suspended sediment concentrations due to dredging activities should not exceed 4,000 mg/l (Ministry of Transport, Japan, Annexure 16).</li> <li>If the dredged material is not contaminated it will be used for rising of the terminal sites. Filling will be done in bunded areas to avoid sediment laden runoff.</li> <li>Dredging should be avoided during months of March and April</li> <li>If suitable and there is a demand, the excess dredged material will be used for other beneficial purposes such as rising of public lands and selling to the willing buyers.</li> <li>The excess material will be disposed in the river through submerged and diffused discharge (to minimize the extent of sedimentation areas) away from the navigation channels.</li> </ul>	Contractor , GC, Env. Expert, AIWTDS	AIWTDS / PIU	
Habitat species and	Disturbance to the species in and	Sediment loads from construction works	Н	ST	-ve	<ul> <li>Implement mitigation measures described above on dredging and</li> </ul>	Contractor , GC, Env.	AIWTDS / PIU	

Activity	Components	Magni Magni Magni		Magnitud Duration Type Mitig	Mitigation/Study required	Responsibility		
			e of Impact	of Impact	of Impact	Mitigation/Study required	Executio n	Monitoring
management	around ghats during construction	<ul> <li>and material storage sites above natural levels can cause mortality of plankton and fish;</li> <li>Underground noise and vibration levels caused by in stream construction activities (such as piling and dredging) may cause disruption to fish migration and disturbance to dolphins.</li> <li>Construction and maintenance dredging may impact the benthic habitat and river water</li> </ul>	н	ST	-ve -ve	<ul> <li>water quality • Compensatory tree plantation for the loss of trees from the site developments</li> <li>In stream construction and dredging activities should not be carried out during hilsa spawning period of March and April</li> <li>Potential Habitat enhancement measures are to be identified and planned during preparation of EIA of terminal sites</li> <li>Terminals will provide adequate reception facilities for collection of waste water from the ships and treatment.</li> </ul>	Expert, AIWTDS	
Health and Safety	Workers camp during construction	<ul> <li>Workers health and safety hazards associated with construction activities</li> <li>Community health and safety hazards at the construction sites, including exposure to sexually transmitted diseases such as HIV/AIDS</li> </ul>	L	ST	-ve	<ul> <li>Separation of people from vehicles and making vehicle passageways one-way, to the extent practical</li> <li>Traffic management</li> <li>Materials handling operations should follow a simple, linear layout to reduce the need for multiple transfer points.</li> </ul>	Contractor , GC, Env. Expert, AIWTDS	AIWTDS / PIU

Major			Magnitud	Duration	Туре		Respo	nsibility
Activity	Components	Major Impacted Area	e of Impact	of Impact	of Impact	Mitigation/Study required	Executio n	Monitoring
Operation of Terminal / jetty- Loading, unloading of luggage etc. <sup>4</sup> vehicles and men	<ul> <li>Occupancy of physical space due to construction of jetty/berth</li> <li>Dust and vehicular exhaust generation</li> <li>Noise generation due to transportation and storage</li> <li>Increased traffic movement for material transportation to from terminal</li> <li>Handling of heavy material, machinery &amp; equipment</li> <li>Generation of sewage and waste</li> <li>Generation of contaminated run-off</li> <li>Spillage of fuel oil, used oil and stored material</li> <li>Dredoing at</li> </ul>	<ul> <li>Aquatic ecology</li> <li>Air quality</li> <li>Noise levels</li> <li>Occupational health &amp; safety</li> <li>Water quality (mixing of contaminated runoff, dredging &amp; disposal of dredged sediments)</li> <li>Soil and ground water pollution due to contamination with sewage/used oil/hazardous waste</li> <li>Existing Infrastructure</li> <li>Increased traffic &amp; accidents risks</li> <li>Increased pressure on existing infrastructure</li> </ul>	HHHH H H MM M		-Ve -ve -ve -ve -ve -ve -ve -ve	<ul> <li>Baseline study to assess the condition of anticipated components to be affected (terrestrial ecology, air quality, water quality, noise levels, soil quality, river bed sediments, aquatic ecology)</li> <li>Impact analysis of affected components and suggesting mitigation measures</li> <li>Identification of RET species and eco-sensitive zones in the study area and assessment of impacts on the same budget for the measures made, institutional mechanism for implementation of EMP &amp; grievance readdressed system</li> <li>Preparation of environment management plans consisting of environmental budget for the measures made, institutional mechanism for implementation of EMP &amp; grievance reads system</li> </ul>	Terminal Operator / Env. Expert, AIWTDS	AIWTDS / PIU

<sup>&</sup>lt;sup>4</sup> Mostof the ferry routes are connected between urban & rural areas. Farmers from rural area are heavily dependent on ferry services for carrying farm products to reach the urban market

	Major		Magnitud	Duration	Туре	Respo	nsibility	
Activity	Components	Major Impacted Area	e of Impact	of Impact	of Impact	Mitigation/Study required	Executio n	Monitoring
	terminal location • Development of Green Belt							
Berthing of barges/ferry unloading and loading of cargo in bargos	<ul> <li>Reduced water circulation near Terminal area</li> <li>Dissolution of anti-fouling point during</li> </ul>	<ul> <li>Water quality (mixing of contaminated runoff, dredging &amp; disposal of dredged sediments, washing water of barges, discolution of</li> </ul>	н		-ve	<ul> <li>Baseline data collection for water quality of river</li> <li>Water Quality Management Plan</li> </ul>	Terminal Operator / Env. Expert, AIWTDS	AIWTDS / PIU
barges	<ul><li>berthing</li><li>Discharge of sewage and</li></ul>	<ul> <li>antifouling paints</li> <li>Water quality (discharge of sewage)</li> </ul>			-ve			
	<ul> <li>waste in water</li> <li>Washing and cleaning vessels</li> <li>Waste from Barges to terminal facility</li> <li>Treatment of</li> </ul>	and waste) • Soil Quality	Н	LT	-ve			
	waste and sewage at terminal site							
Vessel maintenance	Hazardous     Materials &     Chemicals use     and storage	<ul> <li>Soil Quality</li> <li>Ground water and Surface water quality</li> </ul>	H H	LT LT	-Ve -ve	Baseline study to assess the condition of anticipated components to be affected (terrestrial ecology, air quality)	Maintenan ce Staff, Terminal Operator	AIWTDS / PIU
	<ul> <li>Hazardous waste generation</li> <li>Removal of</li> </ul>	<ul> <li>Odours and fumes</li> <li>Aquatic ecology</li> <li>Noise levels</li> <li>Air quality</li> </ul>	H H H	LT LT LT	-ve -ve -ve	,water quality, noise levels, soil quality, river bed sediments, aquatic ecology)	Env. Expert, AIWTDS	

	Major		Magnitud	Duration	Type		Responsibility	
Activity	Components	Major Impacted Area	e of Impact	of Impact	of Impact	Mitigation/Study required	Executio n	Monitoring
	<ul> <li>anti-fouling paint from vessels' hull through scraping and scrubbing</li> <li>Cleaning of vessels' exterior</li> <li>Painting of Vessels</li> <li>Maintenance operations</li> <li>Fiber glassing</li> <li>Welding and Metal fabrication</li> </ul>	<ul> <li>Occupational health &amp; safety</li> </ul>	Μ	LT	-ve	<ul> <li>components and suggesting mitigation measures</li> <li>Identification of RET species and eco-sensitive zones in the study area and assessment of impacts on the same</li> <li>Management Plan for non hazardous and hazardous waste, air emissions, odour &amp; noise level</li> <li>Occupational health &amp; safety plan</li> <li>budget for the measures made, institutional mechanism for implementation of EMP &amp; grievance readdressed system</li> </ul>		
Berthing of barges/vessel for repair	<ul> <li>Reduced water</li> <li>Circulation near terminal area</li> <li>Dissolution of anti-fouling paint during berthing</li> <li>Discharge of sewage and waste in water</li> <li>In water washing and cleaning vessels</li> </ul>	<ul> <li>Water quality (mixing of contaminated run off, dredging &amp; disposal of dredged sediments, washing water of barges, dissolution of anti-fouling paints)</li> </ul>	Т	LT	-Ve	<ul> <li>Baseline data collection for water quality of river</li> <li>Water Quality Management Plan</li> </ul>	Terminal Operator	AIWTDS
Climate change	<ul> <li>Jetty Operation</li> <li>Navigation &amp; Transportation</li> </ul>	<ul> <li>During jetty operations greenhouse gases such as carbon dioxide will be released, from terminal operations and related navigation</li> </ul>	Μ	LT	-ve	<ul> <li>Preparing GHG emissions inventory (from the current operations) and setting goals to reduce emissions. Also periodic reporting.</li> <li>Introduce cleaner fuels such as CNG (comparatively less emissions) in the vessels owned</li> </ul>	Env. Expert, AIWTDS	AIWTDS

	Major		Magnitud	Duration	Туре		Responsibility		
Activity	Components	Major Impacted Area	e of Impact	of Impact	of Impact	Mitigation/Study required	Executio n	Monitoring	
		<ul> <li>and hinterland transport, contributing to global climate change.</li> <li>damage to terminal and landing facilities</li> </ul>	н	LT	-ve	<ul> <li>by the ministry to set a good example for others to follow.</li> <li>Improving efficiency within the logistic chains by streamlining the movement of cargo, truck traffic and inland navigation access</li> </ul>			
		<ul> <li>due to water level rise</li> <li>Loss of navigability due to increase in frequency and duration of dry spell (drought);</li> </ul>	н	ST	-ve	<ul> <li>Reduce energy dependence within the ports by developing and using renewable energy sources</li> <li>Greening of vessel fleet</li> <li>Design of facilities sufficiently above the flood levels expected</li> </ul>			
		<ul> <li>Increase in frequency in wet and stormy period may imply higher costs due to weather disturbances and safety:</li> </ul>	L	ST	-ve	<ul> <li>from climate change.</li> <li>Climate change modelling and developing forecasts for river water levels</li> <li>long term planning and design for new infrastructure</li> </ul>			
		<ul> <li>Large variations in water levels and reduced water depth;</li> </ul>	u	1.7	-1/9	<ul> <li>Identify the vulnerabilities in the IWT sector and proactive actions</li> <li>Design of new wider vessels that could accommodate low drafts</li> <li>Studies for alternate channel</li> </ul>			
					-ve	<ul> <li>and alternate charmer maintenance through river training works (will be carried out under Component B)</li> <li>A hydro-meteorological station should be ostablished at</li> </ul>			
						important Ghats to permanently monitor the climate			
Dredging Impacts	Dredging for maintenance if required	Dredging activities may cause several negative impacts on the aquatic habitat and fauna due to generation of high	Н	ST	-ve	<ul> <li>Dredging should be avoided during spawning months of March and April</li> <li>If suitable and there is a demand, the excess dredged material will be used for other beneficial</li> </ul>	Contractor , Env. Expert, AIWTDS	AIWTDS	
		sediment flows, disturbance of benthic habitat, noise and emissions from				<ul><li>purposes such as raising of public lands and selling to the willing buyers</li><li>The excess material will be</li></ul>			

Major		Magnitud	Duration	Тура		Responsibility		
Components	Major Impacted Area	e of Impact	of Impact	of Impact	Mitigation/Study required	Executio n	Monitoring	
	construction machinery, and accidental spillage of fuels.				disposed in the river through submerged and diffused discharge (to minimize the extent of sedimentation areas) away from the navigation channels.			
Operation of /essels	<ul> <li>During operation, the waste water releases from port facilities and maintenance dredging activities will impact the river water quality and habitat.</li> </ul>	Н	LT	-ve	<ul> <li>Implementation of mitigation measures for water quality and dredging</li> <li>Dredging activities in the river should not be carried out during months of March and April;</li> <li>Implementation of potential habitat enhancement measures that are identified and planned during preparation of EIA of terminal sites</li> <li>Maintenance of reception facilities that are established for collection of waste water from the ships and treatment</li> </ul>	Env. Expert, AIWTDS	AIWTDS	
Handling of jetties & associated machineries and vehicles Handling of Inflammable materials, accidental oil spillages	<ul> <li>Physical hazards associated with jetty handling and use of associated machinery and vehicles.</li> <li>Jetty workers may be exposed to chemical hazards especially if their work entails direct contact with fuels or chemicals, or depending on the nature of bulk and packaged products transferred in jetty activities.</li> <li>Work with fuels may present a risk of exposure to volatile</li> </ul>	M	-ve -ve	LT ST	<ul> <li>Constructing the surface of jetty areas to be: of adequate strength to support the heaviest expected loads; level, or with only a slight slope; free from holes, cracks, depressions, unnecessary curbs, or other raised objects; continuous; and skid resistant</li> <li>Providing safe access arrangements suitable for the sizes and types of vessels calling at their facilities. These access arrangements should include guard rails and / or properly secured safety nets to prevent workers from falling into the water between the ship's side and the adjacent quay</li> <li>Materials handling operations</li> </ul>	Terminal Operator	AIWTDS	
	ajor pmponents	ajor omponentsMajor Impacted Areaconstruction machinery, and accidental spillage of fuels.peration esselsof sselsperation esselsof sselsof essels• During operation, the waste water releases from port facilities and maintenance dredging activities will impact the river water quality and habitat.andling of jetties associated achineries and shicles Handling Inflammable aterials, ccidental oil billages• Physical hazards associated machinery and vehicles.Jult of aterials, ccidental oil billages• Physical hazards associated machinery and vehicles.Jult of billages• Physical hazards associated machinery and vehicles.Jult of billages• Workers may be exposed to chemical hazards especially if their work entails direct contact with fuels or chemicals, or depending on the nature of bulk and packaged products transferred in jetty activities.• Work with fuels may present a risk of exposure to volatile expansion companyed	ajor omponentsMajor Impacted AreaMagnitud e of ImpactalorConstruction machinery, and accidental spillage of fuels.Impactperation issels• During operation, the waste water releases from port facilities and maintenance dredging activities will impact the river water quality and habitat.Handling of jetties anding of jetties actioneries and shicles Handling Inflammable aterials, ccidental oil billages• Physical hazards associated machinery and use of associated machinery and vehicles.MMagnitud e version• Physical hazards associated machinery and vehicles.MMagnitud werkers may be exposed to chemical hazards especially if their work entails direct contact with fuels or chemicals, or depending on the nature of bulk and packaged products transferred in jetty activities.MMagnitud exposure to volatile arranging comparendedM	ajor omponentsMajor Impacted AreaMagnitud e of ImpactDuration of Impactconstruction machinery, and accidental spillage of fuelsLperation ssels•During operation, the waste water releases from port facilities and maintenance dredging activities will impact the river water quality and habitat.HLTandling of jetties associated achineries and phicles Handling Inflammable aterials, cidental oil billages•Physical hazards associated machinery and vehicles.M-ve-ve waste water releases from port facilities will impact the river water quality and habitat.M-veandling of jetties associated achineries and phicles Handling Inflammable aterials, cidental oil billages•Physical hazards associated machinery and vehicles.M-ve•Jetty workers may be exposed to chemical hazards especially if their work entails direct contact with fuels or chemicals, or depending on the nature of bulk and packaged products transferred in jetty activities.M-ve•Work with fuels may present a risk of exposure to volatile oreanie compounderM-ve	ajor pmponentsMajor Impacted AreaMagnitud e of ImpactDuration of ImpactType of Impactconstruction machinery, and accidental spillage of fuels.Construction machinery, and accidental spillage of fuels.HLT-veperation issels• During operation, the waste water releases from port facilities and maintenance dredging activities will impact the river water quality and habitat.HLT-veandling of jetties associated achineries and chicles Handling Inflammable aterials, cidental oil iillages• Physical hazards associated machinery and vehicles.M-veLTJetty workers may be exposed to chemicals, or depending on the nature of bulk and packaged products transferred in jetty activities.M-veSTM-veST	ajor pmponentsMajor Impacted AreaMagnitud of ImpactDuration of ImpactType of ImpactMitigation/Study requiredconstruction machinery, and accidental spillage of fuels.constructiondisposed in the river through submerged and diffused of sedimentation areas) away from the navigation channels.disposed in the river through submerged and diffused of sedimentation areas) away from the navigation channels.peration of ussels•During operation, the waste water releases from port facilities and maintenance dredging activities will impact the river water quality and habitat.HLT-ve•Implementation of mitigation measures for water quality and dredging activities in the river should not be carried out during months of March and April; •anding of jetties associated actineria anding of jetties associated machinery and vehicles.•M-veLT•••Implementation of get previous and habitat.Maing of jetties associated triales••Physical hazards associated machinery and vehicles.M-veLT•••••••Maing and vehicles.•Physical hazards associated machinery and vehicles.M-veST•••••••••••••••••••••••••••••••••••• </td <td>ajor proponentsMajor Impacted AreaMagnitud of ImpactDuration of ImpactType of ImpactMitigation/Study requiredRespont Impactconstruction machinery, and accidental spillage of fuels.construction machinery, and accidental spillage of fuels.ImpactImpactdisposed in the river through submerged and diffused disposed in the river through submerged and diffused of sedmentation areas) away from the navigation channels.ImpactImpactImpactperation of peration of excessionDuring operation, the waste water releases from port facilities and maintenance dredging activities will impact the river water quality and habitat.HLT-veImpact of the river water should not be carried out during months of March and April.Expert. AlWTDSandling of jettis associated activities and inclices Handing inclices Handing inclices Handing inclices Handing inclices Handing of jettices activities, will balading and use of associated machinery and vehicles.M-veLT- Constructing the surface of jetty areas to be: of adequate strength or other raised objects; continuous; and skild resistant or other raised objects; transfered in jetty activities.M-veST- Constructing the surface of jetty areas to be: of adequate strength operation work soft and construction; the haviest expected loads; level, or with only a slight signer transfered in jetty activities.M-veST- Constructing the surface of jetty areas to be: of adequate strength operation subtale for the sizes and types of vessets calling at their</td>	ajor proponentsMajor Impacted AreaMagnitud of ImpactDuration of ImpactType of ImpactMitigation/Study requiredRespont Impactconstruction machinery, and accidental spillage of fuels.construction machinery, and accidental spillage of fuels.ImpactImpactdisposed in the river through submerged and diffused disposed in the river through submerged and diffused of sedmentation areas) away from the navigation channels.ImpactImpactImpactperation of peration of excessionDuring operation, the waste water releases from port facilities and maintenance dredging activities will impact the river water quality and habitat.HLT-veImpact of the river water should not be carried out during months of March and April.Expert. 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	Major		Magnitud	Duration	Type		Responsibility		
Activity	Components	Major Impacted Area	e of Impact	of Impact	of Impact	Mitigation/Study required	Executio n	Monitoring	
		<ul> <li>(VOC) via inhalation or skin contact during normal use or in the case of spills</li> <li>Fuels, flammable liquid goods and</li> </ul>				<ul> <li>layout to reduce the need for multiple transfer points.</li> <li>Development of Safety System. This safety system should include procedures to regulate the safe</li> </ul>			
		<ul> <li>flammable dust may also present a risk of fire and explosions.</li> <li>Exposure to dust from handling of dry materials (depending</li> </ul>	Μ	-ve	ST				
		<ul> <li>on type of goods handled, e.g. cement, grain, and coal) and from roads if any.</li> <li>Noise from goods handling, including vehicular traffic, and loading / unloading</li> </ul>	Н	-ve	LT				
		containers, goods	Н	-ve	LT				
Community health and safety	Jetty workers Operators Staff and daily wagers	<ul> <li>Risk of accidents with activities associated with cargo handling in the terminals,</li> <li>Visual impacts from the illumination of the</li> </ul>	L	-ve	ST	<ul> <li>To minimize impacts on visual concerns of the community and improve the cleanliness of port facilities, it is required to implement regular clean up (in the jetty facilities and water</li> </ul>	Terminal Operator	AIWTDS	
		<ul><li>jetty, and traffic activities associated with the jetty.</li><li>Visual concerns from</li></ul>			LT	<ul> <li>surface) and maintenance</li> <li>Visual impacts, including excessive background illumination, should be prevented</li> </ul>			
		jetty activities operations are uncontrolled dumping, floating debris, derelict warehouses and broken machinery	M	-ve	LT	during the port planning process or managed during operations through the installation of natural visual barriers such as vegetation or light shades, as applicable. The location and colour of bulk storage facilities also should be selected with consideration of			

	Major		Magnitud	Duration	Type		Respor	nsibility
Activity	Components	Major Impacted Area	e of Impact	of Impact	of Impact	Mitigation/Study required	Executio n	Monitoring
						<ul> <li>visual impacts</li> <li>Separation of people from vehicles and making vehicle passageways one-way, to the extent practical</li> </ul>		
Labour Influx	• Gender Base Violence (GBV)	<ul> <li>Labour Camp for construction workers</li> </ul>	M	LT	-ve	<ul> <li>A dedicated NGO will be engaged to look after the issues related to GBV through regular inspection</li> <li>Separate toilet facilities for woman engaged during the construction activities.</li> <li>Accessible ramp to be provided where required</li> </ul>	Engaged NGO/ Contractor	AIWTDS
Ship/ vessel Wastes	<ul> <li>Transportation of garbage and sewage from barges to terminal facility Treatment of the waste and sewage at terminal site</li> </ul>	<ul> <li>Water quality (discharge of sewage and waste)</li> <li>Soil Quality</li> <li>Liquid effluents associated with ships are sewage, bilge water (e.g. from oil tankers), and vessel cleaning wastewater from ships/vessels.</li> <li>Ship / vessel sewage and wastewater contains high levels of BOD and Coliform bacteria, with trace concentrations of constituents such as pharmaceuticals, and typically low pH levels.</li> <li>Wash water may</li> </ul>	н	LT LT LT	-ve -ve -ve	<ul> <li>Baseline data collection for water quality of river</li> <li>Waste Management Plan establish reception facilities for collection of wastes from ships / vessels.</li> <li>The reception facilities can be fixed, floating or mobile and should be adapted to collect the different types of ship generated waste and goods residues.</li> <li>No waste should be disposed in the river. Dust bins and recycling or chemical toilets, or holding tanks should be provided on the ships. Information should be available for ship captains to identify waste reception facilities and acceptable handling procedures at jetties.</li> <li>The wastes should be adequately disposed or treated based on the</li> </ul>	Terminal Operator	AIWTDS
		contain residues such as oil. • Pollutants in bilge	н	LT	-ve	type of waste, in cooperation with the local municipal authorities.		

	Maior		Magnitud	Duration	Type		Respo	onsibility	
Activity	Components	Major Impacted Area	e of Impact	of Impact	of Impact	Mitigation/Study required	Executio n	Monitoring	
		water contain elevated levels of BOD, COD, dissolved solids, oil, and other chemicals that accumulate as the result of routine operations.	н	LT	-ve				

#### 5.2 Risk Assessment and Oil Spill Management Framework

#### 5.2.1 Risk Assessment

Oil spill Management plan covers the planning for handling of the potential off-shore and onshore emergencies and oil spillage accidents during operation phase of IWT& Terminal. Potential emergencies anticipated during operation phase are given below

- 1. Spillage of oil while handling at terminal
- 2. Grounding & sinking of vessels
- 3. Collision of vessels with other cargo vessel
- 4. Collision of vessel with country boat carrying cargo if any during emergency landing
- 5. Collision of vessel with ferry boat carrying passengers
- 6. Collision of vessel with small country crafts
- 7. Hitting of vessel with river bank / rocks in the river bed
- 8. Hitting of vessels on shore structure/cross structures like bridges
- 9. Fire hazard
- 10. Spillage of oil in waterway due to mishandling of oil tanks while loading & unloading, accident/collision of vessels, damage of tank during grounding of vessels, leakage of fuel tank/bilge tank.
- 11. Terrorist attack
- 12. Natural calamity like earthquake, tsunami, heavy floods, etc.

Disaster which may arise due to oil spillage is not anticipated to be of high risk. Spillage is anticipated from Terminal only in case of operation failure of fuelling station and will be of smaller magnitude.

#### 5.2.1.1 Type of Oil which can be spilled & Characteristics

Edible oil & POL will be stored, loaded, unloaded at terminal and during handling and transportation transported through waterway, which can be spilled in the river. Apart from this fuel oil/residual from barges can be spilled in the River in case of above mentioned emergencies. Characteristics of the oils are given below.

Sr. No.	Parameter	Edible oil	POL	Residual Oil
1.	Density at 15°C ,g/ml	-	0.8558	30Max.960
2.	Specific gravity@60°C	0.87- 0.94	0.8562	-
3.	Pour Point °C	-	33	6Max
4.	Kinematic Viscosity (cst) at40 °C	-	7.65	30.0
5.	Water content %vol.	-	2.0	0.5
6.	Total sediments% m/m.	-	0.05(basic sediment % vol)	0.1
7.	Ash % m/m	-	-	0.1
8.	Carbon residue on 10% V/V Distillation bottoms carbon residue	-	-	10 Max
9.	Cetane index	-	-	-
10.	Sulphur content	-	0.5%	3.5%
11.	Flash point	-	52-96°C	60.0Min
12.	Vanadium mg/kg	-	-	150 Max
13.	API gravity at60°F	-	33.76	

#### Table 5-2 Characteristics of Oil

#### 5.2.1.2 Probable fate of spilled oil

When oil leaks, it reaches the surface of the waterway with almost all its high fractions. When oil is blown out in air, its light fractions evaporate instantaneously and, when it reaches the surface of the river, it spreads with no further evaporation. After two hours of exposure evaporation does not increases significantly. Fate of the spilled oil at river may be as under, depending upon river/ weather conditions:

**a. Evaporation:** Evaporation from an oil spill would result in loss of about 50 - 55% of POL. The rate of evaporation will increase due to wind velocity, river currents and ambient temperature of river. Volume of oil remaining after evaporation is as follows:

- During SW Monsoon: 50%
- During Jan March: 55%
- Other Months: 52%

**b.** Emulsification: The un-evaporated POL/edible oil would form water-in-oil emulsion which is fairly stable due to high wax content and asphaltenes. There will be quantum increase in volume of remaining spilled oil to the order of approximately 3 times in the emulsification process. The emulsion is fluid enough to thoroughly coat shoreline yet viscous enough to substantially retard evaporation.

**c. Dispersion:** Under the process, oil breaks up into droplets small enough to remain in suspension in the water column. The process would set in about 8 - 10 hours after the spill occurs.

Months	Before Evaporation	Before Evaporation	After Evaporation	After Evaporation
	Doped	Undoped	Doped	Undoped
Jan - Mar	Liquid	Solid	Solid	Solid
Jun - Dec	Liquid	Viscous	Solid	Solid
Apr - May	Liquid	Liquid	Very viscous	Very Viscous

#### Table 5-3: Viscosity of oil - Physical state

#### Table 5-4: State of Oil and drift

Location	Source	State (After evaporation)	Drift
Near bank	Tanker	Liquid	Towards bank
Offshore	Tanker rupture	Very viscous(through out the year)	E & SE (Towards coast

#### 5.2.2 Statutory Requirements of preparation of Oil Spill Management plan

The regulatory framework which requires preparation of oil spill management plan is mandatory. Primarily as per: Indian Coast Guard as per its National Oil Spill Disaster Contingency Plan (NOS-DCP), 2006 updated up to date. Though the contingency plan is for coast guard, it may be relevant for the proposed IWT project.

#### 5.2.2.1 Government of India

- 1. The Environment (Protection) Act, 1986 (amended 1991) and Rules there under
- 2. The Environment (Protection) Rules, 1986 (amended 2004)
- 3. The Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989 (amended, 1994 and 2004)
- 4. Hazardous & Other waste Rules, 2016
- 5. The Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996
- 6. Inland Vessels Act, 1917
- 7. The Inflammable Substances Act, 1952

8. The Factories Act, 1948 (amended 1987) and State Factory Rules

9. The Public Liability Insurance Rules, 1991 (as amended 1992 and 1993)

- 10. The Petroleum Act, 1934 & The Petroleum Rules, 2002
- 11. The Explosives Act, 1884 (amended till 1983) & The Explosive Rules, 1983
- 12. National Disaster Management Guidelines for Chemical Disasters, 2007
- 13. IWAI Act, 1985

#### 5.2.2.2 International

The IMO Convention of Oil Pollution Preparedness, Response and Co Operation (OPRC) 1990, to which India is a signatory.

#### 5.2.3 Response Strategy

To mitigate any possible oil spill/incident/accident during the voyage the following shall be provided by AIWTDS.

#### 5.2.3.1 Coordination & Control of Emergency

- 1. A coordination cum monitoring committee will be formed at AIWTDS Regional office for round the clock monitoring of voyage of the vessel
- 2. Important telephone no/contact detail of AIWTDS emergency handling team, district administration officials, police, hospitals, fire stations etc. shall be maintaining.
- 3. Sensitize AIWTDS/State Govt. agencies for any salvage/rescue operation. Also, sensitize the users of the waterway mostly the general public, fisher men & passenger ferry operators & crew about risk & its response strategy
- 4. Rescue stations shall be equipped with high speed launches/boat fitted with additional lifesaving gears, fire-fighting equipment & first aid facilities
- 5. AIWTDS shall make available the water ambulance & road ambulance at each of its terminal site available 24X 7 to take injured to nearby hospitals. AIWTDS should have tieups with nearby hospitals to take up emergency case on priority & mutual aid programme.

#### 5.2.3.2 Emergency Prevention Aids

Maintaining adequate navigational aids for easy passage of vessels near critical locations and preventing accidents. Meaning of the signals and cautionary marks should be communicated to the sailors/vessel crews by displaying this management plan on the website. Details of various navigational aids and marks to be provided by AIWTDS for prevention of accidents which may result to oil spills are given below. All signage will be as per the guidance given in Annexure I, II, III of IWAI Act, 1985.

#### a. Navigational Aids

LED Lights (Green & Red) fitted on MS Post LED lights fitted on bamboo towers Red/Green flags on MS Posts and bamboo towers Day Marks/Cautions Marks at critical locations Bend marks in the entire channel for better manoeuvring of the vessel Chainage marks for assistance of the Master and Pilots on board the vessel Pilots who are acquainted with the river/channels for the different beats

#### **b. Transiting Marks**

Provision & maintenance of 2 NM LED lights fitted on the MS posts/bamboo towers at different locations along the stretch for safe vessel transiting Above posts will be fitted with red/green flags for better visibility The masters shall keep the vessel on left to the red lighted beacons/right to the green lighted beacons while sailing downstream



For any additional requirement of lighted marking, the vessel Masters should contact the concerned nodal officers

The nodal officers would relocate/provide additional marks as per requirement

#### c. Signage for bends and snags

Signage boards with bend signs in reflective paint fitted on bamboo towers will be provided to identify bends in advance

Vessel masters will keep the vessel left to the red signages and right to Green signage while sailing downstream

Vessel master should inform beat in charge/nodal officer in case of any change in the nature of bends

#### d. Provision of buoys at critical locations

Buoys should be provided at all critical locations

Vessel operators have to be cautious while negotiating through critical zones Vessel operators may ask for assistance of tug in such locations in advance Tug should be provided to vessel operators within 2 days of making such request

#### e. Marking on navigable span of bridge (wherever applicable)

Red marks should be put on right piers and green on left piers of the navigable span of the bridges with the reflective paint

Vessel operator should keep the vessel in between the navigable span of the bridges at controlled speed

Vessel master should keep the search light on for identifying the navigation span at least 1 km ahead of the structure or navigation radar can be used for night time navigation

#### f. Chainage & information boards

To identify the location during voyage, chainage marks should be provided all along the stretch

Details of contact persons should be provided at prominent locations. The contact no of AIWTDS emergency team, police station, fire station, hospital, water ambulance and medical facilities will be displayed at each such prominent location.

#### g. Pilotage

AIWTDS should provide its pilots for specified reaches in the waterway on request of fixed fee amount. Pilotage can be provided at advance request of 3 days' minimum

Pilots of AIWTDS shall be available only for guidance; however, pilot of the vessel will be responsible for safe navigation in channel

#### 5.2.3.3 Oil Spill Management Facilities

The POL and oil spill emergency scenario, the action response would be limited and will be controlled through defined response action. The response action for oil spill contingency plan facilities are listed below:

- i. Oil spill dispersant with spray arm/applicators (conventional hydrocarbon base, water dilatable concentrate & concentrate)
- ii. Boom for containment of oil
- iii. Skimmer for pumping the contained oil (20 TPH)
- iv. Flex barge/floating storage for collection of spilled oil
- v. Disposal facility at shore
- vi. Vessel for laying the booms
- vii. Oil recovers boats

- viii. Sorbent pads and sorbent boom packs
- ix. Shore cleanup equipment-mini vacuum pumps/OSD applicators/fast tanks
- x. Work boats
- xi. Tugs

Oil spill management assistance is expected to reach the incident spot within 6 to 8 hrs of accidents/spill.

Onshore Facilities at terminals to be provided by AIWTDS: Fire extinguishers at strategic locations and substations at terminals & jetties and oil spill management kit containing sorbent material such as clay (kitty litter), polypropylene pads, rags and saw dust and temporary foldable tanks for storage of oil.

Off-shore Facilities to be provided by AIWTDS: Multipurpose tug (MPT) shall be positioned at the above three rescue station for assisting the vessel in rescue/salvage operations, oil spill management operations and fire-fighting operations. The possible equipment/gears may be provided on board the tug for the removal/arresting the oil spillage. These tugs should have towing winch & fire-fighting gear with deluge system, hoses, nozzles etc. Specifications of such tugs are as follows. Two such salvage should be available with AIWTDS to manage the emergency situations

- a. Length-30-35 m
- b. Beam-9-11 m
- c. Draught- not exceeding 1.7 m
- d. Bollard pull-not less than 28 T
- e. Speed-not less than 12 knots

AIWTDS will notify on its website to allthe waterway user about the upcoming predicted storms/heavy rains. Also signage will be displayed in the river as per Annexure III of IWAI Act, 1985 to notify about such storms

#### 5.2.4 Nodal Officers and Disaster Management Units of AIWTDS

AIWTDS will set up a Unit of nodal officers and disaster management units which should be contacted on day to day basis and during time of accidents, disasters, oil spills and other emergencies. Details of the contact staff and unit are given below

- 1. To be contacted for day to day operations (stretch wise)
- 2. To be contacted in case of disaster (Incident controllers) On Field:
  - i. Terminal Operator
  - ii. Terminal Manager
  - iii. Environmental Expert of AIWTDS
  - iv. Advisor (Administration) cum GRM Officer AIWTDS
  - v. Deputy State Project Director, AIWTDS, Guwahati
  - vi. Additional State Project Director, AIWTDS, Guwahati

Terminal managers would coordinate for timely deployment of multipurpose tugs, oil spill management systems & equipment, fast launches/ports for possible assistance, provide all kind of medical support and services to take the person to the nearest hospital and visit the incident site for timely coordination. Following are the district disaster management authority (DDMA) management team. Table No. 5.5, 5.6, 5.7 and 5.8 are DDMA of Dhubri, Dibrugarh, Cacher and Kamrup (Metro) respectively.

		<u> </u>
SI. No.	Designation	
1.	The Deputy Commissioner Dhubri	Chairman
2.	The Additional Deputy Commissioner, DM,	Chief Executive
	Dhubri	Officer
3.	The Superintendent of Police, Dhubri	Member
4.	The Joint Director, Health Service, Dhubri	Member
5.	The Executive Engineer, PWD (RR), Dhubri	Member
6.	The Executive Engineer, WR, Dhubri	Member
7.	The District Agricultural Officer, Dhubri	Member

#### Table 5-5: District Disaster Management Authority (DDMA), Dhubri

#### Table 5-6: District Disaster Management Authority (DDMA), Dibrugarh

SI.No	Designation	
1.	The Deputy Commissioner	Chairperson
2.	Chairperson, Zilla Parishad	Co-Chairperson
3.	Chief Executive Officer of the District Authority	Member secretary
4.	Superintendent of Police	Member
5.	Chief Medical Officer	Member
6.	Executive Engineer,	PWD Member
7.	Executive Engineer, Water Resource	Member

#### Table 5-7: District Disaster Management Authority (DDMA), Cachar

SI. No.	Designation	
1.	Deputy Commissioner	Chairperson
2.	President ZillaParishad	Co-chairperson
2.	Addl. Deputy Commissioner (DM) cum CEO DDMA	Member Secretary.
3.	Superintendent of Police	Member
4.	Project Director D.R.D.A.	Cachar Member.
5.	Joint Director of Health Services	Member.
6.	Exe. Engineer PWD Rural Roads Div.	Cachar Member.
7.	Exe. Engineer Water Resources	Cachar Member

#### Table 5-8: District Disaster Management Authority (DDMA), Kamrup (Metro)

SI. No	Designation	
1.	Deputy Commissioner, Kamrup	Chair person
2.	Mayor, Guwahati Municipal Corporation	Co- Chairperson
4.	Suptd. of Police	Member
5.	Jt, Director of Health Services/Chief Medical Officer	Member
6.	Executive Engineer PWD (B)	Member
7.	Executive Engineer PWD PWD (R)	Member
8.	Executive Engineer WR	Member

#### 5.2.5 Clean-up Guidelines for oil spills

The various guidelines for oils and waste storage and disposal methods with contact details of clean-up for shoreline contamination authorized waste recyclers and suppliers / service agencies for oil response are given at Annexure – 7, 8, 9 respectively.

#### 5.2.6 The Important Government and Resource and Response Agencies

Pollution control board of Assam has pre-designated OSC/lead agency when oil affects the shoreline in Assam which will be contacted in case of an emergency. The details are given at Annexure – 9.

### 5.3 Action and Response Strategy

#### 5.3.1 Action Sequence

Whenever there is an emergency following steps shall be followed:

- 1. Identification / Notification of emergency
- 2. Activation of spill management response strategy for clean-up
- 3. Positioning and activation and communication of clean-up committee
- 4. Clean-up completion intimation
- 5. Documentation

The oil spill internal reporting format and format for spill report to India Coast Guard Organization are given at Annexure - 10 and 11.

#### 5.3.2 Flow of Information of Emergency

Information flow of emergency/disaster/accident/oil spill will flow as per the given diagram in Figure 5.1.

#### 5.3.3 Communication Facilities

Communication facilities for transmitting information related to emergency are given below

- 1. Incident control room at each terminal site
- 2. Wireless services should be available at incident control room to coordinate with emergency control units





Figure 5-1: Flow of Information of Emergency

#### 5.3.4 Roles & responsibility of Vessel Owners/Masters for Prevention and Management of Emergency

Roles and responsibility of owners and masters of the vessels are as prescribed in IWAI Act, 1986 for management of emergencies and ensuring safety and prevention of accidents and are listed below;

1. The master of vessel shall be responsible for ensuring that the vessel is river worthy. He should follow the regulations relating to the safety measures for navigation in particular: take all precautions required to exercise vigilance and to avoid damage to the vessel, installations in the national waterway and avoid causing obstructions to shipping and navigation

to avoid imminent danger, take all steps required by the situation (according to the general practice of seamanship) even if this entails departing from these regulations;

be responsible for compliance with the rules or regulations applicable to his vessel and his crew and to the vessels in tow, while his vessel is engaged in towing of other vessels;

ensure possession of a valid certificates of registration and survey of the vessel and valid certificate or licence by the crew, ships article or the crew list, ships log and engine log

ensure that at no time the vessel is over loaded or carried more than the number of passengers it is certified to carry;

ensure that dangerous goods or explosive materials are carried on board as authorized by Competent Authority and procedures and safety precautions as per the Explosives Rules, 1983 as amended are taken for carrying of such goods or material on board;

on sighting a vessel or raft which has suffered an accident endangering persons or the vessel or threatening to obstruct the channel, give immediate assistance to such vessels without endangering safety of his own vessel;

in case of any marine casualty, give warning to the approaching vessels to enable them to take necessary action in good time and steer clear of the channel when in danger of sinking or goes out of control;

ensure that lifesaving appliances as specified in Annexure-IV of IWAI Act, 1985 are carried onboard, in good condition and in a position available for immediate use;

ensure that no time the vessel discharge in the waterway except at places designated by the Competent Officer, raw sewage, oily substances garbage etc.

- 2. The master of a passenger vessel shall display the disposition and uses of life saving appliances carried onboard and demonstrate the use of life jackets before commencement of journey;
- 3. The master shall ensure that all the navigational aids, fire-fighting and flooding control appliances are on board in proper working condition and in a position available for immediate use and cause regular conduct of exercises to his crew for the efficient use of such appliances;
- 4. The master shall make immediate report to the nearest competent officer on

sighting of any other vessel in distress;

grounding or sinking of the vessel;

outbreak of fire or flooding in his vessel;

damage caused to any waterway installations or permanent structures;

observing uncharted obstruction or failure of navigational aid is noticed;

falling over board of any object which may become an obstruction or danger to navigation

spillage of oil into National Waterway piracy or theft onboard.



- 5. Master or persons in charge of a vessel shall give the competent officer or any person authorized by him all necessary facilities for verifying compliance with these regulations
- 6. Only qualified personnel with a valid certificate of competency certificate of service or licence are employed on board the vessel as master / serang, engineer or driver and the crew
- 7. Ensure that the crew provided is sufficiently huge and skilled to ensure the safety on those onboard and safe navigation
- 8. Provide insurance for his vessel against third party risks

#### 5.3.5 Emergency Management Unit and Mechanism at Vessel

Vessel operators shall follow all the safety guidelines as specified in IWAI Act, 1985 to prevent any accident/emergency/oil spillage. Vessel crew should be experienced for navigating in the NW-2 stretch or similar waterway. Assistance for pilotage should be searched by vessel operators for critical stretches identified by AIWTDS, if needed. Off-shore emergency management specialist/controller should be available onboard as crew member. Vessel should contain list of the emergency personnel of AIWTDS, list of major hospitals along the stretch, list of police station, disaster management units and external assistance for emergency management and oil spill management.

#### 5.3.6 Facilities to be Available Onboard

All vessels should have the following facilities

- 1. Fire-fighting facilities
- 2. Communication system and list of contact no of All emergency personnel (AIWTDS, police, Hospital, District Authority, Fire-fighting, External spill management agencies)
- 3. First aid services
- 4. List of the locations of critical bends, areas of ferry operations, heavy fishing activity, low LAD and festive seasons in Brahmaputra
- 5. Adequate lighting, horn, search lights (navigation radar if possible)
- 6. Lifesaving equipment as per schedule I of IWAI Act, 1985 (boats, life rafts, life jackets, life buoys). These should be handled as per Annexure II of IWAI Act, 1985

#### 5.3.7 Roles & responsibility of AIWTDS for Prevention and Management of Emergency

Assistance to be provided by AIWTDS during emergencies include the following

- 1. Assistance during breakdown: On receiving information from vessel master, necessary assistance will be provided by IWAI to vessel for rescue by providing tug boats. Vessel master should coordinate with other agencies as well as required
- 2. Assistance during emergency as specified above in section

#### 5.3.8 Other Reference Documents

This Plan should be used in conjunction with the following documents;

Emergency Response Plan (ERP). Regional Contingency Plan (Eastern coast guard). National Oil Spill Disaster Contingency Plan (NOSDCP).

#### 5.4 Gangetic Dolphin & Turtle Conservation Framework and Underwater Noise Impacts Framework during Construction and Operation Period

As per the secondary data and authentic reports as listed below, in Brahmaputra River, altogether 197 dolphins (27 calves, 32 sub-adults and 138 adults) were recorded from 82 locations of the river with an encounter rate of one dolphin per 4.2 km. the references are as below;

- 1. Conservation of Gangetic dolphin in Brahmaputra river system, India, Dr. Abdul Wakid, 2004
- 2. Report on the initiatives to involve the major stakeholders of Assam in the conservation of Gangetic dolphin, Dr. Abdul Wakid, 2009
- 3. Protection of endangered Ganges river dolphin in Brahmaputra river, Assam, India
- 4. Final technical report to sir peter Scott fund, IUCN, Dr. Abdul Wakid, 2009

However, no dolphin movement was observed during the site visit around the proposed sites. The presence of Dolphin in study area was also not reported by local people during site visit.

#### 5.4.1 Gangetic Dolphin and Turtle Conservation Framework

Further in waterways project mostly the impacts on aquatic fauna area associated with vessels movement and related activities. As only terminal construction and operation activities are included in the EIA scope, hence the impact of construction and operation activities on Dolphin is negligible. Impact due to increased sedimentation due to Off-shore construction activities and their mitigation shall be included in EIA report. Though Dolphins will be impacted due to the movement of vessels operation only and for conservation of dolphin (if any) detailed strategic plan shall be included in EIA report, which should be implemented by terminal authority. The key points are given below:

- For conservation of dolphin instruction should be given to all vessels operators and all employee and staff that no dolphin or any other endangered species should be harmed due to any reason.
- Instruction should be given to vessel operator that in case any accident with dolphin occurs that should be reported immediately to terminal authority.
- Vessel should be instructed for not using sharp lights and sounds as they may disturb aquatic organisms.
- Provision for propeller guards should be provided for all the vessels to minimize the propeller inflicted injuries and scars.
- Regulation of vessel speed in Dolphin habited area

#### 5.4.2 Assessment Underwater Noise

Underwater noise monitoring shall be carried out by using hydrophones at the critical locations where the dolphins have been spotted. A hydrophone is used to identify underwater noise levels by using piezoelectric transducer that generated electricity when subjected to pressure changes in a denser medium than air such as water. This shall aid in understanding the baseline noise levels at the critical locations to carry out noise modelling in the future scenario. The major sources of underwater noise shall include the existing vessels during construction phase along with construction equipment such as dredger and motorized pumps. During the construction phase the underwater noise contributors shall include new vessels and dredgers used to maintain the least available depth.

The underwater noise monitoring locations are identified taking into account the study carried out for dolphin citing locations<sup>5</sup>, the least available depth as per IWAI 1985, and the locations identified for Ghat terminal construction. The critical locations are shown in the images below in Figure 5.2, 5.3 and 5.

The underwater noise monitoring locations are considered based on the proximity (in the range of 600mts) of the dolphin locations to the least available depth and probable ferry movement paths. The noise monitoring shall be carried out by vessel based survey to identify the noise levels produced by various sources such as a ferries, dredgers and aquatic fauna. As this survey is to be used as a baseline data, the sound pressure levels shall be monitored for both day and night to identify the highest cumulative levels for worst case scenario conditions.



Figure 5-2: Figure showing the critical dolphin locations at Dhubri Medartary ferry terminals



Figure 5-3: Figure showing the critical dolphin locations at Sonaram Rajadaur ferry terminals



<sup>&</sup>lt;sup>5</sup>Conservation of Gangetic Dolphin InBrahmaputra River System, IndiaA. Wakid



Figure 5-4: Figure showing the critical dolphin locations at Kamalabari Neamati ferry terminals

#### 5.4.3 Assessment Underwater Noise Impacts and Management Framework

Construction Phase	<b>x</b>	
Sources	Impacts	Mitigations
Dredging activities for	Communication masking could happen	Use of cutter section dredger or bucket
maintaining least	due to long time exposure at a particular	dredger for lesser noise generation.
available depth	location	Bubble curtains should be provided to
		keep the aquatic fauna from accidents
Ghat renovation and	Construction of piers and other	Provision of acoustic deterrent devices at
construction	permanent structures ahead of the bank	critical locations.
	shall lead to underwater noise.	
Construction material	Movement of additional vessels through	Use of signages in critical locations so
transportation through	the river during construction phase of	that the speed and underwater sound
river channel	the project shall add to the existing	could be regulated
	underwater noise	
Intake wells for water	May lead to permanent or temporary	Use of low speed pumps or reduction in
pumping at the ghat	hearing loss base on the proximity to	running speed so as to reduce the noise.
locations	the source	
Operation Phase		
High speed vessel	Movement of vessel at high speeds in	Use of signage in critical locations so
movement.	areas where underwater ecology	that the speed and underwater sound
	(cetacean and other fishes) is present	could be regulated
Dredging activities for	Communication masking could happen	Use of cutter section dredger or bucket
least available depth	due to long time exposure at a particular	dredger for lesser noise generation.
maintenance	location	Bubble curtains should be provided to
		keep the aquatic fauna from accidents

#### Table 5-9: Underwater Noise Management Framework



### Chapter 6 : Terms of Reference for Project EIA

#### 6.1 Scope of Work for EIA

# 6.1.1 Environmental and Social Impacts Anticipated Due to Development and Operation of Terminals / Ro-Ro-Jetty / Passenger Jetty / Ghats

River terminal / jetties development and operation will have interface with various physical, social and biological components of the environment, i.e. water quality, aquatic and terrestrial flora & fauna, air quality, noise levels etc. All these environmental components will get affected due to development and operation of the terminals / jetties and a detailed environment and social impact assessment should be carried to assess all the potential impacts of the project. Further the impacts of development can be due to its location or due to the nature of activities to be performed during its development and operation phase thus both these aspects should be looked into while carrying out EIA study. Environmental framework as given in Table 5.1 in Chapter 5 can be referred to carry out the EIA study.

# 6.1.2 Environmental and Social Impacts Anticipated Due to Development and Operation of Repair & Maintenance facility

Maintenance and repair facilities for barges involve handling, storage and management of various hazardous chemicals and waste. Also there is occupational health and safety risks are involved at these facilities due to nature of works and machinery involved. High VOC emission and odour are also expected from such sites due to storage of paints & other chemicals and painting facility. Large quantity of washing water will be generated from these sites for which an efficient effluent treatment system should be provided. Overall development of maintenance facility will have interface with various physical, social and biological components of the environment, i.e. soil quality, water quality, aquatic and terrestrial flora & fauna, air quality, noise levels, waste management facilities etc. All these environmental components will get affected due to development and operation of the maintenance facilities and a detailed environment and social impact assessment should be carried to assess all the potential impacts of the project. Further the impacts of development can be due to its location or due to the nature of activities to be performed during its development and operation phase thus both these aspects should be looked into while carrying out EIA study. Environmental framework as given in Table 5.1 in Chapter 5 can be referred to carry out the EIA study

#### 6.1.3 EIA Report should essentially contain the following components:

Project general background, need of the project and sub-component, overview of the project & sub-component, Objective of the EIA study, Extent and limitation of EIA study, Contents of the EIA report, Methodology followed to carry out EIA study, Data Sources for EIA study and References

Overview of Indian environmental legislation & administrative framework, applicable environmental legislation, international best practices &guidelines including operational policies of world bank; EHC guidelines of IFC for General industry & Ports, terminals & harbours; IMO conventions and other related conventions, Environmental standards & guidelines (national &international including PIANC), MARPOL 1973/1978, London convention 1972

Settings and locations of project site, connectivity of the site, existing facilities at the site & its surroundings, project components including size & type of project; salient features of project; master planning layout; off-shore & on-shore components, construction phase activities including onshore & off-shore, operation phase activities including material handling & maintenance activities, construction material sourcing, utilities requirement &management, environmental provisions including drainage system; sewerage system; dust

suppression system; green belt development; fire protection & emergency measures& flood protection measures, implementation schedule of project, Analysis of alternatives

Environment and social features of project within study area, environmental settings& features of project, site connectivity, existing sources of pollution, monitoring plan & quality assurance procedures, description of physical environment including topography; drainage pattern; land use pattern; cropping pattern; river morphology; riverbank features slope & elevation; habitations along the project site; archaeological protected areas; wastewater &waste management facilities in the area; geology; rock types; regional tectonic settings; history of volcanic activity; seismicity; information on quarries along the waterway; soil quality; meteorology (wind speed & direction, relative humidity, temperature, rainfall, calm periods, cloud cover, barometric pressure, history of cyclones& tidal surges, history of floods & HFL); water resources & quality; riverbed sediments; air quality; noise levels, description of biological environment including the terrestrial ecology (flora & fauna); avifauna; aquatic ecology(planktons, benthos, mangroves, marshes, fisheries); forest cover, migratory routes& eco-sensitive zones in study area; RET species in waterway (dolphins, turtles, otters) with their habitat & status, description of social environment including demography; occupation/livelihood pattern; health facilities; infrastructure (transportation, industries, educational institutes); public utilities in the area (sewerage system of area, all type solid waste disposal sites in area); cultural heritage and archaeological sites; fest & festivals; tourism; spiritual& other practices associated with the waterway of locals. Maps on GIS platform should be prepared to show the study area & project site, environmental settings of project site, drainage pattern, contours, land use, connectivity and monitoring network. Primary & secondary baseline monitoring data should be presented in the reports.

Impact identification matrix for each project activity & development stage on the above defined baseline components during the pre-construction, construction & operation stage of the project along with the impact avoidance & mitigation measures and a matrix detailing the residual impact of the project after implementation of mitigation measures. Quantification of impacts should be carried out by using modelling and calculation methods for estimating air emissions, GHG emission, noise level, sewage generation, muck generation & disposal, underground noise etc as applicable.

Methodology & objective of the public consultation, stakeholders consulted, proof of communication and conducting consultations (attendance sheet, invitation letter/leaflets/newspaper invitation/public communication, proceedings &photographs of consultation and summary outcome of consultation with their redressal.

Environment management plan for each of the identified project activity and affected environmental component, institutional arrangement to ensure EMP implementation, structure of environment management plan with roles and responsibility of each member, environmental standards for operation and maintenance of terminal facility, environmental monitoring plan, reporting requirement, grievance redressal mechanism and environmental budget. EMP should cover the following components

Measures for soil erosion protection and muck management Measures for management, closure and rehabilitation of sites of labour camps and plant site (batching plants, workshops and material storage sites) Green Belt Development Plan Construction Debris Management Plan Borrow Area Management Plan Oil Spill Management Plan Occupational Health & Safety Management Plan Bio-diversity (RET species) Conservation & Management Plan Air emission Management Plan Noise Level Management Plan Water Resources and Quality Management Plan Accident and Risk Management Soil Quality Management Plan Sewage and Waste Management Plan Vessel Waste and Wastewater Management Plan EMP for vessel fuelling facility Monitoring Mechanism for Prevention of Disposal of Waste generated at site and vessels in the waterway

Summary of findings EIA report and concluding remarks with recommendations made

This Environmental Assessment process for the proposed IWT development in Assam is depicted shown below in Table 6.1.

	Table 6-1: Environmental Assessment Process				
Task	Aim / Objective	Work / Output			
Screening and Scoping Study	<ul> <li>Identify potential issues and gaps in data</li> <li>Identify the additional studies to be required other than TOR given by AIWTDS</li> </ul>	Scoping Report			
Primary Data Collection	<ul> <li>To identify the baseline / ambient / background / existing environment baseline</li> </ul>	<ul> <li>Background / baseline data including existing literature and Functional Area expert studies</li> </ul>			
Functional Area Expert Studies	<ul> <li>To further investigate those environmental parameters which may be subject to potentially significant effects</li> </ul>	<ul> <li>Functional Area expert reports (e.g. hydrodynamic study, EB Study, River Hydrology Study etc.)</li> </ul>			
Impact Assessment	<ul> <li>To evaluate the baseline environment in terms of sensitivity</li> <li>To evaluate and predict the impact (i.e. magnitude) upon the baseline</li> <li>To assess the resultant effects of the above impacts (i.e. determine significance)</li> </ul>	Series of significant adverse and beneficial impacts			
Mitigation and Monitoring Measures	<ul> <li>To identify appropriate and practicable mitigation measures and enhancement measures</li> <li>To determine the requirement for monitoring</li> </ul>	<ul> <li>The provision of solutions to adverse impacts (e.g. sensitive scheduling to avoid noise impacts)</li> <li>Feedback into the design process, as applicable</li> </ul>			
Environmental Statement i.e. EIA report	Production of the EIA Report in accordance with EIA Guidance	<ul> <li>Comprehensive EIA report</li> <li>Cumulative EIA Report</li> <li>Consolidated EIA Report</li> </ul>			

#### 6.2 Detailed Terms of Reference for EIA Study

As per the scope of work the detailed TOR is discussed in the subsequent section.

#### 6.2.1 Survey / Baseline monitoring as per MoEF&CC / SPCB / WB requirement

The various parameters to be studied under each environmental features i.e. air, noise, water and soil had been finalized based on Central Pollution Control Board (CPCB) procedures. State Pollution Control Board (SPCB) Procedures, Local Authorities and MOEFCC clearance requirements (though EC is not applicable for the project, the MoEF&CC requirements are to be followed as per Mandate given by WB) acceptable to World Bank. The apparatus used to record data should be as per guidelines of the relevant IS codes of standards. The Laboratory for data collection should be NABL certified and MoEF&CC recommended. Detail methods followed during monitoring of baseline condition are described below:

	Table 6-2: List and S	pecifications of Ba	aseline Surveys	
Environmental	Parameters to be	Duration and	Apparatus to be	Remarks
Feature	recorded/Components	Frequency	used/ to be	
	to be studied		referred	
1. Ambient Air Quality	<ul> <li>Suspended Particulate Matter(SPM)</li> <li>Respirable particulate matter(RPM) PM 10 and PM 25</li> <li>Sulphur dioxide (SO2)</li> <li>Oxides of nitrogen (NOX)</li> <li>Carbon Monoxide (CO)</li> <li>Pb (Lead)</li> <li>NH3,</li> <li>C6H6, BaP,</li> <li>Arsenic &amp; Nickel.</li> </ul>	<ul> <li>At 3 to 4 locations at each Ghat within study area for one season (except monsoon period)</li> <li>Sampling locations will be decided as per the wind direction and activities</li> <li>Sampling to be done at each location twice a week for 45 days (Gaseous sample 8 hour duration and SPM /RPM sample 24 bour duration)</li> </ul>	High volume samples Mylar bags / Bladder	<ul> <li>SPM (as per IS-5182 (Part V) – 1975)</li> <li>SO2 (as per IS-5182) Part – II) – 1969)</li> <li>NOX (as per IS-5182 (Part VI)-1975)</li> <li>CO (as per IS-5182 (Part X) 1975)</li> <li>Lead (as per IS: 12074)</li> </ul>
2. Noise Level	<ul> <li>Max Noise Level (L max)</li> <li>Min noise level (Lmin)</li> <li>Maximum hourly Leq</li> <li>Minimum hourly Leq</li> <li>Day time Leq value (6 am10 pm)</li> <li>Leq value 9 hourly (10 p.m. – 6 am)</li> </ul>	Frequency: 24 Hourly sampling (Day & Night time) to be done on twice in a week basis for one season (except monsoon period) At 2 to 3 locations in the study area at each Ghat. Each location, noise monitoring should be conducted continuously over a period of twenty four hours at uniform time intervals of 1 hour In each hourly time	Noise level meter	The following criteria adopted for measuring noise level: Measurement of "A weighted" sound level continuously using noise level meter at one minute interval for one day in each survey locations as per the

Environmental Feature	Parameters to be recorded/Components	Duration and Frequency	Apparatus to be used/ to be	Remarks
		interval Leq values at uniform time interval of 30 seconds Frequency: 48 continuous hours of Hourly sampling (Day & Night time) to be done	Telefreu	CPCB approved method IS: 4954.
3. Water	Physical parameters: pH, Temp., DO, Conductivity, Colour (Hazen Units), Turbidity &Salinity, Chemical parameters: TSS, TDS, Alkalinity, Hardness, BOD, COD, NO3,PO4, CI, SO4, Na, K, Ca, Mg, Mn, Zn, Hg, Pb, Cu, Arsenic, Silica, Oil &grease, Phenolic compounds, Residual Sodium Carbonate. Biological parameters: Total Coliform. Aquatic biota like phytoplankton, zooplanktons	Surface Water Quality at 2 to three locations at each Ghat for following parameters Frequency: One time for two season i.e. dry and wet i.e. Pre and Post Monsoon Seasons	Relevant apparatus used as per codes	From each water sampling station grab samples shall be collected and transported to laboratory for physicochemical analysis. Parameters like pH, temperature and dissolved oxygen will be measured intuitionally. Analysis of the samples as per the standard methods for examination of water and wastewater published by APHA et.al. and relevant IS codes (IS:2488 :Part I to V)
	pH, Temp., DO, Conductivity, Colour (Hazen Units), Turbidity &Salinity, Chemical parameters: TSS, TDS, Alkalinity, Hardness, BOD, COD, NO3,PO4, CI, SO4, Na, K Ca Mg Mp Zp Hg	Quality at 2 to 3 locations at each Ghat Frequency: One time for two season i.e. dry and wet i.e. Pre and Post Monsoon	apparatus used as per codes	shall be collected from wells / bore wells / hand pumps present on the adjacent to the Ghat location

Environmental Feature	Parameters to be recorded/Components to be studied	Duration and Frequency	Apparatus to be used/ to be referred	Remarks
	Pb, Cu, Arsenic, Silica, Oil &grease, Phenolic compounds, Residual Sodium Carbonate. Biological parameters: Total Coliform	Seasons		
4. Soil and riverbed / riverbank sediment analysis (Composite samples shall be prepared based on at least 3replicates from each location.)	Bulk Density, Colour, Texture, Soil Type, pH, EC,N, P, K. as well as presence of pollutants or heavy metals such as PCBs, POPs, hydrocarbons, and heavy metals such as arsenic, cadmium, mercury, lead, nickel, etc.	2 to 3 soil samples in the study area at each Ghat location Frequency: One time for two season i.e. dry and wet i.e. Pre and Post Monsoon Season	Analysis in Atomic Absorption Spectrophotometer (AAS)	Sampling and analysis as per standard methods and procedures prescribed in IS:2720 and ASTM
Riverbank sediment analysis	Salinity, Mg, Ca, Na, K, Total Organic Compound,PO43-, NO3, As, Cd, Hg, Pb, Cr, Zn, Ni	2 to 3 samples in the study area at each Ghat location Frequency: One time for two season i.e. dry and wet i.e. Pre and Post Monsoon Season and during each dredging activities.	OSPAR Guidelines for management of Dredged Materials	Sampling and analysis as per standard methods and procedures based on OSPAR guidelines.
5. Aquatic & Terrestrial Ecology	Trophic status, Species diversity & densities of Phyto & Zooplanktons, Benthic Organism (Benthos, Macro- benthos), Fish and Macrophytes, Identification of Schedule-1 species nearby each sub project site. (e.g: Gangetic dolphin)	River for Aquatic Ecology at Ghat Locations Terrestrial Ecology at Ghat Locations Secondary data collection for PA, WLS, Forest, Land use Frequency: One time for two	- Shannon Weiner Diversity Index IUCN Red List status; national or state/regional protection status.	-

Environmental Feature	Parameters to be recorded/Components to be studied	Duration and Frequency	Apparatus to be used/ to be referred	Remarks
		season i.e. dry and wet i.e. Pre and Post Monsoon Season		

#### 6.2.2 Legislative Requirement

The EIA report will be prepared in compliance with the EIA notification dated September 14, 2006 and its amendments and World Bank requirements as OP/BP guidelines and international guidelines applicable to this project. It will be based on a minimum of two seasons' data and actual field measurements and appropriate modelling studies. The EIA study will include detailed characterization of the existing status of the all components of the environment within the study area, identification of the potential environmental impacts of the project and formulation of an effective Environmental Management Plan (EMP) to prevent, control & mitigate the adverse environmental impacts.

National Legislation: As per the EIA notification of September 14, 2006 of Ministry of Environment and Forests (MOEF), government of India (GOI) the proposed project will not require environment clearance from MOEFCC from central or state level.

World Bank OP/BP: As per the World Bank environmental policy all the developmental of this magnitude require preparation of full-fledged EIA to incorporate environmental concerns in the project design and implementation.

#### 6.2.3 Analysis of Project Alternative

Alternative analysis study shall be carried out for each of the proposed terminal covering the following

#### • Strategic Analysis- With and Without Project Scenario: -

This analysis enables us to justify that why and how much the project is viable. A comparison is made for "With" & "Without" project scenario for the physical, social and biological environments. This helps in assessment and comparison of the potential impacts on these environments in both the scenario. The scenario having minimal impact is recommended for selection. This helps us to find the benefit of development of the project.

Analysing both the scenarios for above mentioned criteria during screening activity it is concluded that "With Project Scenario" is beneficial for all physical, biological and social environment when compared to "Without Project Scenario". With Project Scenario will improve the freight transportation efficiency, reduce the GHG emissions, fuel requirement, air emissions, land acquisition, tree cutting and land requirement required for maintaining and expanding road / railway network. However significant impact is anticipated on water and aquatic ecology in "With Project" scenario for which mitigation and management plans are prepared to minimize the impact.

• Planning Analysis- Site selection, selection of layout, selection of alignment of roads/railways:-

This involves the consideration of options involved in planning stage, i.e. location of the proposed interventions, suitability of site, design of the project layout and dredging extent. This enables to select the option having best planning/design with minimal implication on physical, biological environment. Since the EIA is to be carried out in tandem with the detailed engineering study, thus this will facilitate to undertake the analysis of proposed alternatives / sites with environmental point of view and planning which is to be done on the basis of

suggestive outcome of the environmental alternative analysis study. Thus the alternative analysis of locations will be carried out for environment, type of jetty, ferry Ghat concept, type of pontoons, vessel design requirements and layout requirements. The outcome of present study is presented in annexure 3.

• Technological Analysis:-

This exercise involves the assessment of technology and design for Vessels, Ferry Ghat Concept, type of Ghat like floating pontoon or pier structure construction, layout alternatives on the basis of the Ghat location and its hydrodynamic modelling and water level availability.

#### 6.2.4 Delineation of Study Area – Primary and Secondary Data Collection

The study area will be defined as the area over which the potential direct and indirect impacts of the proposed development under the Master Plan are predicted to be detectable offshore and onshore.

#### 6.2.4.1 Offshore Study Area

Direct impacts offshore will be defined as physical effects in the river environment arising from the development. Therefore, the study area for direct impacts will include the footprints and immediate vicinities of the harbour works and capital dredging areas in activity area (where required) and offshore disposal of dredged material if any.

Indirect impacts offshore may arise as a consequence of the development's effect on, for example, hydrodynamic and sediment transport processes (e.g. erosion and accretion of inter-tidal sediments), noise disturbance or changes to the rivers cape (e.g. presence of new infrastructure in the water). Therefore, the study area for indirect impacts will extend beyond the study area for direct impacts and, for the purposes of this Study, will be taken into consideration. By taking this approach, the offshore study area will encompass the areas covered by a number of management plans including:

River / Aquatic Management Plan Sediment Management Plan Shoreline Management Plan / River training / Erosion Control Measures

#### 6.2.4.2 Onshore Study Area

Direct impacts onshore are defined as physical effects in the terrestrial environment arising from the development. Therefore, the study area for direct impacts will include the footprints and immediate vicinities of the harbour works within the existing land holding at the project sites.

Indirect impacts onshore may arise as a consequence of the development's effect on, for example, road transportation (e.g. traffic on the local highway network / approach road to proposed sites / parking area / access bridge), noise disturbance (e.g. to local residents) or changes to the landscape (e.g. presence of new infrastructure on land). Therefore, the study area for indirect impacts extends beyond the study area for direct impacts and, for the purposes of this Screening and Scoping Study, is taken into consideration the properties neighbouring to the project sites, the main road corridors providing access to the jetty and the settlements around jetties. By taking this approach, the onshore study area encompasses the areas covered by a number of management plans including:

Environment management plan as per the environmental resources Air modelling, Noise modelling as per the activities Sediment dumping area Management plan Land use management plan as per the impacts of project components Risk Management Plan The study area of 500mt radius from project site of direct impact zone and study area of 10km radius from project site of indirect impact zone will be taken into consideration. Primary baseline data will be collected from direct impact zone and secondary baseline data will be collected for indirect impact zone.

The assessment process will determine the significance of the impact based on an investigation into the status of the existing environment and determination of the methods to be used for construction and the operational activities and the sensitivity of each parameter to the works proposed. Mitigation measures will be recommended where possible to reduce the scale of impact and a residual impact will be determined based on the information available, Monitoring measures will be recommended to record the actual impacts and the success of mitigation where applied. The assessment of significance will be based on a number of categories as shown below:

#### 6.2.5 Historic Environment to have better Understanding

In the first instance, a desk study will be undertaken in order to determine whether there are any known areas of archaeological interest within the footprint of the proposed development. In addition, the risk of potentially disturbing any unknown sites will be evaluated. This will be undertaken in accordance with the standards and guidance of the Archaeological Survey of India and agreed with the local authority archaeologist. It is envisaged that the assessment will require the following elements of work:

Identify the known and potential archaeological heritage using existing information available;

Identity in detail past impacts on the study area; and

Undertake a detailed assessment of the potential impacts of the proposed development on the archaeological heritage.

The desk study will then identify the nature of any further work should it be required. This may include the requirement to undertake intrusive site investigation

#### 6.2.6 Ecology and Biodiversity

#### 6.2.6.1 Aquatic and Terrestrial Ecology

Ecological surveys to be conducted during two different seasons –Monsoon Season, post Monsoon i.e. dry and wet season. The study area within 10 km radii should be divided into different influence zones. Further, suitable sites within the survey area should be identified in order to represent the ranges of ecosystem and land use types.

A nested quadrate technique to be used for sampling the vegetation. The size and number of quadrates needed to be determined using the species area curve and the running mean method. The number of species of trees, shrubs and large climbers, as well as the number of individuals of each species, falling within the area shall be noted. At each site, faunal diversity shall be studied through direct evidence, in the form of visual sightings, and indirect evidence such as calls, nests, burrows, droppings, scats, moults, tracks, etc.

River Ecology Data from fish landing points about monthly fish landings and variety of fishes available in the region. To determine the magnitude and significance of impacts on benthic communities, the nature of existing communities needs to be characterised. Given the amount of available information on the ecology at the study site, it is considered that the baseline characteristics of the site would need to be further defined by field investigations. It is proposed to undertake survey work, using grabs, to describe the existing benthic communities of the area that could be affected by the proposed project (6-10 sites).

The approach and methodology which will be adopted for conducting the entire study on Ecology and Biodiversity (Aquatic & Terrestrial) of the proposed project along with the monitoring plan during EIA Study is mentioned as below:

#### • Collection of Primary & Secondary data:

To assist in determining the potential impacts associated with direct loss of habitat, it is proposed that a survey of the in faunal communities will be undertaken in the footprint of each of the elements of the development that either will give rise to a direct loss or that will require sediment removal.

A rapid field survey will be carried out to record the floral and faunal diversity and to understand the biodiversity of the study area. The team for the study consisted of 3 members along with few local people for the confirmation of floral & faunal diversity. The aim of the study is to gather data of present flora and fauna in the study area.

Both floral and faunal species will be identified in the field and also collected from secondary sources. Some of the floral species may be identified with the help of local informants.

The team will trek the project area to explore different floral and faunal diversity.

The team will visit the local fish market to collect the data on fish diversity.

Secondary data from the sites of IUCN & WII will be used for confirming the status of different species.

The increase in vessel numbers will be further considered as part of the EIA process and compared to the data already gathered as part work undertaken

#### • Identification of Protected areas under 10 km of influence area:

The status of protected areas i.e NP/BR/WLS/Ramsar sites etc. are to be confirmed by using the GIS software & SOI topo maps.

#### • Terrestrial environment on Jetty

Walkover study to identify key plant and animal animals in the study area Survey of tree to be cut during development if any

Identification of suitable native tree species for afforestation near Ghat area

Collection of detailed data to assess the impact of Ghat operations on terrestrial ecology

#### Study for Aquatic/River & Terrestrial Ecology & Biodiversity / Monitoring Plan for Aquatic & Terrestrial Ecology:

A separate team (from research institute/local agency) will be formed to conduct the different study on River ecology, Trophic status of the river, primary productivity, Species diversity & densities of phyto &zoo planktons, fish and macrophytes etc.

The monitoring of aquatic ecology & biodiversity will be conducted in the month of September-October-2018i.e Wet Season and January 2019 i.e. Dry Season. Monitoring will be conducted in both upstream & downstream of the Ghat locations.

The monitoring plan for construction and operational phase will be finalised during detailed EIA studies.

#### • Additional studies on Dolphin & other species like Hilsa of importance:

The additional study will be carried on the basis of primary and secondary data. Public Consultation and interaction with local NGOs working on Dolphins/other important species will be done to gather the data on its occurrence, breeding ground, threat & conservation etc.

Finding of the dolphin habitation areas in the Brahmaputra River near IWT project sites This data will be linked with the Vessel number and size and specifications and impacts magnitude on Dolphin

Accordingly mapping of Dolphins and turtle area shall be prepared depending on the secondary details

#### • Observation & Recommendation: (For sites under Kamrup Districts)

Gangetic /River Dolphin spotted in project locations during high flood.678.

<sup>&</sup>lt;sup>6</sup>CONSERVATION OF GANGETIC DOLPHIN IN BRAHMAPUTRA RIVER SYSTEM, INDIA, Dr. Abdul Wakid, 2004

In our Study area total 25 Dolphins are recorded.

Annexure 12 is depicting Records of Gangetic /River Dolphin spotting in project locations during high flood in Brahmaputra River as per the research and secondary data available

Tortoise also spotted in the project locations.

A separate study on dolphins & tortoise will be required.

Ecology	Study	Criteria	Man	Qualification	Time/duration
			Power		
River	Baseline data	The study area within	One	Ecologist:	During
water	collection on	a 10 km radius	ecologist	M.Sc. Life	monsoon and
ecology	aquatic flora and	around the proposed	and two	sciences	Post monsoon
	fauna including	terminal site has been	support		season
	phytoplankton,	considered as general	staff		
	zooplankton and	impact zone and 2 Km			
	benthos	radius as specific			
Terrestrial	Baseline data	impact zone (which	One	Ecologist:	Post monsoon
Ecology	collection on	more critical for such	ecologist	M.Sc. Life	season
	terrestrial flora	projects) for EIA	and two	sciences	
	and fauna	study. Primary and	support		
		secondary data to be	staff		
		collected for both the			
		zones however; focus			
		of primary data			
		generation has been			
		more for 2 km radius.			

#### 6.2.7 Air quality

In air environment following steps will be carried out during EIA studies.

- Collection of meteorological data and preparation of wind rose diagram:-
  - Micrometeorological data will be collected by using the mechanical instrument near the project site as per CPCB guideline.
  - Wind rose diagram will be prepared by using daily average wind velocity and dominant wind direction.
- Selection of ambient air quality monitoring stations at Ghat area and carrying out ambient air quality monitoring:-
  - Ambient air monitoring locations will be selected in all the directions looking towards the possibility of change in wind pattern during the study period.
  - Ambient Air Quality Monitoring will be carried out as per CPCB guidelines.
- Comparison of ambient air quality results with CPCB standards.
- Prediction of impact:-
  - During construction phase air emission are intermittent in nature, hence by implementation of proper mitigation measures there will be marginal impact.
  - During the operational period continuous air emissions may be generated from ferry engines. The air pollutants of concern from the ferry engine emissions are Sulphur Dioxide(SO2), Carbon Monoxide (CO) and Oxides of Nitrogen (NOx), PM10 and PM2.5.



<sup>&</sup>lt;sup>7</sup> REPORT ON THE INITIAITVES TO INVOLVE THE MAJOR STAKEHOLDERS OF ASSAM IN THE CONSERVATION OF GANGETIC DOLPHIN, Dr. Abdul Wakid, 2009

<sup>&</sup>lt;sup>8</sup> PROTECTION OF ENDANGERED GANGES RIVER DOLPHIN IN BRAHMAPUTRA RIVER, ASSAM, INDIA Final Technical Report to Sir Peter Scott Fund, IUCN, Dr. Abdul Wakid, 2009

- Prediction of Impact studies using Gaussian model (ISCST3, CALINE 4, ARMOD) for ferry engine gaseous emission and particulate matter will be carried out and presented in EIA report.
- Evaluating total impact (baseline plus predicted concentration of pollutant), comparison of the same with CPCB standards
- Preparation of Air Environment Mitigation measures for construction and operation phase:-
  - Construction of Ghats will be confined to a relatively small area. During operation phase ferry movement generates gaseous and particulate matter as emission.
  - The potential impacts will be identified for the construction and operations phase.
  - These impacts can be reduced/controlled/prevented by proposed mitigation measures and Good Management Practices (Safety Management, Environment Management and HSE Management).
  - Air pollution mitigation measures for the same will be detailed in EIA report.
  - Detailed emission inventory, including fugitive emissions and simulations as per incremental load and traffic
  - Evaluation of existing/ proposed pollution control measures
  - o Detailed inventory of sensitive receptors in and around jetty area
  - o Delineation of impact zone based on meteorological data
  - Delineation of measures to minimize impacts on air quality sensitive receptors
- Preparation of Air Environment Management plan and Monitoring Plan during construction and operation phase :-
  - To ensure the effective implementation of the mitigation measures and environmental management plan during construction and operation phases of new terminal or Ghat building and ferry operation in project, it is essential that an effective Environmental Monitoring Plan for Air Pollution monitoring will be designed and followed during construction and operation phases, which will be detailed in EIA studies.

#### 6.2.8 Noise and Vibration environment

It is proposed that a noise survey will be carried out to obtain baseline data and inform the EIA process. This will be focussed on the jetty and receptors around the jetty where the majority of construction and operational activity will take place. The noise surveys will measure existing ambient and background noise levels and will be based on consultation with Environmental Health Officer and initial desk-based studies of noise impacts.

- It is not proposed to undertake underwater noise surveys or vibration surveys to inform the EIA process.
- It is suggested that noise calculations will be made to determine whether any of the receptors are likely to be at risk of increased noise levels during construction and operation of the new jetty facilitates. Impact assessments will be made in accordance with guidance contained in relevant British Standards as Indian standards are not available.
- Prediction of increased noise levels due to jetty operations through simulation studies
- Delineation of noise management plan.
- Vibration from construction will be assessed in relation to the extent and duration of construction works likely to cause ground-borne vibration (i.e. piling) in relation to the proximity of sensitive receptors (i.e. buildings susceptible to damage). The assessment of the likelihood of building damage will be assessed against criteria for vibration levels in relevant British Standards.
- Vibration from on-site construction may affect the listed/heritage buildings on, or close to the site. The assessment will examine the extent, duration and proximity of those works likely to create significant levels of ground borne vibration (i.e. piling). Assessment of the likelihood of building damage will be assessed against relevant criterion vibration levels provided in appropriate British Standards and other information, as appropriate.
- The underwater noise monitoring locations are considered based on the proximity (in the range of 600mts) of the dolphin locations to the least available depth and probable ferry

movement paths. The noise monitoring shall be carried out by vessel based survey to identify the noise levels produced by various sources such as a ferries, dredgers and aquatic fauna. As this survey is to be used as a baseline data, the sound pressure levels shall be monitored for both day and night to identify the highest cumulative levels for worst case scenario conditions.

#### 6.2.9 Water resources/ drainage

Understanding the water quality is essential in preparation of EIA and identification of critical issues with a view to suggest appropriate mitigation measures for implementation.

Selected water quality parameters of surface and ground water resources within the study area will be studied for assessing the water environment and evaluating the impact due to the proposed project. The water quality of Brahmaputra River may get affected due to activities of proposed terminals/ jetty / landing points. It is proposed that sediment sampling both at the surface and at depth is undertaken and sample locations will cover all elements of the proposed Master Plan that require dredging or could lead to sediment disturbance. These sites will be discussed and agreed with the regulators.

Assessment of baseline data on water environment includes;

Identification of surface water sources

Identification of ground water sources

Identification of point sources of pollution

Collection of water samples

Analysing water samples for physio-chemical and biological parameters

Comparison of water samples with CPCB prescribed water quality standards for designated use and IS for its quality

Water quality of Brahmaputra River and Barak River will be studied through secondary and primary information.

Detailed study of hydro geological features and aquifer characteristics at jetty

Estimation of possible rise in demand for water for various activities at jetty

Impact on ground water table and assessment waste water intrusion due to dredging in Ghat area

Identification of wastewater generation sources and quantification of pollution loads

Study of impact on drainage pattern near jetty area due to jetty construction and construction of boundary wall

Consideration of the results in relation to potential impacts on aquatic ecology, water quality, river bank quality and bathing waters.

The potential impacts of the development both during the construction and operational phase will then be assessed in relation to the existing background environment and the potential for exceeding Environmental Quality Standards

Suggestion of mitigation measures for impacts identified

Preparation of Environment Management plan and Monitoring Plan for Water during construction and operation phase

#### 6.2.10 River environment

- Assess baseline river water and sediment quality and study the impacts of jetty construction or river water and sediment quality
- Study the impact of the jetty development on river physical processes including siltation and erosion processes. We propose this to be done in a two phased approach:
  - o Initial desk based study by river hydrologist expert using existing data
  - If the desk based study indicates that there may be significant impacts on Ghat processes, then a specialist mathematical model would be commissioned to predict the impacts
- Ecological studies to quantify primary productivity, density and frequency of species 0 (including commercial fish species), species diversity, food chain relationships and bioaccumulation. Consideration of any river breeding/spawning, feeding habitats/areas.
- Special studies on turtle area / dolphin area 0
- Ecological risk assessment studies on potential receptors and quantification of impacts including but not limited to impacts from dredging, underwater noise, increased vessel movement, changes in hydrodynamics and changes to water or sediment quality
- Study the impact of the dredging on river ecology. This will be done through a desk based study, however if the desk based study indicates that there may be significant impacts on river ecology from the dredging sediment plume, then a desk based study or specialist mathematical model would be commissioned to predict the spread of the plume (level of study would be commensurate with the significance of the predicted impact)
- Delineation of River Environment Management Plan

The land on which the Terminals / Ghats / Landing Points will stand will be reclaimed from River and will require fill material. As far as possible the fill material will be sourced from the dredging planned for the approach channel and turning circle with the Terminals / Ghats itself. However, there may be a requirement to borrow materials. Ultimately, it will be the contractors decision where to source fill material from, as each contractor will have different preferences and cost requirements.

In addition, it may be that not all the material dredged from within the Terminals / Ghats / Landing Points and river navigation route is suitable for reclamation (silt content), and will be waste. Where possible this material should be reused (e.g. for landscaping), however it may be that some disposal on inland is necessary in the case the material cannot be re-used. It is been discussed necessary in the Scoping Phase borrow areas can be found within 10 km area from the project site. Disposal sites should be found based on the environmental suitability parameters. In the case a site needs to be selected for disposal or dredging for fill material, a three stage methodology is required, as follows:

- 1. Site selection and characterisation study;
- 2. Environmental impact assessment;
- 3. Monitoring

#### The principal factors to be considered in selecting and assessing new dredge / disposal areas are:

- 1. Characteristics of the material to be dumped or dredged including the presence and mobility of contaminants.
- 2. Location of amenities, protected areas, and other uses in the area
- 3. Characteristics of the water-column and the river-bed at potential sites,
- 4. Economic and operational feasibility of river transport of the material to the site,
- 5. Size of the disposal site: large enough to accommodate / generate the anticipated volumes
- 6. Environment or interference with other uses of the river, but small enough for practical monitoring, and
- 7. The presence of other disposal sites in the vicinity.

Beneficial use (e.g. in landscaping or ecological enhancement) is the preferred disposal route for all waste materials from dredging, however, it may be necessary for the contractor to investigate the potential for offshore disposal in case suitable beneficial use options are not available or are not financially viable. The financial viability is often related to the guality of the dredged material, available space for re-use, contractor's equipment, mobilisation costs of dredging equipment, etc.

# 6.2.11 River Bank Protection

To address the afore said potential environmental issues, the main players and stake holders particularly WRD and AIWTDS need to evolve mechanism to know each other's plan and programme in and around the river terminals. In addition, AIWTDS needs to coordinate among the

stake holders to spell out the emerging issues of the kind concerning environment, by holding periodic review meetings during the project intervened period. Also, since most of the Ghats are seen experiencing river bank erosion, the issue could be addressed by WRD by way of convergence of works. If some of the river bank protection works are taken up at the terminals by IWT sector on their own, there is a need to seek expertise of the WRD to give justice to the implementation of the works.

### 6.2.12 Land environment

- The land use / land cover map will be prepared by adopting the interpretation techniques of the image in conjunction with collateral data such as Survey of India topographical maps and census records. Image classification will be done by using visual interpretation techniques and digital classification using ERDAS image processing 10.0 software and ARC/GIS 10.0 software. The various activities for preparation of LULC include preprocessing, rectification, enhancements and classifying the satellite data for assessing the change in land use land cover due to proposed developmental activities.
- The imagery will be interpreted, and ground checked for corrections. The final map will be prepared after field check. The different land use/land cover categories in the study area will be carried out based on the NRSC land use / land cover classification system.
- Study of possible changes in land use pattern near Ghat due to jetty expansion activities
- Study of land degradation, soil erosion, natural drainage network and delineation of soil conservation measures to minimize the impacts
- Suggestion of solid and hazardous waste management plan
- Delineation of Land Environment Management Plan.

# 6.2.12.1 Land Use / Land Cover Mapping

Prepare land use/Land cover (LULC) maps of the 10 km radius study area with reference to the proposed port site using latest satellite imageries.

- LISS III sensor
- Resolution of the imagery : 23.5m
- Map scale: 1:50,000

It should at least cover classifications like built up area, agriculture land, fallow land, forest cover, water bodies etc. The accuracy of the interpretation of the satellite imagery to be enhanced using reference data from ground truthing.

The land use land cover study will be done through digital image processing and visual interpretation technique to generate output of Land use / Land cover map around the 10 Km radius of proposed project will be prepared for study area on 1:50,000 scale. Also, a 10 Km radius False Color Composite satellite map surrounding the project site will be provided in context to the study area. Flowchart showing the methodology adopted for land use/land cover mapping is provided below:



#### Figure 6-1: Flowchart showing the methodology adopted for land use/land cover mapping

#### 6.2.13 Risk analysis

Preparation of a framework for recommendations for the completion of a disaster management plan (both offsite and onsite) for the Ghat area, implementation of mitigation measures and recommendations for monitoring.

#### 6.2.14 Geology and Soils

Geological receptors are distant to the jetty estate and unlikely to be affected by the proposals. Accordingly, it is suggested that impacts on geology can be scoped out of the EIA and no further work is proposed.

Given that little disturbance to soils and ground is expected to occur, a standard Phase of Desk Study and site walkover and surveys are proposed to inform the EIA process. This work will include the following tasks:

- Soil sample collection and quality analysis
- Suggestion of mitigation measures as per the identified and featured impacts during construction and operation phase
- Suggestion of suitable implementation measures for the soil management in EMP and monitoring plan preparation
- Soil treatment if necessary
- Review of historical maps to determine potential sources of historical contamination;
- Site walkover to determine potential sources of current contamination;
- Review of licensed activities and recorded pollution events;
- Review of previous construction, infill and reclamation events;
- Review of any technical reports; and
- Preparation of a conceptual model and conclusions relating to potential contamination.

The desk study will identify the potential for the presence of contaminated land and for the proposed new jetty development to affect it. While this is currently considered to be unlikely, further work in the form of an intrusive site investigation works might be required to complete the impact assessment.

#### 6.2.15 Navigation

The approach to assessment of the potential impacts on navigation will be to discuss the key navigation issues with the officer in charge and IWT's pilots. This consultation process will establish the level of concern over the potential impacts and reveal any measures, in addition to those measures that are already in place, that are considered necessary in order to ensure the safe navigation of both commercial and recreational vessels. It is anticipated that a navigation risk assessment (NRA) will not be required to inform the EIA process.

#### 6.2.16 Landscape and Visual Amenity

In the absence of national or state level guidelines for landscape and visual impact assessment, an approach to the landscape and visual assessment will be developed in accordance with The Guidelines for Landscape and Visual Impact Assessment (The Landscape Institute & the Institute of Environmental Management and Assessment, 2002). The landscape and visual assessment will be considered to identify potential impacts associated with:

- Temporary activities and infrastructure associated with construction.
- Long-term activities and infrastructure associated with operations.
- Short-term activities and infrastructure associated with decommissioning.

The landscape and visual assessment method will involve a desktop assessment including identification of a landscape and visual baseline, field surveys and a significance assessment.

A preliminary desk-based analysis of the project development area's landscape and visual resource will be undertaken to inform the baseline assessment, including analysis of the underlying landscape, land cover, landscape value and recognised viewing locations.

- The desktop study involved a review of key information sources, including documents and maps on:
- Planning schemes from relevant local bodies.
- Cadastral data (showing roads and all major features, built up areas, etc.).
- Hydrological corridors.
- Land use.
- Geology and soils.
- Vegetation.
- Land resource area mapping.
- Existing infrastructure.
- Important cultural heritage features.
- Designated tourist drives.

The baseline landscape character assessment will involve mapping and describing broad landscape character types and discrete landscape character areas within each ferry / Ghats / terminals (where appropriate).

The baseline assessment will be considered factors that had influenced landscape change in the past and factors that are likely to do so in the future. The visual baseline will be assessed and described views from selected representative viewpoints within the project development area.

Field visits will be carried out to ground truth the findings of the desktop study, collect photographic records that portray the existing landscape character, inform the viewpoint selection and assessment of viewpoints, and provide data for the production of photographic visualisations. Landscape and visual receptor sensitivity will be the primary factor in determining which areas of the project development area were targeted for field visits, with highly sensitive landscapes and visual receptors being the focus. Accordingly, the management plan will be prepared and will be monitored during construction and operation phase.

#### 6.2.17 Recreation and Amenity

The AIWTDS shall investigate opportunities to provide access for passive recreational and amenity purposes in these areas subject to the preparation of an appropriate assessment where there may be infringement upon a proposed site.

To investigate the potential of facilitating non-invasive access to the River Brahmaputra utilising, where feasible buffer zones between proposed Ghats / terminals and surrounding development. Any proposals which might impinge upon the integrity of proposed Ghats / terminals and surrounding development shall ensure that a screening exercise for Appropriate Assessment will be carried out. Where required, full Appropriate Assessment shall be carried out for any plan or project which, individually, or in combination with other plans or projects, is likely to have a significant direct or indirect impact on any proposed Ghats / terminals and surrounding development.

Inland waterway will bring huge potential to intensify recreational activities. Fishing is the best potential recreational activity to be developed. Besides, fishing as recreational activity, river expedition is another popular activity among the youngster especially among school children and teenagers.

The effects due to the presence of dredgers will be investigated by identifying the number and type of vessels and equipment that will be required during the works, the duration for which they will be required and their location. This information will be used to determine any restrictions that will be required during the proposed works. The information undertaken in order to inform the noise assessment will also inform potential impacts on areas currently used for recreational activities.

The effects of any hydrodynamic changes associated with operation of the proposed Master Plan will be investigated as part of the hydrodynamic assessment and the results used to inform potential impacts on recreation and amenity. The increase in watercraft numbers will also be assessed and compared to the current use of the area.

#### 6.2.18 Communication and Consultation

Stakeholder engagement is an essential part of the whole EIA process. Communication is a vital tool in the successful development of any such project and will help to inform the requirement for, and focus of, specialist surveys, the assessment of impacts and the development of mitigation measures. Without a comprehensive approach towards consultation, it is not possible to effectively incorporate information and views which are important for a thorough consideration of the potential impacts of the proposed jetty development. Communication and consultation will be flexible in order to allow engagement with stakeholders as and when key issues arise, and would be an integral part of the EIA exercise.

The aim of any consultation is to inform all relevant stakeholders of the proposed scheme, to identify available information, and to identify stakeholders' issues and concerns. Statutory and local stakeholders included:

- Directorate of Fisheries
- Directorate of Tourism
- Member Secretary Assam Pollution Control Board
- PWD /PMGSY
- Irrigation Department
- Deputy Director of IWAI
- Scientist, Central Inland Fisheries Research Institute
- Assam Science Technology & Environment Council
- Assam University
- Guwahati IIT
- village council (gram Panchayat)
- Local fisherman
- Operators

Traders

# 6.2.18.1 Framework for Future Consultations

Consultations with the key stakeholders will need to be carried out throughout the Project life. These will include consultations and liaison with communities and other stakeholders during the construction phase and also extensive consultations with the grass-root as well as institutional stakeholders during the EIA studies of the various subprojects. The team structure who will be engaged in stakeholder consultation will be as follows;

The AIWTDS is well equipped with in-house Environment and Safety Cell or external agency appointed by AIWTDSwho will be allocated the roles of stakeholder's consultation along with lead designer (ISDP) and lead consultant (ISBP) during Preconstruction phase. It is the responsibility of Design Consultant (in this case ISDP Consultant), EIA Consultant to present the outcomes / findings of TOR, Screening, EMF and EIA Studies during its stages for getting feedback and recommendations of stakeholders. It will improve and add values and additional studies framework if required for betterment and sustainability of the project. For the Consultations with communities and other stakeholders during construction phase E&S cell of AIWTDS and main contractor will be responsible. During O&M E&S cell of AIWTDS and ISDP and DPR consultants will have Consultations with communities. The framework for the future consultations is presented in **Table 6.3**.

Description	Objective/Purpose	Responsibility	Timing
Consultations with communities and other stakeholders during pre-construction phase	Information dissemination; Public relation; confidence building; awareness about risks and impacts; minimizing conflicts and frictions.	Environment & Social Development Expert, AIWTDS, Design Consultant and Lead Consultant	Pre - Construction phase
	Sharing EIA TOR	E&S Cell of AIWTDS / ISDP and EIA team	During scoping stage of EIA
Consultations with	Sharing of EMF		During EMF Stage considering cumulative studies for the project
other stakeholders during EIA studies of subprojects	Dissemination of information on project and its key impacts and proposed mitigation measures; soliciting views, comments, concerns, and recommendations of stakeholders	Environment & Social Development Expert, AIWTDS / ISDP and EIA team	During EIA study (once draft analysis is available for discussion and feedback)
Consultations with communities and other stakeholders during construction phase	Awareness about risks and impacts; minimizing conflicts and frictions.	Environment & Social Development Expert, AIWTDS; Contractors	Construction phase
Consultations with communities	Liaison with communities and project beneficiaries	Environment & Social Development Expert, AIWTDS;	O&M phase

#### Table 6-3: Consultation Framework

#### 6.2.19 Cumulative Impacts

Describe the approach to assessing cumulative environmental impacts of the proposed scheme. Cumulative effects imply interaction between potential impacts, possibly resulting in an impact of greater (or lesser) significance than the effects in isolation. This might include the combined effects from several developments in the area, which when considered together could result in a significant cumulative effect.

- Assessment of cumulative impacts of known projects in the area that could have a cumulative effect on jetty project
- Information on impacts arising from relevant plans and projects would be collated through literature searches and from consultations with organisations holding such information. It is anticipated that Environmental Statements from other developments within the area would form an important resource for the cumulative impact assessment.
- The factors underlying the assessment of cumulative and in combination effects include:
  - The environmental impacts of proposed activities on the river environment;
    - The geographical boundaries of the environmental effects of activities within each project;
    - o Indirect effects of a project on another project or resource;
    - Dredging impacts on the environment;
    - Reclamation impacts on the river environment;
    - Construction of approach road to Ghat;
    - o Incremental traffic of vessel on jetty and Ghat due to up gradation of system;
    - Upcoming infrastructure projects like smart cities, roads, area development, industrial units;
    - Seasonal variations in the impacts due to the shifting of jetty (Dry and wet Season);
    - The temporal characteristics of projects; and
    - The thresholds of sensitivity of the existing environment.
- The assessment would cover potential impacts of proposals, plans and projects in various sectors, not limited to the activities of the proposed scheme.
- The assessment would also include the following types of project, subject to availability of information:
  - Existing completed projects
  - Approved but uncompleted projects
  - On-going activities (e.g. discharge consents, maintenance dredging)
  - o Other infrastructure
  - Plans or projects for which an application has been made and are under consideration by the consenting authorities; and
  - o Plans and projects which are "reasonably foreseeable".

# 6.2.20 Linking of EMF findings and subsequent EIA findings with other on-going consultancies

The EMF findings and subsequent EIA findings along with Ghat surveys will be presented in stakeholder consultation for getting recommendations. Also the same findings and recommendations will be discussed with project consultants to implement those during design of project components, business proposals. This will ensure to reduce the impacts of project on environmental components due to project implementation and also environmental impact on project components during its operation. It will be a good approach for sustainable development of the project.

#### 6.2.21 EIA Consultant's Requirement (Expertise Requirement and Responsibility)

For the purpose of EIA study of jetties and terminal facility, following experts to be engaged,

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SI. No	Expert Position	Roles & Responsibilities	Input Period				
1	Team Leader/Sr. Environmental Specialist	<ul> <li>Team Leader will provides direction, instructions and guidance to experts working on project</li> <li>Drafting &amp; reviewing EIA-EMP &amp; EMF reports and mitigation measures</li> <li>Develop, implement, and evaluate methods of data collection, such as questionnaires or</li> </ul>	6 months on full time basis				

# Table 6-4: Expertise Requirement and Responsibility- EIA Consultant

SI. No	Expert Position	Roles & Responsibilities	Input Period
		<ul> <li>interviews.</li> <li>To draw the applicable Legislative structure for the project</li> <li>Assist PIU in obtaining of requisite environmental clearance, mandatory Statutory clearances, public hearing and stakeholder consultation processes, <i>etc.</i> related to project</li> <li>Consult with and advise individuals such as administrators, social workers, and legislators regarding social issues and policies, as well as the implications of research findings</li> </ul>	
2	Ecology and Biodiversity Expert (Terrestrial & Aquatic)	<ul> <li>Provides required inputs in preparation of EIA &amp; EMP reports</li> <li>Carry out site inspections, check and undertake periodic environmental monitoring and initiate necessary follow-up actions</li> <li>Carry out consultations with the NGOs and Community groups to be involved in the project;</li> <li>Review and finalize the terms of references for the consulting firms and NGOs to be hired under the project for biodiversity conservation and monitoring, fisheries development and community development. Monitor and assess progress of study execution, suggesting corrective measures if necessary. Review and comment on study findings.</li> <li>Assist the Senior Environmental Specialists in implementation of the EMP for Component 1 and Preparation of EIA for Component 3</li> <li>Any other tasks specified by the SPD and Senior Environmental Specialist</li> </ul>	6 Months on intermittent basis
3	Team Leader – Lead Social Development Specialist	<ul> <li>Team Leader will provides direction, instructions and guidance to experts working on project</li> <li>Drafting &amp; reviewing SIA-SAP, IPP, RAP &amp; SMF reports and mitigation measures</li> <li>Develop, implement, and evaluate methods of data collection, such as questionnaires or interviews.</li> <li>To draw the applicable Legislative structure for the project</li> <li>Consult with and advise individuals such as administrators, social workers, and legislators regarding social issues and policies, as well as the implications of research findings.</li> <li>Develop approaches to the solution of groups' problems, based on research findings in sociology and related disciplines.</li> <li>Observe group interactions and role affiliations to collect data, identify problems, evaluate progress, and determine the need for additional change.</li> </ul>	6 Months on intermittent basis
4	Junior Environmental Specialist	<ul> <li>Provides required inputs in preparation of EIA &amp; EMP reports</li> <li>Carry out site inspections, check and undertake</li> </ul>	4 months on intermittent basis

SI. No	Expert Position	Roles & Responsibilities	Input Period
		<ul> <li>periodic environmental monitoring and initiate necessary follow-up actions</li> <li>Field Investigation</li> <li>Report Preparation</li> <li>Will coordinate with client in absence of TL</li> <li>Assist the Design Consultants in environmental screening and scoping process</li> <li>Any other tasks specified by the SPD and Senior Environmental Specialist</li> </ul>	
5	Solid Waste Management Expert	<ul> <li>Provides required inputs in preparation of EIA &amp; EMP reports</li> <li>Carry out site inspections, check and undertake periodic environmental monitoring and initiate necessary follow-up actions.</li> <li>To quantify the solid waste generation</li> <li>Categorization of the solid waste</li> <li>Framing the strategy for solid waste management</li> <li>Assist the Design Consultants in environmental screening and scoping process</li> <li>Any other tasks specified by the SPD and Senior Environmental Specialist</li> </ul>	2 Months on intermittent basis
6	Risk Assessment & Hazard (RH) Management Expert, including Occupational Health and Safety (OHS)/labor influx risk assessment	<ul> <li>Provides required inputs in preparation of EIA &amp; EMP reports</li> <li>Carry out site inspections, check and undertake periodic environmental monitoring and initiate necessary follow-up actions</li> <li>Looking after the risk assessment and management in the project at different stages and report the findings and recommendation to Environmental Specialist.</li> <li>Review, evaluate, and analyse work environments and design programs and procedures to control, eliminate, and prevent disease or injury caused by chemical, physical, and biological agents or ergonomic factors.</li> <li>Assist the Design Consultants in environmental screening and scoping process</li> <li>Any other tasks specified by the SPD and Senior Environmental Specialist</li> </ul>	3 Months on intermittent basis
7	Hydrology Expert / Hydrologist	<ul> <li>Provides required inputs in preparation of EIA &amp; EMP reports</li> <li>Carry out site inspections, check and undertake periodic environmental monitoring and initiate necessary follow-up actions</li> <li>Measure the properties of bodies of water, such as volume and stream flow</li> <li>Collect water and soil samples to test for certain properties, such as the pH or pollution levels</li> <li>Analyze data on the environmental impacts of pollution, erosion, drought, and other problems</li> <li>Research ways to minimize the negative impacts of erosion, sedimentation, or pollution on the</li> </ul>	3 Months on intermittent basis

SI. No	Expert Position	Roles & Responsibilities	Input Period
		<ul> <li>environment</li> <li>Looking after the hydrology properties in the project at different stages and report the findings and recommendation to Environmental Specialist.</li> <li>Review, evaluate, and analyse work environments and design programs and procedures to control erosion</li> <li>Assist the Design Consultants in environmental screening and scoping process</li> <li>Any other tasks specified by the SPD and Senior Environmental Specialist</li> </ul>	
8	GIS Expert	<ul> <li>Perform various reprocessing activities within the ArcGIS platform.</li> <li>Land use mapping</li> <li>EMP mapping</li> <li>Any other tasks specified by the SPD and Senior Environmental Specialist</li> </ul>	3 Months on intermittent basis

# Chapter 7 : Institutional Framework

The Project implementation will be led by the Project Management Unit (PMU) that will be established within AIWTDS. The PIU will be responsible for procurement of consultants for carrying out the EIA and engineering designs for the proposed sub components. The PMU will be headed by the State Project Director (PD). He will be assisted by an Additional State Project Director and Deputy State Project Director

The PMU will consist of an Environment and Social Experts. The Experts will assist the PMU on issues related to environmental and social management and implementation of environmental and social safeguard. They will also provide trainings to the AIWTDS / GC / Contractor's field personnel responsible for monitoring of environmental compliance during both construction and O&M phases of the project, besides the Environmental Specialist, there will be a Marine/IWT Specialist and River Specialist/Hydrologist in the PMU.

The overall responsibility of environmental performance including EMP implementation of the Project will rest with the PMU. The general Consultants attached to the PMU will be converted as the team for supervising and monitoring the Project during the construction Phase. They will prepare and submit periodic reports to the PMU

The PMU will also engage an independent organization viz Safeguard Monitoring Consultants (SMC), to carry out third party environmental and social safeguard monitoring, during project implementation, on a quarterly basis

#### Divisional Level PIU

The Project Implementation Unit will be set up at the Divisional offices under the leadership of Executive Engineers of IWT. An Environment and Social Unit (E&S Unit) will be set up there deploying Environmental & Social Development Officer in this cell. To implement the safeguard functions especially the resettlement Action Plans and Indigenous Peoples Development plan, competent NGOS as supporting organisations.

#### 7.1 **Project Organogram for Environment and Social Management**

A dedicated cell to monitor environmental& social safeguard issues related to all the activities under this project is on board at AIWTDS with one environmental expert & one social development expert. AIWTDS will expand the cell as and when required.



# Figure 1: Flow Chart - A: Organogram of the Project Proponent (Project Management Unit; AIWTDS)







<sup>&</sup>lt;sup>99</sup> Flow Chart- 8.1 be followed for GRM procedure

Organizations	Responsibilities
PIU	<ul> <li>Ensure that all project activities are well-managed and coordinated.</li> </ul>
	<ul> <li>Recruitment of consultants for EIA and engineering designs;</li> </ul>
	<ul> <li>Procurement of works and goods.</li> </ul>
	<ul> <li>Payment of compensation to the project affected</li> </ul>
	<ul> <li>Recruitment and supervision of external monitor and independent Panel of Experts</li> </ul>
Environmental Expert & Social Development Expert within PIU	<ul> <li>Responsible for screening and determining scope of EA work required for Component B activities and studies, assisting PD with developing TORs and hiring of consultants to carry out any required environmental assessment work for Components B, reviewing consultant deliverables related to environmental assessment, reviewing bid documents for inclusion of EMP measures, supervising construction activities, producing periodic monitoring reports.</li> </ul>
	<ul> <li>Ensuring inclusion of EMP in bidding documents</li> </ul>
	<ul> <li>Closely coordinate with other concerned agencies, local governments and communities to support implementation of EMP</li> <li>Breparation of programs reports on implementation of EMP</li> </ul>
	<ul> <li>Ensure effective implementation of EMP components not directly tasked to the contractor including components dealing with indirect, induced and cumulative effects, as well as operations and maintenance stage plans and measures.</li> <li>Commissioning and oversight/review of consultant reports for EIAs/EMPs to be developed for the subcomponents of the Project</li> </ul>
EIA Consultants	Carrying out EIA studies in compliance with the MoEF&CC and World Bank
	guidelines following the EMF
	<ul> <li>Preparing EMP for inclusion in the bid documents</li> </ul>
Design Consultant	<ul> <li>Prepare Detailed Project Report (DPR), Front End Engineering Design (FEED) and tender document</li> <li>(as per World Bank guidelines) for development works amounting to approx. US \$100 million, selected based on assessment of output provided by ISDP Consultant.</li> <li>ask 1 - Detailed Design, Engineering &amp; Preparation of DPR</li> <li>ask 2 - Preparation of Bid Document</li> <li>ask 3 - Draft TOR for Supervision of Works</li> <li>Modularization of design elements for passenger (and cargo) ferry terminals &amp; development of customizable design models for future interventions</li> <li>For the sake of clarity, the above scope will involve carrying out the following basic tasks / activities:</li> <li>a) Collect the relevant data, review and assess the earlier reports provided by the ISDP Consultant in detail for the declared feasible sites/banks, proposed terminal size and associated costs.</li> <li>b) Based on the finalized sites as per ISDP Consultant / Client, carry out site surveys and investigations to</li> <li>assess the underlying soil conditions, river bed levels and topographic levels for the adjacent land.</li> <li>c) Planning and Design of fixed / floating infrastructure for terminal development to cater primarily for passengers (including those with cargo facilities).</li> <li>d) Carry out Front End Engineering and Design for the terminal works (water and landside) along with cost estimate and construction schedule of the works.</li> <li>e) Preparation of Detailed Project Report based on activities listed from (a) to (d) above along with FIRR and EIRR.</li> <li>f) Preparation of Tender Documents for each of the sites.</li> <li>1.4 Project Organization and Deployment Details</li> <li>The services required for the project will be performed by an integrated and multi-</li> </ul>

# Table 7-1: Roles and Responsibilities for EMP Implementation

Organizations	Responsibilities
GC	<ul> <li>Supervise and monitor Environmental and Social safeguard components as per the management Frameworks, during implementation phase</li> <li>Prepare monthly reports and submit to PMU</li> <li>Prepare monthly reports and submit to PIU</li> </ul>
TSC <sup>10</sup>	<ul> <li>Supervising contractors for EMP implementation</li> <li>Prepare monthly progress reports and submit to PMU</li> <li>TSC will have dedicated environmental and social staff</li> <li>Supervise civil works, ensuring compliance with all design parameters including quality requirements</li> <li>Certification of quantity during construction of all civil/ mechanical works as per the BOQ of the contractor.</li> </ul>
Contractor	<ul> <li>Responsible for implementation of mitigation and monitoring measures proposed in the EMP</li> <li>Each contractor will recruit an Environmental, Health, and Safety Manager, who will be responsible for implementing the contractors' environmental, health and safety responsibilities, and liaising with government agencies. S/he will have adequate number of staff to support him/her for these tasks.</li> </ul>
Safeguard Monitoring Consultant(3 <sup>rd</sup> party)	<ul> <li>Independent monitoring of implementation of EMP</li> <li>External Monitoring and evaluation</li> </ul>

# Table 7-2: Proposed Roles & Responsibility on Environmental Management of Key Expert as per Organogram

SI .No	Expert Position	Roles & Responsibilities
1	Environmental Specialist	<ul> <li>Environmental Specialist will be overall responsible to provides direction, instructions and guidance to other experts under the E&amp;S Cell working on this project</li> <li>Responsibility to execute &amp; implement EMF, EIA &amp; EMP through design DPR Consultant, contractors etc.</li> <li>Assist the Environmental Specialist of the Design Consultants and Contractor in preparation of the training materials and in conducting training;</li> <li>To obtain mandatory statutory clearances. related to project</li> <li>Consult with and advise individuals such as administrators, social workers, and legislators regarding social issues and policies, as well as the implications of research findings</li> <li>Carry out site inspections, check and undertake periodic environmental monitoring and initiate necessary follow-up actions;</li> <li>Document the good practices in the project on incorporation and integration of environmental issues into engineering design;</li> <li>Facilitate and coordinate with the Safeguard monitoring consultant (3rd Party).</li> <li>Assist in the preparation of periodic reports for dissemination to the PIU, and World Bank.</li> <li>Any other tasks specified by the SPD</li> </ul>
2	River Specialist/	Carry out site inspections, check and undertake periodic environmental monitoring and initiate necessary follow-up actions
		Measure the properties of bodies of water, such as volume and

 $<sup>^{\</sup>rm 10}$  The detail roles and responsibilities of TSC will be formulated during the preparation of EIA

		<ul> <li>stream flow at regular interval</li> <li>Collect water and soil samples to test for certain properties, such as the pH or pollution levels, sediment load etc.</li> <li>Analyse data on the environmental impacts of pollution, erosion, drought, and other problems</li> </ul>
		<ul> <li>Research ways to minimize the negative impacts of erosion, sedimentation, or pollution on the environment</li> <li>Looking after the hydrology properties in the project at different stages and report the findings and recommendation to Environmental Specialist.</li> <li>Review, evaluate, and analyse work environments and design programs and procedures to control erosion</li> <li>Any other tasks specified by the SPD and Senior Environmental Specialist</li> </ul>
3	Marine Expert/IWT Specialist:	<ul> <li>Responsible for all Marine Design related works.</li> <li>Responsible for policy / guidelines of Central / State Govt. Related toIWT matter.</li> <li>Responsible for supervising /marine works related to IWT Projects.</li> <li>Technical and contractual aspects of the projects.</li> <li>Supervise project clearances for the project.</li> </ul>

# 7.2 Environmental and Social Management

Various environmental and social management plans will be prepared during preparation of EIA for the Project components. Suggestive plans to be prepared and tasks to be carried for Component 1 and Component 3 works in the Table 7.3, which will be revisited during the preparation of the EIA.

Table 7-3:	Management	Plans/	Additional	Tasks
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Plan / Task	Responsibility			Timing	
Timing	Plan	Plan	Implementation	Review	
	Preparation	Approval	-		
	Plans prepared	/ to be prepar	red by AIWTDS / Its	s Consultants	
Mitigation and Compliance Monitoring Plans	ESIA Consultant	AIWTDS / WB	Contractors	Safeguard Monitoring Consultant(3 <sup>rd</sup> party)	Preliminary plans are prepared (Table 5.1, 5.2), but will be updated during detailed ESIA studies of subprojects
Environmental Codes of Practice (ECoPs)	ESIA Consultant	AIWTDS / WB	AIWTDS through Contractors	Safeguard Monitoring Consultant(3 <sup>rd</sup> party)	Already Prepared and depicted as Annexure 1
Inclusion of environmental clauses in bid documents for various contracts	ESIA Consultant	AIWTDS / WB	Design	Safeguard Monitoring Consultant(3 <sup>rd</sup> party)	Tender / Bid Stage of project for implementation of construction activities
	Plans to be pre	pared by Con	tractors	1	
Dredging for terminal sites and Dredge Material Management	Contractor	AIWTDS / WB	Terminal Works Contractors	TSC/SMC	Within one month of mobilization and prior to any initiation of dredging

Plan / Task		Responsibili	ity		Timing
Timing	Plan	Plan	Implementation	Review	
	Preparation	Approval			
					activities
OHS Plan	All contractors	TSC& PIU	All Contractors	TSC/SMC	Before Mobilization of
		<b>TOO</b> 5111		700/01/0	each Contractor
Poliution Prevention Plans (related to air, noise, soil, water resources)	All contractors	TSC& PIU	All Contractors	TSC/SMC	Mobilization of each Contractor
Waste Disposal and Effluent Management Plan	All contractors	TSC& PIU	All Contractors	TSC/SMC	Before Mobilization of each Contractor
Drinking Water Supply and Sanitation Plan	All contractors	TSC& PIU	All Contractors	TSC/SMC	Before Mobilization of each Contractor
Traffic Management Plan	All contractors	TSC& PIU	All Contractors	TSC/SMC	Before Mobilization of each Contractor
Construction Camp Management Plan	All contractors	TSC& PIU	All Contractors	TSC/SMC	Before Mobilization of each Contractor
Fuels and hazardous substances management plan	All contractors	TSC& PIU	All Contractors	TSC/SMC	Before Mobilization of each Contractor
Instream Construction Works Management Plan	All contractors	TSC& PIU	All Contractors	TSC/SMC	Before Mobilization of each Contractor
Emergency Preparedness Plan (for construction phase)	All contractors	TSC& PIU	All Contractors	TSC/SMC	Before Mobilization of each Contractor
	Plans to be pre	pared for O&I	M Phase		
O&M Phase Environmental Code of Practices	AIWTDS Through Consultants	-	AIWTDS		Prior to completion of construction
Environmental Management System (waste disposal, air and noise quality, etc.)	AIWTDS Through Consultants	-	AIWTDS		Prior to completion of construction
Safety Management Systems (OHS Management)	AIWTDS Through Consultants	-	AIWTDS		Prior to completion of construction

# 7.3 Environmental Codes of Practices

The environmental codes of practice (ECoPs) are generic, non-site-specific guidelines. The ECoPs consist of environmental management guidelines and practices to be followed by the contractors for sustainable management of all environmental issues. The contractor will be required to follow them and also use them to prepare site-specific management plans (discussed in the Chapter 5). The ECoPs are listed below and attached in Annexure 1.

- ECoP 1: Waste Management
- ECoP 2: Fuels and Hazardous Substances Management
- ECoP 3: Water Resources Management
- ECoP 4: Drainage Management
- ECoP 5: Soil Quality Management
- ECoP 6: Erosion and Sediment Control
- ECoP 7: Top Soil Management
- ECoP 8: Topography and Landscaping
- ECoP 9: Borrow Areas Management
- ECoP 10: Air Quality Management
- ECoP 11: Noise and Vibration Management
- ECoP 12: Protection of Flora
- ECoP 13: Protection of Fauna
- ECoP 14: Protection of Fisheries
- ECoP 15: River Transport management
- ECoP 16: Construction Camp Management
- ECoP 17: Cultural and Religious Issues
- ECoP 18: Workers Health and Safety
- EcoP 19: Dredging Management

# Chapter 8 : Environmental Management & Monitoring Programme (EMMP)

# 8.1 EMP and Monitoring

Environmental Management & Monitoring Programme (EMMP) refers to systematic implementation of Environment Management Plan during Construction and Operation Phase along with sampling of air, water soil, and biota in order to observe and study the environment, as well as to derive knowledge from this process. One of the objectives of Environmental Monitoring is to monitor the performance of a project and the effectiveness of mitigation measures. The project may be a new one or an existing project under expansion or an existing project opted for change in product mix. Another important objective of environmental monitoring is to verify the impact of the project on the environment predicted during environmental assessment studies. To ensure the effective implementation of EMP and weigh the efficiency of the mitigation measure it is proposed to undertake environmental monitoring both during construction and operation period.

As one of the key elements of the EMP, a three-tier monitoring program has been proposed comprising compliance monitoring, effects monitoring, and external monitoring. The main purpose of this monitoring program is to ensure that the various tasks detailed in the EMP particularly the mitigation measures are implemented in an effective manner, and also to evaluate program impacts on the key environment and social parameters. Various types of EMP monitoring are discussed below.

#### 8.1.1 Compliance Monitoring

The purpose of the compliance monitoring is to ensure that the contractor implements the mitigation measures given in the EMP are effectively and timely implemented. This monitoring will generally be carried out by the GC with the help of checklists prepared on the basis of the mitigation measures given in Chapter 5. This monitoring should be implemented to ensure that the prescribed mitigation measures are having the predicted and desired effect. This monitoring would be conducted periodically, the timing of which will vary from project to project. It must be used to check that the levels of specific environmental parameters are compliant with laws, regulations, standards or guidelines, as applicable. The programme must make provision for remedial measures to be effectively implemented in the event of noncompliance - i.e. when mitigation measures are inadequate or when impacts have been underestimated in the EIA.

#### 8.1.2 Effects Monitoring / Baseline Monitoring

Effects monitoring is a very important aspect of environmental management to safeguard the protection of environment. The effects monitoring plan proposed for the subprojects is presented in Table 8-1; which will be revisited and revised during EIA studies. The monitoring will comprise surveillance to check whether the contractor is meeting the provisions of the contract during construction (assuming 3 years) and operation of the project (assuming 3 years which will get repeated as per the SPCB consent) including the responsible agencies for implementation and supervision. This should occur prior to the start of the project or activity in order to determine the level and status of the environmental parameters prior to any impacts associated with the project or activity.

· · · · · · · · · · · · · · · · · · ·					
Parameter/	Location	Means of Monitoring	Frequency	Responsible Agency	
Activity				Implemented by	Supervised by
Construction Phase					
Dredging	At all dredging points	Ecological inspection of the site prior to development;	Weekly	Contractor	TSC/ Safeguard Monitoring Consultant(3 <sup>rd</sup> party)

# Table 8-1: Environment Monitoring Plan

Daramotor/	Location	Means of Monitoring	Frequency	v Responsible Agency		
Pb, Cd, Cr, Cu, Zn, Mn, As, Se, Hg, PCBs, POPs, and hydrocarbons	Riverbed sediments at Ghat Locations	Laboratory analysis of material for screening for metals and oil/grease	Before sand extraction	Contractor through a nationally recognized laboratory	TSC/ Safeguard Monitoring Consultant(3 <sup>rd</sup> party)	
Soil Pollution	At terminal and landing construction sites	Visual inspection that filling is through several compartments	Beginning of earth filling works	Contractor	TSC/ Safeguard Monitoring Consultant(3 <sup>rd</sup> party)	
	Construction and material storage sites	Ensure no contaminated effluent is leaving from the filling area to the nearby agricultural lands	Weekly	Contractor	TSC/ Safeguard Monitoring Consultant(3 <sup>rd</sup> party)	
Hydrocarbon and chemical storage	Construction camps and yards	Visual Inspection of storage facilities	Monthly	Contractor	TSC/ Safeguard Monitoring Consultant(3 <sup>rd</sup> party)	
Traffic Safety	Haul Roads	Visual inspection to see whether proper traffic signs are placed and flag-men for traffic management are engaged	Monthly	Contractor	TSC / Safeguard Monitoring Consultant(3 <sup>rd</sup> party)	
Air Quality (dust, smoke)	Construction sites	Visual inspection to ensure good standard equipment is in use and dust suppression measures (e.g., spraying of waters) are in place.	Daily	Contractor	TSC/ Safeguard Monitoring Consultant(3 <sup>rd</sup> party)	
	Material storage sites	Visual inspection to ensure dust suppression work plan is being implemented	Monthly	Contractor	TSC/ Safeguard Monitoring Consultant(3 <sup>rd</sup> party)	
Air quality (PM, CO2, SOx, NOx)	Near the terminal sites	24 hours continuous monitoring with the help of appropriate instruments and analysers	Weekly two times in each season	Contractor	TSC/ Safeguard Monitoring Consultant(3 <sup>rd</sup> party)	
Noise	Construction sites	Noise measurement using noise meter; Ensure work restriction between 21:00-06:00 close to the sensitive locations	Weekly	Contractor	TSC/ Safeguard Monitoring Consultant(3 <sup>rd</sup> party)	
Water quality (For all drinking water parameters including As, and coliforms)	Locations of tube-well installation installed for each landing station / offices/ campus	Depth of tube well should be more than 30m. Test water for arsenic and iron before installing of casing. If the quality is found not suitable further deepening will be done.	During drilling of wells	Contractor trough a nationally recognized laboratory	TSC/ Safeguard Monitoring Consultant(3 <sup>rd</sup> party)	

Parameter/	Location	Means of Monitoring	Frequency	Responsible Ager	
	Water wells to	Laboratory analysis of	After	Contractor trough	TSC/ Safeguard
	be used by contractors for	all drinking water parameters specified in	development of wells	a nationally recognized	Monitoring Consultant(3 <sup>rd</sup>
14/	arinking	national standards		laboratory	party)
Waste	Construction	Visual inspection that	Monthly	Contractor	General
Management	camps and	solid waste is disposed			Consultant/
	construction	at designated site			Safeguard
	SITES				Monitoring
Eloro ond	Sonaitivo	Survey	Six monthly	Construction	party)
Fiura ariu Fauna	habitats in	comparison with	Six-monuny	supervisor	Monitoring
	Project	baseline environment		30per 11301	Consultant(3 <sup>rd</sup>
	influence area	Ensure use of lighting			party)
		at construction sites			party)
		conforms with			
		requirements to limit			
		impacts to wildlife			
Cultural and	At all work	Visual observation for	Daily	Contractor	TSC/ Safeguard
archaeological	sties	chance finds	-		Monitoring
Sites					Consultant(3 <sup>rd</sup>
					party)
Safety of	At work sites	Usage of Personal	Monthly	Contractor	TSC/ Safeguard
workers		Protective equipment			Monitoring
Monitoring and		and implementation of			Consultant(3 <sup>rd</sup>
reporting		contractor OHS plan			party)
accidents				DUL	
Grievances	in the project	Number of grievances	wontniy	PIU	ISC/ Safeguard
	area	registered and			
		addressed			Consultant(3 <sup>rd</sup>
Operation and M	aintenance Phas				party)
Cleanliness	At all terminal	Visual Inspection	Monthly	Terminal	AIWTDS
Clouinnicoco	sites	riedal mepoelleri	Working	Administration	
	0.100			Offices	
Waste effluents	Along the	Visual inspection that	Six-monthly	Terminal	AIWTDS
	terminal sites	solid and liquid waste	,	Administration	-
		effluents are properly		Offices	
		managed during			
		maintenance works			
Waste reception	At the terminal	Visual inspection that	Six-monthly	Terminal	AIWTDS
facilities	sites	waste collection		Administration	
		facilities are in use		Offices	
Workers and	At all terminal	Visual inspection on	Six-monthly	Terminal	AIWTDS
community	sites	health and safety		Administration	
health and		issues		Offices	
safety					
Water Quality	At all terminal	Sampling and analysis	Six-monthly	AIW I through a	AIWIDS
	sites			recognized	
				university	
Accidents	At all terminal	Visual assessment and	As and when	Terminal	
, 1001001110	sites	Interviews with	happened	Administration	,
		involved people		Offices	

#### 8.1.3 Monitoring of Jibondinga Scheme

GoA incentive scheme (known as Jibondinga) to assist industry transition to the new regulatory regime; it is designed to support the scrapping and replacement of unsafe or obsolete private vessels and replace them with new vessels, or retrofit existing but acceptable vessels with modern marine engines and safety equipment

As per the proposed scheme, a vigilance body comprising of AIWT staff (Jalsarathis) or volunteers from local communities in the villages at each Jetty/Ghat will monitor the implementation of the Jibondinga scheme. The vigilance body will also monitor compliance to Standard Operating Procedures (SOPs) for ferry terminals to ensure convenience, safety and security of passengers. They will report any incident or non-compliance of Scheme/SOP related to safety of passengers or use of any boat not compliant to safety standards as specified by nodal agency at respective jetty/ghat.

The members from local communities may also be trained and deployed to act as search & rescue team personnel, if required. As per the scheme, number of members to be deployed in the vigilance body will be determined based on daily commuters in each ghat/jetty. DIWT must clearly establish the procedure for community monitoring, to meet the objectives of social development principles of social inclusion, participation, transparency and accountability.

#### 8.1.4 Third Party Monitoring / Impacts or Performance Monitoring

The AIWTDS will engage Safeguard Monitoring Consultant (3rd party) to conduct external and independent monitoring of the EMP implementation. The main purpose of the external monitoring will be to ensure that all the key entities including E&S, Construction Supervisor, and contractors are effectively and adequately fulfilling their designated role for EMP implementation and that all the EMP requirements are being implemented in a timely and effective manner. This monitoring should be on-going throughout the project life-cycle and must be implemented to ensure that environmental impacts are within the predicted levels and that specified environmental performance targets are being achieved.

The objective of appointing an independent consultant is to review and monitor the performance of the project through its entire lifecycle of implementation, on the basis of detailed on-site review, examination of appropriate documents, EIA document and discussions with the PIU, Beneficiary departments and other key stakeholders. The scope of the service expected from the agency is described below. The inputs from the agency shall enable to report on the performance of the contractor / monitoring agency with respect to the project implementation. The scope of services of the Safeguard Monitoring Consultant (3<sup>rd</sup> Party) is described below;

#### 8.1.4.1 Scope of Services of Safeguard Monitoring Consultant (3rd Party)

- i. Review the EMP and recommend the implementation plan for ensuring its implementation
- **ii.** Formulate necessary reporting formats for the contractors to monitor the implementation of environmental management activities in the AIWTDS
- iii. Plan and impart regular orientation / training programs for the AIWTDS / Contractor staff on the effective implementation of Environmental Management measures in the project

- iv. Ascertain that borrow area management plan duly agreed by AIWTDS is in place and borrow areas are opened, operated and closed as per EMP and in consultation with Engineer
- v. Verify proper Health & Safety measures are in place for labours, employees working at site
- vi. Monitor whether Contractor(s) follows silicosis exposure reduction strategy formulated for the project.
- vii. Check trees are removed (where necessary) from the project area (land side) prior to start of construction following all procedures and with clearance from Forest Dept. Verify compensation paid to the owners of trees which are felled to clear the project site as per the provisions and green belt development work is undertaken
- viii. Inspect implementation of Conservation Plan formulated for conservation of 'Gangetic Dolphin' in sensitive locations.
- ix. Review if Contractor(s) avoid soil pollution, remove top soil & keep safely stacked for re-use after construction work is over
- **x.** Monitor pollutants not making its way to water bodies and advise Contractor(s) accordingly, temporary drainage is provided at construction sites.
- **xi.** Check construction work is not carried during the night and during rainy/flood season, without necessary safety and precautionary measures.
- **xii.** Ensure that the contractor carries out regular environmental monitoring as per the EMP and recommend necessary mitigation measures, where the parameters exceed the permissible standards
- **xiii.** Verify adequate dust suppression measures are undertaken and these follow CPCB emission norms; periodical AAQ monitoring data to be checked w.r.t. standards
- **xiv.** Check construction equipment, vehicles & machineries have noise control measures, vehicles are fitted with exhaust silencer, vehicles' tyres are washed before it moved inside the river and outside construction sites
- **xv.** Check workers/ labours working on machineries generating noise are provided with ear muff / plug
- **xvi.** Check if construction is carried out close to any sensitive receptor without any, temporary noise barrier
- **xvii.** Monitor that the construction activities are carried without causing any unwanted land subsidence
- **xviii.** Check if silt fencing is provided by the contractor to avoid run-off to river/ canal / water body
- **xix.** Check solid waste and other types of construction wastes including hazardous waste are managed as per EMP and regulatory provision
- **xx.** Verify whether permission from the authority is obtained for withdrawal of water from ground water & / or natural water body
- **xxi.** Verify if forest clearance (if required) has been obtained for working on erstwhile forest land now taken over for AIWT project
- **xxii.** Ensure all personnel working at sites are aware of statutory provisions related to Wildlife
- **xxiii.** Participate in the meetings and consultations held by the implementing agencies/ contractor(s), Engineer
- **xxiv.** Report any lapse by Contractor(s) on environmental aspects to the Engineer with specific recommendations for remedial actions
- xxv. Preparation of quarterly progress report on all environmental issues and submission to the AIWTDS.

# 8.1.4.2 Deliverables and time lines

The assignment will be carried out for the entire construction period of the Project (2 years) and shall comprise the following out puts.

**Inception Report** to be submitted within two weeks of commencement of the project, out lining the detailed approach and methodology, schedule of monitoring surveys and field activities

**Quarterly Review Report** to be submitted within two weeks of the previous quarter presenting the details of review and recommendations for the addressing various issues identified.

**Completion Report** to be submitted within four weeks of completion of social and environmental management activities, clearly summarizing the status

The consultant is also expected to conduct training and orientation workshops, at least one in six months with an objective to guide AIWTDS, GC, Contractors and other agencies on the implementation of RPF / RAP/EMP/ EMF and its compliance.

# 8.1.4.3 Personnel requirements

The consultants should have adequate experience in monitoring the implementation of Social and Environmental Management activities in waterways / marine projects.

The consultant's team should comprise the following specialists in their team.

**Senior Social Development Specialist** with about 10 years of experience in conducting SIA studies and monitoring the implementation of RAPs / RPF for waterways / marine projects.

Senior Environmental Engineer with about 10 years of experience in conducting EIA studies and monitoring the implementation of EMP / EMF for waterways / marine projects

**Social Development Specialist** with about 5 years of experience in the implementation of RAP / RPFs of waterways / marine projects

**Environmental Engineer / Planner** with about 5 years of experience in the implementation of Environmental Management of waterways / marine projects

Depending on the study requirements, the consultant should deploy necessary additional staff for carrying out the assignment.

#### 8.1.4.4 Time Frame

The services of the Safeguard Monitoring Consultant are required to be rendered over the entire life cycle of the project development. For a particular project, the SMC's work starts from the date of start of construction ends on beginning of jetty operation. Subsequent to filing of the Project Completion Report, the SMC shall make one visit after one quarter of such milestone to assess the overall performance of the asset created.

The SMC shall be appointed by the AIWTDS and is expected to cover all the identified projects. SMCs shall be appointed for entire life cycle of the projects. Extension of work of SMC beyond this period shall be subject to the decision of the AIWTDS. The suggested methodology and frequency for the SMC's work is tabulated in table no 8.1& 8.4.

The timing of review and the method of review is indicative. The required frequency of such reviews is mentioned below, and shall vary based on the requirements of specific

project. Review visits at a frequency higher than that mentioned below, shall only be undertaken at the express request of AIWTDS.

#### 8.1.4.5 Deliverables

The SMC will undertake desk review of documents and make periodical site visits to each project as mentioned above. SMC may be expected to conduct additional field inspection on the specific aspects as required. SMC shall provide reasonable advance notice of planned visit to site, schedule of meetings for review, and documents required for review, etc. to the PIU. SMC shall report to the Director PIU. The PIU will provide necessary inputs to the SMC team. The observations of the SMC team should be discussed with project management team of the PIU before concluding the visit. The reporting would be as per the check lists, Govt. format provided by the Director of PIU and qualitative feedback should be captured in narrative in separate documents. Hard copies & soft copies of the reports should be submitted to the PIU office. PIU and supportive team may then record their responses to the reports filed by the SMC to the Construction / implementation / monitoring agency.

#### 8.1.4.6 Personnel Requirements

Experts from the SMC are expected to be optimally deployed as per the needs of individual projects. The team members of the SMC are expected to be highly qualified in the irrespective areas of expertise. They are expected to have experience in similar infrastructure projects for a minimum period of 10 years.

SMC should provide clarifications / explanations to all the agency concerned.

The SMC team should typically comprise a core team led by an experienced Team Leader. The Team Leader should have relevant project monitoring and implementation experience. The Team Leader is expected to play a key role in interface with PIU, and provide guidance on review methodology and coordinate deployment of the core team specialists. The core team should comprise professionals and engineering, with specialization in public health engineering, roads and highway structures, finance and accounts. The core team should be supplemented by specialists in fields such as geo-technical engineering, traffic and transportation, procurement and urban renewal and heritage conservation, electromechanical contracts. and instrumentation.

The core team members should be supported by the specialists in the site visits and interactions with the PEA.

#### 8.1.4.7 Support and Inputs to the SMCs

For evaluating the performance of the environmental management and monitoring plan, performance indicators are identified to for efficient and timely implementation of measures/actions proposed in EMP. The indicators are defined both for implementation phase and for operation phase. Construction Supervisor will be responsible for compiling the information on these indicators and report to AIWTDS. To measure the overall environmental performance of the project, a list of performance indicators is given below; however, a detailed list of indicators will be prepared by EIA studies

Number of inspections carried out by Construction Supervisors (GC) per month Number of non-compliances observed by Construction Supervisor or E&S Availability of environmental specialists in E&S. Availability of environmental specialists in Construction Supervisor. Availability of environmental specialists with contractors. Timely reporting of documents (as defined in EMP and monitoring plan) Number of trainings imparted to stakeholders/other capacity building initiatives Number of grievances received.

Number of grievances resolved.

Number of construction related accidents.

Performance specifications (eg. criteria or targets) must be provided for each management action or monitoring activity, in order to assess whether the actions have been effective. Performance specifications could be based on the level at which an environmental condition must remain (e.g. habitat in a part of the site that must not be disturbed), or the level to which the environmental condition must be restored (e.g. habitat rehabilitation), or legislated or agreed limits (e.g. air quality standards), or the level of socio-economic benefits to be realized through the project (e.g. use of local labour and enterprises). Where possible, these performance specifications should be quantitative. These specifications might be revised during the implementation of the EMP, in the spirit of promoting continuous improvement.

# 8.2 **Performance Indicators**

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#### 8.3 Implementation Schedule

An implementation schedule must be prepared showing the sequence and timing (including frequency and duration) of the management actions and monitoring activities of the EMP. Where monitoring reports are produced, the timing of such reports should be indicated. The schedule must be drawn up with the Project Proponent, to ensure necessary links are made between the implementation schedule for the EMP and the overall project schedule. However, EMP Implementation Schedule (Monthly Track Chart for Monitoring of Contractor's Activities) is presented in Annexure 13.SMC report will be

released on the basis of monthly contractors monitoring report. The format is provided in Annexure 14.

# 8.4 Implementation of the EMP

### 8.4.1 Grievance Redress Mechanism (GRM)

# 8.4.1.1 Existing Web-enabled GRM system and Hotline

AlWTD has adopted a Centralized Public Grievance Redress and Monitoring System (CPGRAMS) which is an online web-enabled system developed by NIC, in association with the Directorate of Public Grievances (DPG) and Department of Administrative Reforms and Public Grievances (DARPG). CPGRAMS is the platform based on web technology which primarily aims to enable submission of grievances by the aggrieved citizens from anywhere and at any time (24x7) to the concerned Ministries/Departments/Organisations who scrutinize and take action to redress these grievances. Grievances can be tracked through the system generated unique registration number.

In addition, AIWTD has a department website wherein complaints can be lodged at the following email id- <u>diwtassam@gmail.com</u>. A dedicated helpline no. for grievance redressal has been setup at the PMU, AIWTD office, Guwahati (0361-2469885) where project related complaints can be registered at any time.

# 8.4.1.2. Review of the Existing GRM Systems

At present, the web-enabled CPGRAMS and the helpline no. does not have <u>dedicated staff</u> at AIWTD to operate the two systems. The helpline no. and email are being internally monitored by the Deputy Director, however there are no systematic procedures to track and assess progress in resolving the grievances reported through it. CPGRAMS, on the other hand generates a unique registration no. which facilitates the process of tracking.

The CPGRAMS has a process of acknowledgement and follow-up integrated into the system, which lacks in the dedicated helpline no. and email. Both, CPGRAMS and the helpline no./email id have not been adequately advertised or communicated to the public.

The existing GRM systems although seems responsive to the needs of the project, requires major overhauling to address the aforementioned gaps. The dedicated helpline no. must be *toll-free* to ensure accessibility to all. AIWTDS has designated the Advisor (Administration) in PMU as the Officer in charge of GRM who will be assisted by HR & Admin Manager and 2 Office Management Executives (OMEs) for addressing complaints through multiple grievance uptake channels (telephone, online, SMS, suggestion box, etc.). Additionally, a <u>standard operating procedure/handbook</u> for addressing grievances should be developed and it must include the following elements:

- *Purpose for the Helpline:* Complainants that the helpline is intended to serve and what are their needs.
- Scope of services: Type of service the helpline will offer (e.g. information, referral, support, redressal etc), nature of grievances (public safety, harassment, quality & efficiency of services, disaster management, R&R, Environment Health & Safety, construction-induced impact, etc.) and languages spoken by the helpline staff; Generating of unique registration no./token id for monitoring of grievances; and an SMS system for acknowledgement and follow-up.

- Operation of the helpline, including human and financial resources required: Operational procedure for responding, staff and budget/logistics needed to support its operation.
- It is crucial to provide *training and supervision of helpline staff*, both to ensure they have relevant information to provide, necessary skills and related competencies for each mode of delivery: telephone, online or SMS.

There should be public awareness program conducted among the affected communities and other stakeholders about grievance process. The purpose would be to inform local communities, and other stakeholder about grievance service. It is also important to highlight that complaint can be registered through multiple grievance uptake channels, such as helpline, email, by letter to the GRCs (a divisional level or upper level GRC) or walk-ins and registering a complaint on grievance logbook to be provided at each project site/Ghat or suggestion box.

There should be specific procedures for Gender Based Violence (GBV) including confidential reporting with safe and ethical documenting of GBV cases. AIWTDS should have an MoU with specialised cells/organisations or state-run women helpline for referring victims of harassment to these organisations.

# 8.4.1.3. Grievance Redress Committee (GRC) at the PIU

A divisional level Grievance Redressal Committee (GRC) will be formed by the Project Authority (vide issuance of Govt. Order) at the time of preparation of the RAP cum IPDP. The GRC will comprise Divisional Executive Engineer; Additional Deputy Commissioner of concerned district; Social Specialist- PIU, representatives of the concerned Village Panchayat/Council President or his/her authorized representative and supporting NGOs for implementing the RAP.

Grievances of PAPs in writing will either be brought to GRC for redressal by the supporting NGO or received through any other channel. The NGO will provide all necessary help to PAPs in presenting his/her case before the GRC. The GRC will respond to the grievance within 7 days. Grievances brought to the GRC shall be redressed within a period of one month (30 days) from the date of receipt of grievance. The decision of the GRC will not be binding to PAPs i.e., decision of the GRC does not debar PAPs taking recourse to court of law. The GRC will meet once in 15 days but may meet more frequently, depending upon the number of such cases. GRCs will continue to function during the life of the Project including the defects liability period. Broad functions of GRC are as under:

- Record the grievances of PAPs, categorize and prioritize them and provide solution to their grievances related to resettlement and rehabilitation assistance, land related disputed or construction induced impacts.
- The GRC may undertake site visit, ask for relevant information from other government and non-government agencies, etc in order to resolve the grievances of PAPs.
- Fix a time frame within the stipulated time period of 30 days for resolving the grievance.
- Inform PAPs through the supporting NGO about the status of their case and their decision to PAPs.

# 8.4.1.4 GRC at the PMU

Petitioners who wish to submit an appeal to the higher authorities can directly appeal to the GRC at the PMU, which will comprise of the Project Director, Advisor (Administration), Social Development Specialist, Environmental Specialist, representative from the Revenue Department and a recognised NGO. On receipt of a complaint at the PMU, an acknowledgement will be issued to the petitioner within 7 days. The case will be disposed by

the PMU within 30 days of receiving the complaint. Details of the resolved cases will be documented and published on the website.

# 8.4.1.5. R&R Authority under RFCTLARR Rules 2015

In case of LA R&R issues, as per the provisions of the Assam Right to Fair Compensation and Transparency in Land Acquisition Resettlement and Rehabilitation Rules 2015 (Section 45) the state Government will designate a Rehabilitation & Resettlement Authority to handle the disputes related to the payment of compensation for L.A and R&R issues. As per this Section this R&R Authority will have the same powers as that of a civil court under Code of Civil Procedure in matters pertaining to land acquisition. The R&R authority is the designated authority to handle any disputes and grievances related to land acquisition and relocation.



Fig 8.1.GRM -Process flow diagram

## 8.4.2 Capacity Building / Training and environmental awareness

Capacity building for effective implementation of the environmental and social safeguard requirements is a key element of the EMP. Capacity building for environmental and social safeguard management will need to be carried out at all tiers of the project, including AIWTDS, E&S Cell of AIWTDS, supervisor, and contractors. The PIU is staffed with senior experts in technical and engineering fields, procurement, environmental and social development, business development strategy, legal, communications, and finance. PIU i.e. AIWTDS under Government of Assam, Transport department is project development team having State Project Director, Additional State Project Director, Deputy State Project Director Advisor (Transport), Advisor (Administration) cum GRM Officer, Financial Specialist, Assistant Procurement Engineer, Environmental Specialist and Social Development Specialist. Four project preparation consultants have been appointed to help the PIU i.e. Design Consultants (ISDP), an ESIA Consultant, ISBP Consultants i.e. market development studies and DPR Consultants along with General Consultant (GC) to guide AIWTDS for all project related activities.

At the construction site, supervisor will take the lead in implementing the capacity building plan, though the contractors will also be responsible to conduct trainings for their own staff and workers. The various aspects that are covered under the capacity building will include general environmental and social awareness, key environmental and social sensitivities of the area, and key environmental and social impacts of the project, EMP requirements, and waste disposal. Table 8.4provides a summary of various aspects of the environmental and social trainings to be conducted at the construction site. E&S Cell may revise the plan during the project implementation as required. During the O&M phase of the project, these trainings will continue to be conducted by AIWTD Sstaff for all relevant O&M personnel and community.

Training is essential for ensuring that the EMP provisions are implemented efficiently and effectively. Training needs should be identified based on the available and existing capacity of site and project personnel (including the Project Proponent, Contractors and Sub-contractors) to undertake the required EMP management actions and monitoring activities. It is vital that all personnel are adequately trained to perform their designated tasks to an acceptable standard. In addition to training, general environmental awareness must be fostered among the project's workforce to encourage the implementation of environmentally sound practices throughout its duration. This ensures that environmental accidents are minimized and environmental compliance maximized. The onus is on the different parties involved in the various stages of the life-cycle of the project to be environmentally conscious. Contractors should forward internal environmental awareness and training procedures to the Project Manager and E&S for comment prior to the commencement of the project. Environmental awareness could be fostered in the following manner:

- Induction course for all workers on site, before commencing work on site.
- Refresher courses as and when required.
- Daily toolbox talks at the start of each day with all workers coming on site, where workers might be alerted to particular environmental concerns associated with their tasks for that day or the area/habitat in which they are working.

Contents	Participants	Responsibility	Schedule				
General environmental awareness; Environmental and social sensitivity of the project influence area; Key findings of the EIA; Mitigation measures; EMP;	Selected staff of AIWTDS, supervisor, and contractors	supervisor	Prior to the start of the project activities. (To be repeated as needed.)				

#### Table 8-2: Environmental and Social Trainings

Contents	Participants	Responsibility	Schedule
Social and cultural values of the area.			
General environmental and awareness; Environmental and social sensitivity of the project influence area; Mitigation measures; Community issues; Awareness of transmissible diseases; Social and cultural values.	PIU; supervisor; selected contractors' crew	supervisor	Prior to the start of the field activities. (To be repeated as needed.)
EMP; Waste disposal;	Construction crew	Contractors	Prior to the start of the construction activities. (To be repeated as needed.)
Road/waterwaysafety;Defensivedriving/sailing;Wastedisposal;Cultural values and social sensitivity.	Drivers; boat/launch crew	Contractors	Before and during the field operations. (To be repeated as needed.)
Camp operation; Waste disposal; Natural resource conservation; Housekeeping.	Camp staff	Contractors	Before and during the field operations. (To be repeated as needed.)
Restoration requirements; Waste disposal.	Restoration teams	Contractors	Before the start of the restoration activities.
Construction Implementation requirements; handling situations for important flora / fauna especially Dolphin; Physical Cultural resources;	PIU; supervisor; selected contractors' crew	Contractors, Supervisor and E&S cell	Before the start of the restoration activities.

# 8.4.3 Documentation and Record Keeping

A document handling system must be established to ensure accurate updating of EMP documents, and availability of all documents required for the effective functioning of the EMP. The document handling system must be devised by the Project Proponent and/or Contractor, and agreed upon by all key parties. Responsibilities must be assigned to relevant personnel for ensuring that the EMP documentation system is maintained and that document control is ensured through access by and distribution to, identified personnel. Where an adequate document management system already exists, then the environmental documentation should be integrated into this system rather than creating a new system. The E&S Cell with assistance from supervisor and contractors will produce the following environmental reporting documentation:

**Environmental Monitoring Reports:** The environmental monitoring reports will include environmental mitigation measures undertaken, environmental monitoring activities undertaken, details of monitoring data collected, analysis of monitoring results particularly the non-compliances, recommended mitigation and corrective measures, environmental training conducted, and environmental regulatory violations observed. The environmental monitoring reports will be submitted quarterly during the construction period and annually for three years after completion of construction.

**Project Completion Environmental Monitoring Report:** One year after completion of construction, the E&S Cell will submit a Project Completion Environmental Monitoring Report which will summarize the overall environmental impacts from the project. AIWTDS will engage External Monitors during construction period to measure the effectiveness and outcome/impact of EMP, as stated earlier. The External monitors will submit the quarterly reports throughout the contract time, impact evaluation report at the end of each year and finally a completion Report at the end of contract period.

#### SupplementaryEMP documentation could include:

- Implementation activity specifications (including Method Statements and ECoPs);
- Site instructions;
- Emergency preparedness and response procedures;
- Incident reports;
- Training records;
- Site inspection reports;
- Monitoring reports;
- Auditing reports; and
- Complaints received.

The E&S is usually responsible for ensuring that the registration and updating of all relevant EMP documentation is carried out. It is usually the responsibility of the Site In-charge to ensure that all personnel are performing according to the requirements of this procedure and to initiate the revision of controlled documents, when required by changes in process, operating procedures, legislation, specifications, audit findings or any other circumstances, by informing the in-charge of the E& S Cell of the changes. A controlled document is official only if the issue/revision has been approved. The EMP documents must be numbered and only distributed according to a distribution list compiled by the E&S. These documents should be marked "controlled copy". Holders of controlled documents should sign the distribution list when they receive a new or revised document and must destroy the old version. Copies of all EMP documentation should be kept on site or at the nearest project office. The documents should be kept as hardcopies as well as in electronic format. Documents must be revised as required by changing circumstances. Clear procedures must be specified in the EMP for making changes to EMP documents, circulating updated documents, and destroying obsolete versions. Distribution lists and document change control sheets must be kept for all documents. Records must be kept for at least five years.

#### 8.4.4 Reporting Procedures

Reporting procedures for conveying information from the monitoring activities must be developed in order to ensure that management is able to take rapid corrective action should certain thresholds be exceeded. Project EMPs shall include reporting procedures as below:

- Inspections;
- Accidents and emergencies;
- · Measuring performance indicators and interpreting and acting on the indicators;
- Records of monitoring activities to test the effectiveness of mitigation measures and impact controls, as well as for compliance auditing purposes; and
- Training programmes and evidence of appropriate levels/amount of skills/capacities created.

# 8.4.5 Stakeholder Engagement

The process to be followed and the degree of stakeholder engagement associated with the EMP will varybetween projects, depending on the project and the preceding environmental assessment process. If the EMP follows an EIA, then it is expected that the stakeholders would have had opportunity to comment on the impacts and management actions described in the EIA. In such cases, the EMP might follow without further specific consultation with stakeholders regarding the EMP. However, where an EMP needs to be developed for a project, but no EIA has been done, best practice requires an appropriate level of stakeholder engagement in the development of the EMP. The EMP must also be developed and implemented in consultation with government departments (besides the lead environmental authority) that may have to authorize environmental aspects of the project or provide specific permits or licenses.

#### 8.4.6 Responding to non-compliance

If the mitigation measures stated in the EMP are not adequately implemented, or do not achieve the desired result, the authorities may stop the project until corrective actions have been taken and the desired environmental objective or target has been met. The system for dealing with noncompliances (i.e. incentives or disincentives for conformance and non-conformance with the EMP requirements) to be employed by AIWTDS will vary depending on the type and specific nature of the project. The system to be used must be described in the EMP, included in the tender documents and contracts, and made clear to all project workers.

# 8.4.7 Inclusion of Relevant Components of EMP in Contract Documents

The EIAs to be prepared for subcomponents should include a section on special environmental clauses to be incorporated in the Tender Document under General/Particular Specification. These clauses are aimed at ensuring that the Contractor carries out his responsibility of implementing the environment management plan (EMP), monitoring plan as well as other environmental and safety measures. Such clauses may specify, for example, penalties for non-compliance as well as incentives to promote strong compliance. The various contractors must be made accountable to implement the plans and mitigation measures which pertain to them through contract documents and/or other agreements of the obligations and importance of the environmental and social components of the project. The Contractor should be well specified with ECoPs for its accounting and implementation. The contractors documents will have information regarding the activities, implementation and compliance. Modification is allowed/required given site conditions for contractor. All the modifications will be reported in consultation with GC/AIWTDS. All these provisions will be included in Contract Document. These will be monitored and reported on during both tendering/bidding and during implementation which will clarify their utility in the context of the project.

#### 8.4.8 Transfer of EMP requirements to Contractor, Sub-contractors or other parties

Stipulating the requirement for an EMP may ensure its satisfactory development, but does not guarantee its implementation. It is therefore important to ensure that the actions specified by the EMP are enforced through the EMP being given some form of legal standing. This can be achieved through integration of the EMP into the tender documents for a particular project as a set of environmental specifications. To ensure compliance, it is essential that the environmental controls identified in the EMP be translated into a suite of environmental specifications that are written in the same language style and format as the rest of the contract document, thereby ensuring that the environmental controls integrate seamlessly into the tender document and are presented in a familiar form to the Contractor. Ultimately, only those aspects of the EMP that are directly relevant to the Contractor's activities should be contained within the environmental specifications. This approach will ensure that obligations are clearly communicated to Contractors and that submitted tenders have taken into account, and budgeted for, the environmental requirements specified in the EMP. For a new project, the proponent should not start with construction on site until the EMP has been approved by the authorities and a prestart inspection has been undertaken. In cases where the EMP cannot, for whatever reason, be included in the tender document (e.g. due to the contracts being signed before the EMP is available), the EMP requirements should be included as a change or variation order to the contract. Similarly, any alterations to the EMP should be included as a change or variation order to the contract.

#### 8.4.9 Management review and revision of the EMP

The extent to which EMPs should be reviewed will vary depending on the project or activity. Where the major negative impacts are associated with the construction phase, the EMP may require no, or limited, revision following construction. For projects where the major environmental impacts are associated with the operational phase, the EMP may require regular review and subsequent

revision. In part, this is linked to the influence of changes in environmental legislation. Conditions under which the EMP would require revision include:

- Changes in legislation;
- Occurrence of unanticipated impacts or impacts of greater intensity, extent and significance than predicted;
- inadequate mitigation measures (i.e. where environmental performance does not meet the required level despite the implementation of the mitigation measure); and
- Secondary impacts occur as a result of the mitigation measures.

Senior management responsible for a project should conduct a review of the EMP and its implementation to ensure that the EMP remains effective and appropriate. A review should be conducted at each of the following stages, before continuation to the next phase of the project life-cycle:

- Pre-construction;
- Construction and commissioning;
- Operation and maintenance;
- Expansion; and
- Closure and decommissioning.

#### 8.5 EMP Implementation Cost

Environment budget has been prepared for design, construction and operation phase of the project. The Environmental budget includes the cost of environmental structures like Sewage Treatment Plant, Air Pollution Control System at terminals, monitoring, enhancement measures, GHG reduction, training and awareness and technical support for establishment, enhancement measures and environmental guidelines. The total project EMP for all the 11 Ferry Locations is also mentioned in the EMP cost Table 8-4Environmental budget is estimated approximately as **Rs. 10.08** crores. The detailed break-up of costs is given at Table 8.4.

Cost estimates will need to be prepared for all the mitigation and monitoring measures to be proposed in the future subprojects EIAs. The cost estimates for some of the mitigation measures to be identified in the EMP will be part of civil works contract.

COMPONENT	ITEM	UNIT	QUANTITY	RATE	Amount (in INR)
PRE-CONSTRUCTION STAGE					
Consultancy Services for EIA & SIA Study of AIWTP	Screening & Scoping of EIA & SIA,EMF, SMF, EIA, SIA, EMP & SMP for all the priority ghats in Phase-I & in Phase-II for remaining Ghats.				20520790
CONSTRUCTION S	STAGE				
Technical Support	Technical support for preparation of guidelines, conservation action plan for turtle and dolphin areas and performance indicators	Lump sum	Combined for all 23 Ghats	15,00,000	15,00,000
Greenbelt development	Plantation in intervention sites (terminal/jetty/locks)-	No. of trees	50trees	50000l/terminal for 23 terminals	1150000
	provisional Monitoring and aftercare	No. of trees	50trees	10000 (once in a year for 23 terminals for 3yrs)	690000
Drainage congestion & disposal of accumulated water	Provision of adequate surveillance	To be covered in project design and engineering cost			
Covered in project design and engineering cost	Embankment and River Bank Protection Measures	To be covered in project design and engineering cost			
Measures to reduce dredging requirement	River training works Bandalling Catchment treatment	To be covered in project desig	n and engineering cost		

Table 8-3: EMP Cost Estimates for overall Pro	piect (all components)

Land	Compensation against land	As required for specific site and is included separately under SIA/RAP reports.				
Soil	Soil contamination protection(Septic tanks, grease trapsetc.) and rehabilitation ofborrow areas/debris disposalsite/plant site & labour camps	To be covered in project design and engineering cost				
Noise	Canopy for DG sets PPEs like ear plug Timely maintenance of the machinery, equipment and vehicles Barricading the site	To be covered in project design and engineering cost				
Water	Provision of storm water and wastewater management system	To be covered in project design and engineering cost				
	Construction of soak pits at construction sites & labour camps	To be covered in project design and engineering cost				
	Provision of clean drinking & domestic water facility at labour camps and construction site	To be covered in project design and engineering cost				
	STP construction, Zero Discharge management (collection of storm water and its distillation and use, and rain water harvesting	Including in project design and engineering costs				
Air Quality – Dust Management during	Water Sprayer / Watering for Dust suppression	To be covered in project design and engineering cost				
construction	Green belt development, dust control system, mechanized material handling systems for material loading and unloading at terminal and vessel.	To be covered in pr	To be covered in project design and engineering cost			
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Safety	Appointment of Safety Officers	To be covered in pr	oject design	and engineering cost		
	Safety signage, fire-fighting measures& water ambulance etc.	To be covered in pr	oject design	and engineering cost		
	Provision of trainings and PPE to workers	To be covered in th	e responsibi	lity of the Contractor		
Health	Health check-up camps for construction workers	To be covered in th	To be covered in the responsibility of the Contractor			
Enhancement Measures	Institutional Support for ecology awareness through reputed institutions	No		1	Lump sum	5,00,000
	Bath shelter for women along the stretch for	No				
	vessel movement					0
	Support for cleanliness at Ghats and improvement of Ghats	To be cove	red in the res	sponsibility of the Contractor	Lump sum	0
ental in the ion	Terrestrial and Aquatic Fauna	1,50,000 per season per site (Once in six month)				20700000
ng uct		23 sites for 3 years				
on orir stru ha	Ambient Air Quality	Monitoring at		Total sample per location for	15,000/ sample	
Envir Monito cons p		along the stretch		3years is 12. Hence, Total sample at 23 location for 3 years will be 12X23 i.e. 276. Considering 15,000/sample, cost for 276 samples will be 276X15000		41, 40,000

		Monitoring at		Total sample per location for 3years is 12. Hence, Total sample at 23 location for 3 years will be 12X23 i.e. 276. Considering 15,000/sample, cost for 276	15,000/ sample	41 40 000
Monitoring in the ion phase	Surface Water Quality	Surface water resources		As per the standard norms, sample may be collected for three seasons (Pre-monsoon, monsoon & post monsoon or winter) at each location for three years. Hence, 3samples each location in one year & 9 samples each location for 3years. Then, for 23 locations @9samples ie. 9X23 will be 207samples.	12,000/ sample	2484000
		Ground water bodies		As per the standard norms, sample may be collected for three seasons (Pre-monsoon, monsoon & post monsoon or winter) at each location for three years. Hence, 3samples each location in one year & 9 samples each location for 3years. Then, for 23 locations @9samples i.e. 9X23 will be 207samples. Hence costing @12000/samples will be 24,84,000	12,000/ sample	2484000
onstruct	Drinking Water Quality	There will be strict i the labours. Hence, activities have no di	instruction to it is not requirect impact of	all the contractors to supply filtered uired to analysis drinking water quality on drinking water in the nearby area.	drinking water to y since the project	0
Enviror c	Noise & Vibration	At monitoring locations identified in the Environmental management plan		24 hourly/season for pre and post monsoon at 3 locations per site for 3 years for 23 ghats. Number of sample per year per location is 2. Total number of samples is 414	4,000/ sample	1656000

		23 sites for 3 years				
		Underwater noise Monitoring		At 4 locations per day per month for 24 hours for 3 years. Total samples for 3 years would be 144.	4,000/ sample	576000
	Soil Quality, Erosion & Siltation and River Bed	At terminal and landing construction sites23 sites for 3 years		As per the standard norms, sample to be collected for three season (Pre-monsoon, monsoon & post monsoon or winter) at each location for three years. Hence, 3samples each location in one year & 9 samples each location for 3years. Then, for 23 locations @9samples ie. 9X23 will be 207samples.	8,000/ sample	1656000
	Sediment	At dredging sites		11 sites for 23 ghats	8,000/ sample	88000
SUB TOTAL (CONSTRUCTIONSTAGE)				31484000		
OPERATION STA	AGE					
	Erosion Control and landscaping	Visual Check		Lump Sum	To be part of Regular maintenance andoperation costs	
Water	Waste Water Management (compact STP cost in NBC) based on number of people/hour	STP Operation, rainwater harvesting management and maintenance	To b	e part of Regular maintenance and op	peration cost	0
	Storm Water Management System	Maintenance of Storm waterdrains	Lump sum		To be part of Regular maintenance and costs	
	Provision of drinking water facilities There will be strict instruction to all the contractors to supply filtered drinking water to the labours. Hence, it is not required to analysis drinking water quality since the project activities have no direct impact on drinking water in the nearby area.		drinking water to y since the project	0		

	Waste Management System	Collection, segregation and disposal of municipal waste, hazardous waste (used oil) and dredged soil	Lump Sum	To be part of Regular maintenance and operation cost	
	Environmental Monitoring in the operation phase	Terrestrial and Aquatic Fauna including surveillance audit	During operation stage, surveil conducted corridor-wise for 4 Corridor, Guwahati Corridor, Silchar Corridor. Hence, @3,00,0 for three years, cost will 36,00,000/-	ance audit may be corridors i.e. Majuli Dhubri Corridor & 00 for each corridor be 4X300000X3=	3600000
		Ambient Air Quality	4 samples/location/yea @15000/samples for 2 locations will be 4X23X1500 i.e. 13,80,000. For 3years it w be 41,40,000	r   15,000/ sample 3 1 11	4140000
		Surface Water Quality	3 samples per location for or year (at pre-monsoon, monsoon post-monsoon) at 23 locatior @12,000/sample will be R 8,28,000. For three years it will b 24,84,000	e 12,000/ sample k s e	2484000
mental oring peration ge		Ground water	3 samples per location for or year (at pre-monsoon, monsoon post-monsoon) at 23 locatior @12,000/sample will be R 8,28,000. For three years it will b 24,84,000	e 12,000/ sample & s  e	2484000
Environ Monit during O		Noise & Vibration	24 hourly/season for pre and po monsoon at 3 locations per site for 1 years for 23 ghats. Number sample per year per location is Total number of samples is 414	t 4,000/ sample r f	552000

			At 4 locations per day per month for 24 hours for 3 years. Total samples for 3 years would be 144.	4,000/ sample	192000
		Soil Quality, River Bed Sediments, Soil Erosion &Siltation, Integrity of embankments	4 samples/location/year @8000/samples for 23 locations will be 4X23X8000 i.e. 7,36,000. For 3years it will be 22,08,000	8,000/ sample	2208000
Electricity	Solar Panels	Cost of solar panels for priority ghats	Provision of installing solar panels design & engineering	to be covered in cost	0
SUB TOTAL (OPE	RATION PHASE)	0/07514			15660000
ESTABLISHMENT,		SYSIEM			
Safeguard Monitoring Consultant (3 <sup>rd</sup> Party)			Quarterly Audit for 3 years	Lump sum	15000000
Training	General environmental awareness;	Selected staff of	Training for Selected staff of	Lump sum	
	Environmental and social sensitivity	AIWTDS, supervisor, and	AIWTDS, supervisor, and		
	of the project influence area;	contractors	contractors		
	Key findings of the EIA;				155000
	Mitigation measures;				
	EMP;				
	Social and cultural values of the area.				
	Training for Ghat managemen	t via training for	Ghat officers	Lump sum	
	Ghat/section officers/ vessel o	perators/masters/	Ghat Maintenance workers		10,00,000
			Vessel Operators		
	General environmental and awareness;	PIU;	supervisor	Lump sum	115000

	Environmental and social sensitivity of the project influence area:	supervisor; selected contractors' crew		
	Mitigation measures;			
	Community issues;			
	Awareness of transmissib diseases;	ble		
	Social and cultural values	i.		
	EMP;	Construction crew	Contractors	
	Waste disposal			115000
	Road/waterway safety;	Drivers;	Contractors	115000
	Defensive driving/sailing;	boat/launch crew		
	Waste disposal;			
	Cultural values and social sensitivity.	I		
	Camp operation;	Camp staff	Contractors	115000
	Waste disposal;			
	Natural resource conservation;			
	Housekeeping.			
	Restoration requirements	; Restoration teams	Contractors	115000
	Waste disposal.			
	Construction Implementat requirements;	tion PIU;	Contractors, Supervisor and E&S cell	135000
	handling situations for important flora / fauna especially Dolphin;	supervisor; selected		
	Physical Cultural resource	es; contractors' crew		
_				

	Management Systems	Health and safety equipment on board and in terminals		1	Lump sum	5000000
		Management Information and tracking system		1	Lump sum	7500000
SUBTOTAL (ESTABLISHMENT & TRAINING and MANAGEMENT SYSTEM)					28365000	
TOTAL (Construction, and Operation and mobilization)					96029790	
CONTINGENCIES @ 5 % on total Environmental Costs					4801489	
GRAND TOTAL (in Rs)					100831280	

## Annexure - 1

## Annexure 1: Environmental Code of Practices for Contractor

Project Activity/	Environmental Impacts	Mitigation Measures/ Management Guidelines
Impact Source		
ECOP 1: Waste Man	agement	
General Waste	Soil and water pollution from the improper management of wastes and excess materials from the construction sites.	<ul> <li>The Contractor shall</li> <li>Develop waste management plan for various specific waste streams (e.g., reusable waste, flammable waste, construction debris, food waste etc.) prior to commencing of construction and submit to Construction Contractor for approval.</li> <li>Organize disposal of all wastes generated during construction in an environmentally acceptable manner. This will include consideration of the nature and location of disposal site, so as to cause less environmental impact.</li> <li>Minimize the production of waste materials by 3R (Reduce, Recycle and Reuse) approach.</li> <li>Segregate and reuse or recycle all the wastes, wherever practical.</li> <li>Prohibit burning of solid waste</li> <li>Collect and transport non-hazardous wastes to all the approved disposal sites. Vehicles transporting solid waste shall be covered with tarps or nets to prevent spilling waste along the route</li> <li>Train and instruct all personnel in waste management practices and procedures as a component of the environmental induction process.</li> <li>Provide refuse containers at each worksite.</li> <li>Request suppliers to minimize packaging where practicable.</li> <li>Place a high emphasis on good housekeeping practices.</li> <li>Maintain all construction sites in a cleaner, tidy and safe condition and provide and maintain appropriate facilities as temporary storage of all wastes before transportation and final disposal</li> </ul>
Hazardous Waste	Health hazards and environmental impacts due to improper waste management practices	<ul> <li>The Contractor shall</li> <li>Collect chemical wastes in 200 liter drums (or similar sealed container), appropriately labeled for safe transport to an approved chemical waste depot.</li> <li>Store, transport and handle all chemicals avoiding potential environmental pollution.</li> <li>Store all hazardous wastes appropriately in bunded areas away from water courses.</li> <li>Make available Material Safety Data Sheets (MSDS) for hazardous materials on-site during construction.</li> <li>Collect hydrocarbon wastes, including lube oils, for safe transport off-site for reuse, recycling, treatment or disposal at approved locations.</li> <li>Construct concrete or other impermeable flooring to prevent seepage in case of spills</li> </ul>

Project Activity/	Environmental Impacts	Mitigation Measures/ Management Guidelines
Impact Source Fuels and hazardous goods.	Materials used in construction have a potential to be a source of contamination. Improper storage and handling of fuels, lubricants, chemicals and hazardous goods/materials on-site, and potential spills from these goods may harm the environment or health of construction workers	<ul> <li>The Contractor shall</li> <li>Prepare spill control procedures and submit the plan for Construction Contractor approval.</li> <li>Train the relevant construction personnel in handling of fuels and spill control procedures.</li> <li>Store dangerous goods in bunded areas on a top of a sealed plastic sheet away from watercourses.</li> <li>Refueling shall occur only within bunded areas.</li> <li>Make available MSDS for chemicals and dangerous goods on-site.</li> <li>Transport waste of dangerous goods, which cannot be recycled, to a designated disposal site approved by DoE.</li> <li>Provide absorbent and containment material (e.g., absorbent matting) where hazardous material are used and stored and personnel trained in the correct use.</li> <li>Provide protective clothing, safety boots, helmets, masks, gloves, goggles, to the construction personnel, appropriate to materials in use.</li> <li>Make sure all containers, drums, and tanks that are used for storage are in good condition and are labeled with expiry date. Any container, drum, or tank that is dented, cracked, or rusted might eventually leak. Check for leakage regularly to identify potential problems before they occur.</li> <li>Store hazardous materials above flood plain level.</li> <li>Put containers and drums in temporary storages in clearly marked areas, where they will not be run over by vehicles or heavy machinery. The area shall preferably slope or drain to a safe collection area in the event of a spill.</li> <li>Put containers and drums in permanent storage areas on an impermeable floor that slopes to a safe collection area in the event of spill or leak.</li> <li>Take all precautionary measures when handling and storing fuels and lubricants, avoiding environmental pollution.</li> <li>Avoid the use of material with greater potential for contain, information on the supplier. However, if they are not empty prior to their return, they must be labeled with the name of the material slop.</li> </ul>
ECoP 3: Water Reso	ources Management	may be considered necessary.
Hazardous Material	Water pollution from the	The Contractor shall
and Waste	storage, handling and disposal of hazardous materials and general	<ul> <li>Follow the management guidelines proposed in ECoPs 1 and 2.</li> <li>Minimize the generation of sediment, oil and</li> </ul>

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
	construction waste, and accidental spillage	grease, excess nutrients, organic matter, litter, debris and any form of waste (particularly petroleum and chemical wastes). These substances must not enter waterways, storm water systems or underground water tables
Discharge from construction sites	During construction both surface and groundwater quality may be deteriorated due to construction activities in the river, sewerages from construction sites and work camps. The construction works will modify groundcover and topography changing the surface water drainage patterns of the area including infiltration and storage of storm water. These changes in hydrological regime lead to increased rate of runoff, increase in sediment and contaminant loading, increased flooding, groundwater contamination, and effect habitat of fish and other aquatic biology.	<ul> <li>The Contractor shall</li> <li>Install temporary drainage works (channels and bunds) in areas required for sediment and erosion control and around storage areas for construction materials</li> <li>Install temporary sediment basins, where appropriate, to capture sediment-laden run-off from site</li> <li>Divert runoff from undisturbed areas around the construction site</li> <li>Stockpile materials away from drainage lines</li> <li>Prevent all solid and liquid wastes entering waterways by collecting solid waste, oils, chemicals, bitumen spray waste and wastewaters from brick, concrete and asphalt cutting where possible and transport to an approved waste disposal site or recycling depot</li> <li>Wash out ready-mix concrete agitators and concrete handling equipment at washing facilities off site or into approved bunded areas on site. Ensure that tires of construction vehicles are cleaned in the washing bay at the entrance of the construction site) to remove the mud from the wheels. This shall be done in every exit of each construction vehicle to ensure the local roads are kept clean</li> </ul>
Soil Erosion and siltation	Soil erosion and dust from the material stockpiles will increase the sediment and contaminant loading of surface water bodies.	<ul> <li>The Contractor shall</li> <li>Stabilize the cleared areas not used for construction activities with vegetation or appropriate surface water treatments as soon as practicable following earthwork to minimize erosion</li> <li>Ensure that roads used by construction vehicles are swept regularly to remove sediment.</li> <li>Water the material stockpiles, access roads and bare soils on an as required basis to minimize dust. Increase the watering frequency during periods of high risk (e.g. high winds)</li> </ul>
Construction activities in water bodies	Construction works in the water bodies will increase sediment and contaminant loading, and effect habitat of fish and other aquatic biology	<ul> <li>The Contractor Shall</li> <li>Dewater sites by pumping water to a sediment basin prior to release off site – do not pump directly off site</li> <li>Monitor the water quality in the runoff from the site or areas affected by dredge plumes, and improve work practices as necessary</li> <li>Protect water bodies from sediment loads by silt screen or bubble curtains or other barriers</li> <li>Minimize the generation of sediment, oil and grease, excess nutrients, organic matter, litter, debris and any form of waste (particularly petroleum and</li> </ul>

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		<ul> <li>chemical wastes). These substances must not enter waterways, storm water systems or underground water tables.</li> <li>Use environment friendly and nontoxic slurry during construction of piles to discharge into the river.</li> <li>Reduce infiltration of contaminated drainage through storm water management design</li> <li>Do not discharge cement and water curing used for cement concrete directly into water courses and drainage inlets</li> </ul>
Drinking water	Groundwater at shallow depths is contaminated with arsenic and hence not suitable for drinking purposes. Depletion and pollution of groundwater resources	<ul> <li>The Contractor Shall</li> <li>Pumping of groundwater shall be from deep aquifers of more than 300 m to supply arsenic free water. Safe and sustainable discharges are to be ascertained prior to selection of pumps.</li> <li>Tube wells will be installed with due regard for the surface environment, protection of groundwater from surface contaminants, and protection of aquifer cross contamination</li> <li>All tube wells, test holes, monitoring wells that are no longer in use or needed shall be properly decommissioned</li> <li>Install monitoring wells both upstream and downstream areas near construction yards and construction camps to regularly monitor the water quality and water levels.</li> <li>Protect groundwater supplies of adjacent lands</li> </ul>
ECoP 4: Drainage N	lanagement	
Excavation and earth works, and construction yards	Lack of proper drainage for rainwater/liquid waste or wastewater owing to the construction activities harms environment in terms of water and soil contamination, and mosquito growth	<ul> <li>The Contractor shall</li> <li>Prepare a program for prevent/avoid standing waters, which Construction Contractor will verify in advance and confirm during implementation</li> <li>Provide alternative drainage for rainwater if the construction works/earth-fillings cut the established drainage line</li> <li>Establish local drainage line with appropriate silt collector and silt screen for rainwater or wastewater connecting to the existing established drainage lines already there</li> <li>Rehabilitate road drainage structures immediately if damaged by contractors' road transports.</li> <li>Build new drainage lines as appropriate and required for wastewater from construction yards connecting to the available nearby recipient water bodies. Ensure wastewater quality conforms to the relevant standards provided by DoE, before it being discharged into the recipient water bodies.</li> <li>Ensure the internal roads/hard surfaces in the construction yards/construction camps that generate has storm water drainage to accommodate high runoff during downpour and that there is no stagnant water in the area at the end of the downpour.</li> </ul>

Project Activity/	Environmental Impacts	Mitigation Measures/ Management Guidelines
Impact Source		
		<ul> <li>Construct wide drains instead of deep drains to avoid sand deposition in the drains that require frequent cleaning.</li> <li>Provide appropriate silt collector and silt screen at the inlet and manholes and periodically clean the drainage system to avoid drainage congestion</li> <li>Protect natural slopes of drainage channels to ensure adequate storm water drains.</li> <li>Regularly inspect and maintain all drainage congestion problem.</li> <li>Reduce infiltration of contaminated drainage through storm water management design</li> </ul>
Ponding of water	Health hazards due to	• Do not allow ponding of water especially near the
	mosquito breeding	waste storage areas and construction camps
		• Discard all the storage containers that are capable
		of storing of water, after use or store them in
ECoP 5: Soil Quality	v Managamont	inverted position
Filling of Sites with	Soil contamination will	The Contractor shall
dredge spoils	occur from drainage of	• Ensure that dredged sand used for land filling shall
	dredged spoils	be free of pollutants. Prior to filling, sand quality
		shall be tested to confirm whether soil is pollution
		free. Sediments shall be properly compacted. Top
		and houndary slopes along with grass Side Slope
		of Filled Land of 1:2 shall be constructed by suitable
		soils with proper compaction as per design. Slope
		surface shall be covered by top soils/ cladding
		materials (0.5m thick) and grass turfing with suitable
		<ul> <li>Leaching from the sediments shall be contained to</li> </ul>
		seep into the subsoil or shall be discharged into
		settling lagoons before final disposal.
		No sediment laden water in the adjacent lands near
		the construction sites, and/or wastewater of suspended materials excessive of 200mg/l from
		dredge spoil storage/use area in the adjacent
		agricultural lands
Storage of	Spillage of hazardous and	The Contractor shall
hazardous and	toxic chemicals will	• Strictly manage the wastes management plans
toxic chemicals	contaminate the solis	FCoP2
		<ul> <li>Construct appropriate spill contaminant facilities for all fuel storage areas</li> </ul>
		<ul> <li>Establish and maintain a hazardous materials</li> </ul>
		register detailing the location and quantities of
		hazardous substances including the storage, use of
		alsposals
		<ul> <li>fram personner and implement sale work practices for minimizing the risk of spillage</li> </ul>
		<ul> <li>Identify the cause of contamination, if it is reported, and contain the area of contamination. The impact</li> </ul>

Project Activity/	Environmental Impacts	Mitigation Measures/ Management Guidelines
Impact Source	•	
		<ul> <li>may be contained by isolating the source or implementing controls around the affected site</li> <li>Remediate the contaminated land using the most appropriate available method to achieve required commercial/industrial guideline validation results.</li> </ul>
Construction	Erosion from construction	The Contractor shall
material stock piles	material stockpiles may	• Protect the toe of all stockpiles, where erosion is
ECoD 6: Erosion on	contaminate the solis	likely to occur, with silt fences, straw bales or bunds
Clearing of	Cleared areas and slopes	Painstate and protect covered areas as seen as
construction sites	are susceptible for erosion of top soils, that affects the growth of vegetation which causes ecological imbalance	<ul> <li>Reinstate and protect covered areas as soon as possible</li> <li>Mulch to protect batter slopes before planting</li> <li>Cover unused area of disturbed or exposed surfaces immediately with mulch/grass turfings/tree plantations</li> </ul>
Construction	The impact of soil erosion	The Contractor shall
activities and material stockpiles	are (i) Increased run off and sedimentation causing a greater flood hazard to the downstream, (ii) destruction of aquatic environment in nearby lakes, streams, and reservoirs caused by erosion and/or deposition of sediment damaging the spawning grounds of fish, and (iii) destruction of vegetation by burying or gullying.	<ul> <li>Locate stockpiles away from drainage lines</li> <li>Protect the toe of all stockpiles, where erosion is likely to occur, with silt fences, straw bales or bunds</li> <li>Remove debris from drainage paths and sediment control structures</li> <li>Cover the loose sediments and water them if required</li> <li>Divert natural runoff around construction areas prior to any site disturbance</li> <li>Install protective measures on site prior to construction, for example, sediment traps</li> <li>Control drainage through a site in protected channels or slope drains</li> <li>Install 'cut off drains' on large cut/fill batter slopes to control water runoff speed and hence erosion</li> <li>Observe the performance of drainage structures and erosion controls during rain and modify as required</li> </ul>
FCoP 7: Top Soil	Management	erosion controls during rain and modify as required.
		The Contractor shall
earth works	fertile top soils that are enriched with nutrients required for plant growth agricultural development.	<ul> <li>Strip the top soil to a depth of 15 cm and store in stock piles of height not exceeding 2m.</li> <li>Remove unwanted materials from top soil like grass, roots of trees and similar others.</li> <li>The stockpiles will be done in slopes of 2:1 to reduce surface runoff and enhance percolation through the mass of stored soil.</li> <li>Locate topsoil stockpiles in areas outside drainage lines and protect from erosion.</li> <li>Construct diversion channels and silt fences around the topsoil stockpiles to prevent erosion and loss of topsoil.</li> <li>Spread the topsoil to maintain the physico-chemical and biological activity of the soil. The stored top soil will be utilized for covering all disturbed area and along the proposed plantation sites</li> </ul>

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		surface will be ripped to assist the bunding of the soil layers, water penetration and re vegetation
Transport	Vehicular movement outside ROW or temporary access roads will affect the soil fertility of the agricultural lands	<ul> <li>Limit equipment and vehicular movements to within the approved construction zone</li> <li>Construct temporary access tracks to cross concentrated water flow lines at right angles</li> <li>Plan construction access to make use, if possible, of the final road alignment</li> <li>Use vehicle-cleaning devices, for example, ramps or wash down areas</li> </ul>
ECoP 8: Topograp	bhy and Landscaping	
Land clearing and earth works	Flood plains of the existing Project area will be affected by the construction of various project activities. Construction activities especially earthworks will change topography and disturb the natural rainwater/flood water drainage as well as will change the local landscape.	<ul> <li>The Contractor shall</li> <li>Ensure the topography of the final surface of all raised lands (construction yards, approach roads, access roads, bridge end facilities, etc.) are conducive to enhance natural draining of rainwater/flood water;</li> <li>Keep the final or finished surface of all the raised lands free from any kind of depression that insists water logging</li> <li>Undertake mitigation measures for erosion control/prevention by grass-turfing and tree plantation, where there is a possibility of rain-cut that will change the shape of topography.</li> <li>Cover immediately the uncovered open surface that has no use of construction activities with grass-cover and tree plantation to prevent soil erosion and bring improved landscaping</li> </ul>
ECoP 9: Borrow Are	eas Management	
Development and operation of borrow areas	Borrow areas will have impacts on local topography, landscaping and natural drainage	<ul> <li>The Contractor shall</li> <li>Use only approved quarry and borrow sites</li> <li>Identify new borrow and quarry areas in consultation with Project Director, if required.</li> <li>Reuse excavated or disposed material available in the project to the maximum extent possible.</li> <li>Store top soil for reinstatement and landscaping.</li> <li>Develop surface water collection and drainage systems, anti-erosion measures (berms, re vegetation etc.) and retaining walls and gabions where required. Implement mitigation measures in ECoP 3: Water Resources Management, ECoP 6: Erosion and Sediment Control</li> <li>The use of explosive should be used in as much minimum quantity as possible to reduce noise, vibration and dust.</li> <li>Control dust and air quality deterioration by application of watering and implementing mitigation measures proposed in ECoP 10: Air Quality Management.</li> <li>Noise and vibration control by ECoP 11: Noise and</li> </ul>

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		Vibration Management
ECoP 10: Air Qualit	y Management	
Construction vehicular traffic	Air quality can be adversely affected by vehicle exhaust emissions and combustion of fuels.	<ul> <li>The Contractor shall</li> <li>Fit vehicles with appropriate exhaust systems and emission control devices. Maintain these devices in good working condition.</li> <li>Operate the vehicles in a fuel efficient manner</li> <li>Cover haul vehicles carrying dusty materials moving outside the construction site</li> <li>Impose speed limits on all vehicle movement at the worksite to reduce dust emissions</li> <li>Control the movement of construction traffic</li> <li>Water construction materials prior to loading and transport</li> <li>Service all vehicles regularly to minimize emissions</li> <li>Limit the idling time of vehicles not more than 2 minutes</li> </ul>
Construction machinery	Air quality can be adversely affected by emissions from machinery and combustion of fuels.	<ul> <li>The Contractor shall</li> <li>Fit machinery with appropriate exhaust systems and emission control devices. Maintain these devices in good working condition in accordance with the specifications defined by their manufacturers to maximize combustion efficiency and minimize the contaminant emissions. Proof or maintenance register shall be required by the equipment suppliers and contractors/subcontractors</li> <li>Focus special attention on containing the emissions from generators</li> <li>Machinery causing excess pollution (e.g. visible smoke) will be banned from construction sites</li> <li>Service all equipment regularly to minimize emissions</li> <li>Provide filtering systems, duct collectors or humidification or other techniques (as applicable) to the concrete batching and mixing plant to control the particle emissions in all its stages, including unloading, collection aggregate handling, cement dumping, circulation of trucks and machinery inside the installations</li> </ul>

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction activities	Dust generation from construction sites, material stockpiles and access roads is a nuisance in the environment and can be a health hazard	<ul> <li>Water the material stockpiles, access roads and bare soils on an as required basis to minimize the potential for environmental nuisance due to dust. Increase the watering frequency during periods of high risk (e.g. high winds). Stored materials such as gravel and sand shall be covered and confined to avoid their being wind-drifted</li> <li>Minimize the extent and period of exposure of the bare surfaces</li> <li>Reschedule earthwork activities or vegetation clearing activities, where practical, if necessary to avoid during periods of high wind and if visible dust is blowing off-site</li> <li>Restore disturbed areas as soon as practicable by vegetation/grass-turfing</li> <li>Store the cement in silos and minimize the emissions from silos by equipping them with filters.</li> <li>Establish adequate locations for storage, mixing and loading of construction materials, in a way that dust dispersion is prevented because of such operations</li> <li>Crushing of rocky and aggregate materials shall be wet-crushed, or performed with particle emission control systems</li> </ul>
ECoP 11: Noise and	Vibration Management	<u> </u>
Construction vehicular traffic	Noise quality will be deteriorated due to vehicular traffic	<ul> <li>The Contractor shall</li> <li>Maintain all vehicles in order to keep it in good working order in accordance with manufactures maintenance procedures</li> <li>Make sure all drivers will comply with the traffic codes concerning maximum speed limit, driving hours, etc.</li> <li>Organize the loading and unloading of trucks, and handling operations for the purpose of minimizing construction noise on the work site</li> </ul>
Construction machinery	Noise and vibration may have an impact on people, property, fauna, livestock and the natural environment.	<ul> <li>The Contractor shall</li> <li>Appropriately site all noise generating activities to avoid noise pollution to local residents</li> <li>Use the quietest available plant and equipment</li> <li>Modify equipment to reduce noise (for example, noise control kits, lining of truck trays or pipelines)</li> <li>Maintain all equipment in order to keep it in good working order in accordance with manufactures maintenance procedures. Equipment suppliers and contractors shall present proof of maintenance register of their equipment.</li> <li>Install acoustic enclosures around generators to reduce noise levels.</li> <li>Fit high efficiency mufflers to appropriate construction equipment</li> <li>Avoid the unnecessary use of alarms, horns and sirens</li> </ul>

Project Activity/	Environmental Impacts	Mitigation Measures/ Management Guidelines
Impact Source	•	5
Construction activity	Noise and vibration may have an impact on people, property, fauna, livestock and the natural environment	<ul> <li>The Contractor shall</li> <li>Notify adjacent landholders prior any typical noise events outside of daylight hours</li> <li>Educate the operators of construction equipment on potential noise problems and the techniques to minimize noise emissions</li> <li>Employ best available work practices on-site to minimize occupational noise levels</li> <li>Install temporary noise control barriers where appropriate</li> <li>Notify affected people if major noisy activities will be undertaken, e.g. pile driving</li> <li>Plan activities on site and deliveries to and from site to minimize impact</li> <li>Monitor and analyze noise and vibration results and adjust construction practices as required.</li> <li>Avoid undertaking the noisiest activities, where possible, when working at night near the residential areas</li> </ul>
ECoP 12: Protection	n of Flora	
Vegetation clearance	Local flora are important to provide shelters for the birds, offer fruits and/or timber/fire wood, protect soil erosion and overall keep the environment very friendly to human-living. As such damage to flora has wide range of adverse environmental impacts. Mitigation Mea Management Guide	<ul> <li>The Contractor shall</li> <li>Reduce disturbance to surrounding vegetation</li> <li>Use appropriate type and minimum size of machine to avoid disturbance to adjacent vegetation.</li> <li>Get approval from supervision consultant for clearance of vegetation.</li> <li>Make selective and careful pruning of trees where possible to reduce need of tree removal.</li> <li>Control noxious weeds by disposing of at designated dump site or burn on site.</li> <li>Clear only the vegetation that needs to be cleared in accordance with the plans. These measures are applicable to both the</li> <li>construction areas as well as to any associated activities such as sites for stockpiles, disposal of fill and construction of diversion roads, etc.</li> <li>Do not burn off cleared vegetation – where feasible, chip or mulch and reuse it for the rehabilitation of affected areas, temporary access tracks or landscaping. Mulch provides a seed source, can firm weeds.</li> <li>Return topsoil and mulched vegetation (in areas of native vegetation) to approximately the same area of the roadside it came from.</li> <li>Avoid work within the drip-line of trees to prevent damage to the tree roots and compacting the soil.</li> <li>Minimize the length of time the ground is exposed or excavation left open by clearing and re-vegetate the area at the earliest practically possible.</li> </ul>

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		<ul> <li>re-vegetation done at the earliest</li> <li>Provide adequate knowledge to the workers regarding nature protection and the need of avoid felling trees during construction</li> <li>Supply appropriate fuel in the work caps to prevent fuel wood collection</li> </ul>
ECoP 13: Protection	n of Fauna	
Construction activities	The location of construction activities can result in the loss of wild life habitat and habitat quality,.	<ul> <li>The Contractor shall</li> <li>Limit the construction works within the designated sites allocated to the contractor</li> <li>check the site for animals trapped in, or in danger from site works and use a qualified person to relocate the animal</li> </ul>
	Impact on migratory birds, its habitat and its active nests	<ul> <li>The Contractor shall</li> <li>Not be permitted to destruct active nests or eggs of migratory birds</li> <li>Minimize the tree removal during the bird breeding</li> </ul>
		<ul> <li>season. If works must be continued during the bird breeding season, a nest survey will be conducted by a qualified biologist prior to commence of works to identify and located active nests</li> <li>Minimize the release of oil, oil wastes or any other substances harmful to migratory birds to any waters or any areas frequented by migratory birds.</li> </ul>
Vegetation clearance	Clearance of vegetation may impact shelter, feeding and/or breeding and/or physical destruction and severing of habitat areas	<ul> <li>The Contractor shall</li> <li>Restrict the tree removal to the minimum required.</li> <li>Retain tree hollows on site, or relocate hollows, where appropriate</li> <li>Leave dead trees where possible as habitat for fauna</li> <li>Fell the hollow bearing trees in a manner which reduces the potential for fauna mortality. Felled trees will be inspected after felling for fauna and if identified and readily accessible will be removed and relocated or rendered assistance if injured. After felling, hollow bearing trees will remain unmoved overnight to allow animals to move of their own volition</li> </ul>
Construction camps	Illegal poaching	<ul> <li>Provide adequate knowledge to the workers regarding protection of flora and fauna, and relevant government regulations and punishments for illegal poaching</li> </ul>
Construction activities in River	The main potential impacts to fisheries are hydrocarbon spills and leaks from riverine transport and disposal of wastes into the river	<ul> <li>The Contractor shall</li> <li>Ensure the riverine transports, vessels and ships are well maintained and do not have oil leakage to contaminate river water.</li> <li>Contain oil immediately on river in case of accidental spillage from vessels and ships and in this regard, make an emergency oil spill containment plan to be supported with enough equipment, materials and human resources</li> <li>Do not dump wastes, be it hazardous or non-hazardous into the nearby water bodies or in the</li> </ul>

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		river
Construction activities on the land	The main potential impacts to aquatic flora and fauna River are increased suspended solids from earthworks erosion, sanitary discharge from work camps, and hydrocarbon spills	<ul> <li>The Contractor shall</li> <li>follow mitigation measures proposed in ECoP 3 : Water Resources Management and EC4: Drainage Management</li> </ul>
	Filling of ponds for site preparation will impact the fishes.	<ul> <li>The Contractor shall</li> <li>Inspect any area of a water body containing fish that is temporarily isolated for the presence of fish, and all fish shall be captured and released unharmed in adjacent fish habitat</li> <li>Install and maintain fish screens etc. on any water intake with drawing water from any water body that contain fish</li> </ul>
ECoP 14: Protection	of Fisheries	
Construction activities in River	The main potential impacts to fisheries are hydrocarbon spills and leaks from riverine transport and disposal of wastes into the river	<ul> <li>The Contractor shall</li> <li>Ensure the riverine transports, vessels and ships are well maintained and do not have oil leakage to contaminate river water.</li> <li>Contain oil immediately on river in case of accidental spillage from vessels and ships and in this regard, make an emergency oil spill containment plan to be supported with enough equipment, materials and human resources</li> <li>Do not dump wastes, be it hazardous or nonhazardous into the nearby water bodies or in the river</li> </ul>
Construction activities on the land	The main potential impacts to aquatic flora and fauna River are increased suspended solids from earthworks erosion, sanitary discharge from work camps, and hydrocarbon spills	<ul> <li>The Contractor shall</li> <li>follow mitigation measures proposed in ECoP 3 : Water Resources Management and EC4: Drainage Management</li> </ul>
	Filling of ponds for site preparation will impact the fishes.	<ul> <li>The Contractor shall</li> <li>Inspect any area of a water body containing fish that is temporarily isolated for the presence of fish, and all fish shall be captured and released unharmed in adjacent fish habitat</li> <li>Install and maintain fish screens etc. on any water intake with drawing water from any water body that</li> </ul>

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
•		contain fish
ECoP 15: River Tra	nsport management	
Construction activities in River	The presence of construction and dredging barges, pipe lines and other construction activities in the river can cause hindrance and risks to the river traffic.	<ul> <li>The Contractor shall</li> <li>Not obstruct other normal riverine transport while doing riverine transport and works</li> <li>Identify the channel to be followed clearly using navigation aids such as buoys, beacons, and lighting</li> <li>Provide proper buoyage, navigation lights and markings for bridge and dredging works to guide the other normal riverine transport</li> <li>Keep regular and close contacts with Assam Inland Water Transport Authority (AIWTDS) regarding their needs during construction of the project</li> <li>Plan the river transport and transportation of large loads in coordination with AIWTDS to avoid traffic congestions.</li> <li>Provide signage for river traffic conforming to the AIWTDS requirements</li> <li>Position the dredge and pipeline in such a way that</li> </ul>
ECoP 16: Construct	Accidents tion Camp Management	<ul> <li>The Contractor shall</li> <li>Prepare an emergency plan for dealing with accidents causing accidental sinking of the vessels and ships</li> <li>Ensure sufficient equipment and staffs available to execute the emergency plans</li> <li>Provide appropriate lighting to barges and construction vessels</li> </ul>
of construction camps	workers are the important locations that have significant impacts such as health and safety hazards on	<ul> <li>Locate the construction camps at areas which are acceptable from environmental, cultural or social point of view.</li> <li>Consider the location of construction camps away from communities in order to avoid social conflict in using the natural resources such as water or to avoid the possible adverse impacts of the construction camps on the surrounding communities.</li> <li>Submit to the Construction Contractor for approval a detailed layout plan for the development of the constructed together with the location of site roads, fuel storage areas (for use in power supply generators), solid waste management and dumping locations, and drainage facilities, prior to the development of the construction camps.</li> <li>Local authorities responsible for health, religious and security shall be duly informed on the set up of</li> </ul>

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		camp facilities so as to maintain effective surveillance over public health, social and security matters.
Construction Camp Facilities	Lack of proper infrastructure facilities, such as housing, water supply and sanitation facilities will increase pressure on the local services and generate substandard living standards and health hazards.	<ul> <li>Contractor shall provide the following facilities in the campsites</li> <li>Adequate housing for all workers</li> <li>Safe and reliable water supply. Water supply from deep tube wells of 300 m depth that meets the national standards</li> <li>Hygienic sanitary facilities and sewerage system. The toilets and domestic waste water will be collected through a common sewerage. Provide separate latrines and bathing places for males and females with total isolation by wall or by location. The minimum number of toilet facilities required is one toilet for every ten persons</li> <li>Treatment facilities for sewerage of toilet and domestic wastes</li> <li>Storm water drainage facilities Both sides of roads are to be provided with shallow v drains to drain off storm water to a silt retention pond which shall be sized to provide a minimum of 20 minutes retention of storm water flow from the whole site. Channel all discharge from the silt retention pond to natural drainage via a grassed swale at least 20 meters in length with suitable longitudinal gradient.</li> <li>Paved internal roads. Ensure with grass/vegetation coverage to be made of the use of top soil that there is no dust generation from the loose/exposed sandy surface. Pave the internal roads of at least haring-bond bricks to suppress dusts and to work against possible muddy surface during monsoon.</li> <li>Provide child crèches for women working construction site. The crèche shall have facilities for dormitory, kitchen, indoor and outdoor play area. Schools shall be attached to these crèches so that children are not deprived of education whose mothers are construction workers</li> <li>Provide in-house community/common entertainment facilities. dependence of local entertainment outlets by the construction camps to be discouraged/prohibited to the extent possible</li> </ul>
Uisposal of Waste	impacts on the	<ul> <li>Ensure proper collection and disposal of solid wastes within the construction camps</li> <li>Insist waste separation by source; organic wastes in one pot and inorganic wastes in another pot at household level.</li> </ul>
		<ul> <li>Store inorganic wastes in a safe place within the household and clear organic wastes on daily basis to waste collector. Establish waste collection, transportation and disposal systems with the manpower and equipment/vehicles needed.</li> </ul>

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		<ul> <li>Dispose organic wastes in a designated safe place on daily basis. At the end of the day cover the organic wastes with a thin layer of sand so that flies, mosquitoes, dogs, cats, rats, are not attracted. One may dig a large hole to put organic wastes in it; take care to protect groundwater from contamination by leachate formed due to decomposition of wastes. Cover the bed of the pit with impervious layer of materials (clayey or thin concrete) to protect groundwater from contamination.</li> <li>Locate the garbage pit/waste disposal site min 500 m away from the residence so that peoples are not disturbed with the odor likely to be produced from anaerobic decomposition of wastes at the waste dumping places. Encompass the waste dumping place by fencing and tree plantation to prevent children to enter and play with.</li> <li>Do not establish site specific landfill sites. All solid waste will be collected and removed from the work camps and disposed in approval waste disposal sites</li> </ul>
Fuel supplies for cooking purposes	Illegal sourcing of fuel wood by construction workers will impact the natural flora and fauna	<ul> <li>The Contractor shall</li> <li>Provide fuel to the construction camps for their domestic purpose, in order to discourage them to use fuel wood or other biomass.</li> <li>Made available alternative fuels like natural gas or kerosene on ration to the workforce to prevent them using biomass for cooking.</li> <li>Conduct awareness campaigns to educate workers on preserving the protecting the biodiversity and wildlife of the project area, and relevant government regulations and punishments on wildlife protection</li> </ul>
Health and Hygiene	There will be a potential for diseases to be transmitted including malaria, exacerbated by inadequate health and safety practices. There will be an increased risk of work crews spreading sexually transmitted infections and HIV/AIDS	<ul> <li>The Contractor shall</li> <li>Provide adequate health care facilities within construction sites.</li> <li>Provide first aid facility round the clock. Maintain stock of medicines in the facility and appoint fulltime designated first aider or nurse.</li> <li>Provide ambulance facility for the laborers during emergency to be transported to nearest hospitals.</li> <li>Initial health screening of the laborers coming from outside areas</li> <li>Train all construction workers in basic sanitation and health care issues and safety matters, and on the specific hazards of their work Provide HIV awareness programming, including STI (sexually transmitted infections) and HIV information, education and communication for all workers on regular basis</li> <li>Complement educational interventions with easy access to condoms at campsites as well as voluntary counseling and testing</li> <li>Provide adequate drainage facilities throughout the</li> </ul>

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		<ul> <li>camps to ensure that disease vectors such as stagnant water bodies and puddles do not form. Regular mosquito repellant sprays during monsoon.</li> <li>Carryout short training sessions on best hygiene practices to be mandatorily participated by all workers. Place display boards at strategic locations within the camps containing messages on best hygienic practices</li> </ul>
Safety	In adequate safety facilities to the construction camps may create security problems and fire hazards	<ul> <li>The Contractor shall</li> <li>Provide appropriate security personnel (police / home guard or private security guards) and enclosures to prevent unauthorized entry in to the camp area.</li> <li>Maintain register to keep a track on a head count of persons present in the camp at any given time.</li> <li>Encourage use of flameproof material for the construction of labor housing / site office. Also, ensure that these houses/rooms are of sound construction and capable of withstanding wind storms/cyclones.</li> <li>Provide appropriate type of firefighting equipment suitable for the construction camps</li> <li>Display emergency contact numbers clearly and prominently at strategic places in camps.</li> <li>Communicate the roles and responsibilities of laborers in case of emergency in the monthly meetings with contractors</li> </ul>
Site Restoration	Restoration of the construction camps to original condition requires demolition of construction camps.	<ul> <li>The Contractor shall</li> <li>Dismantle and remove from the site all facilities established within the construction camp including the perimeter fence and lockable gates at the completion of the construction work.</li> <li>Dismantle camps in phases and as the work gets decreased and not wait for the entire work to be completed</li> <li>Give prior notice to the laborers before demolishing their camps/units</li> <li>Maintain the noise levels within the national standards during demolition activities</li> <li>Different contractors shall be hired to demolish different structures to promote recycling or reuse of demolished material.</li> <li>Reuse the demolition debris to a maximum extent. Dispose remaining debris at the designated waste disposal site.</li> <li>Handover the construction camps with all built facilities as it is if agreement between both parties (contactor and land-owner) has been made so.</li> <li>Restore the site to its condition prior to commencement of the works or to an agreed condition with the landowner.</li> <li>Not make false promises to the laborers for</li> </ul>

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		future employment in O&M of the project.
ECoP 17: Cultural a	nd Religious Issues	
Construction activities near religious and cultural sites	Disturbance from construction works to the cultural and religious sites, and contractors lack of knowledge on cultural issues cause social disturbances	<ul> <li>The Contractor shall</li> <li>Communicate to the public through community consultation and newspaper announcements regarding the scope and schedule of construction, as well as certain construction activities causing disruptions or access restriction.</li> <li>Do not block access to cultural and religious sites, wherever possible</li> <li>Restrict all construction activities within the foot prints of the construction sites.</li> <li>Stop construction works that produce noise (particularly during prayer time) shall there be any mosque/religious/educational institutions close to the construction sites and users make objections.</li> <li>Take special care and use appropriate equipment when working next to a cultural/religious institution.</li> <li>Stop work immediately and notify the site manager if, during construction, an archaeological or burial site is discovered. It is an offence to recommence work in the vicinity of the site until approval to continue is given by the Construction Contractor /PMU. Provide separate prayer facilities to the construction time</li> <li>Resolve cultural issues in consultation with local leaders and supervision consultants</li> <li>Establish a mechanism that allows local people to raise grievances arising from the construction process.</li> <li>Inform the local authorities responsible for health, religious and security duly informed before commencement of civil works so as to maintain</li> </ul>
		effective surveillance over public health, social and
FCoP 18: Worker H	ealth and Safety	security matters
Best practices	Construction works may	The Contractor shall
	pose health and safety risks to the construction workers and site visitors leading to severe injuries and deaths. The population in the proximity of the construction site and the construction workers will	<ul> <li>implement suitable safety standards for all workers and site visitors which shall not be less than those laid down on the international standards (e.g. National / International Labor for 'Safety and Health in Construction; World Bank Group's 'Environmental Health and Safety Guidelines') and contractor's own national standards or statutory regulations, in addition to complying with the national standards of the Government of Assam and Government of India</li> </ul>

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
	be exposed to a number of (i) biophysical health risk factors, (e.g. noise, dust, chemicals, construction material, solid waste, waste water, vector transmitted diseases etc), (ii) risk factors resulting from human behavior (e.g. STD, HIV etc) and (iii) road accidents from construction traffic.	<ul> <li>Provide the workers with a safe and healthy work environment, taking into account inherent risks in its particular construction activity and specific classes of hazards in the work areas,</li> <li>Provide personal protection equipment (PPE) for workers, such as safety boots, helmets, masks, gloves, protective clothing, goggles, full-face eye shields, and ear protection. Maintain the PPE properly by cleaning dirty ones and replacing them with the damaged ones.</li> <li>Safety procedures include provision of information, training and protective clothing to workers involved in hazardous operations and proper performance of their job</li> <li>Appoint an environment, health and safety manager to look after the health and safety of the workers</li> <li>Inform the local authorities responsible for health, religious and security duly informed before commencement of civil works and establishment of construction camps so as to maintain effective surveillance over public health, social and security Matters</li> </ul>
	Child and pregnant labor	<ul> <li>The Contractor shall</li> <li>not hire children of less than 14 years of age and pregnant women or women who delivered a child within 8 preceding weeks, in accordance with the Bangladesh Labor Code, 2006</li> </ul>
Accidents	Lack of first aid facilities and health care facilities in the immediate vicinity will aggravate the health conditions of the victims	<ul> <li>Provide health care facilities and first aid facilities are readily available. Appropriately equipped first-aid stations shall be easily accessible throughout the place of work Document and report occupational accidents, diseases, and incidents.</li> <li>Prevent accidents, injury, and disease arising from, associated with, or occurring in the course of work by minimizing, so far as reasonably practicable, the causes of hazards. In a manner consistent with good international industry practice.</li> <li>Identify potential hazards to workers, particularly those that may be life-threatening and provide necessary preventive and protective measures.</li> <li>Provide awareness to the construction drivers to strictly follow the driving rules</li> <li>Provide adequate lighting in the construction area and along the roads</li> </ul>
Construction Camps	Lack of proper infrastructure facilities, such as housing, water supply and sanitation facilities will increase pressure on the local services and generate	<ul> <li>The Contractor shall provide the following facilities in the campsites to improve health and hygienicconditions as mentioned in ECoP 17 Construction Camp Management</li> <li>Arrangement for trainings</li> <li>Adequate ventilation facilities</li> <li>Safe and reliable water supply. Water supply from deep tube wells that meets the national standards</li> </ul>



Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
	substandard living standards and health	<ul> <li>Hygienic sanitary facilities and sewerage system. The toilets and domestic waste water will be collected through a common sewerage.</li> <li>Treatment facilities for sewerage of toilet and domestic wastes</li> <li>Storm water drainage facilities.</li> <li>Recreational and social facilities</li> <li>Safe storage facilities for petroleum and other chemicals in accordance with ECoP 2</li> <li>Solid waste collection and disposal system in accordance with ECoP1.</li> <li>Paved internal roads.</li> <li>Security fence at least 2 m height.</li> <li>Sick bay and first aid facilities</li> </ul>
Water and sanitation facilities at the construction sites	Lack of Water sanitation facilities at construction sites cause inconvenience to the construction workers and affect their personal hygiene.	The contractor shall provide portable toilets at the construction sites, if about 25 people are working the whole day for a month. Location of portable facilities shall be at least 6 m away from storm drain system and surface waters. These portable toilets shall be cleaned once a day and all the sewerage shall be pumped from the collection tank once a day and shall be brought to the common septic tank for further treatment. Contractor shall provide bottled drinking water facilities to the construction workers at all the construction sites.
Other ECoPs	Potential risks on health and hygiene of construction workers and general public	<ul> <li>The Contractor shall follow the following ECoPs to reduce health risks to the construction workers and nearby community</li> <li>ECoP 2: Fuels and Hazardous Goods Management</li> <li>ECoP 4: Drainage Management</li> <li>ECoP 10: Air Quality Management</li> <li>ECoP 11: Noise and Vibration Management</li> <li>ECoP15: Road Transport and Road Traffic Management</li> <li>ECoP 16: River Transport management</li> </ul>
Trainings	Lack of awareness and basic knowledge in health care among the construction workforce, make them susceptible to potential diseases.	<ul> <li>The Contractor shall</li> <li>Train all construction workers in basic sanitation and health care issues (e.g., how to avoid malaria and transmission of sexually transmitted infections (STI) HIV/AIDS.</li> <li>Train all construction workers in general health and safety matters, and on the specific hazards of their work Training shall consist of basic hazard awareness, site specific hazards, safe work practices, and emergency procedures for fire, evacuation, and natural disaster, as appropriate.</li> <li>Commence the malaria, HIV / AIDS and STI education campaign before the start of the construction phase and complement it with by a strong condom marketing, increased access to condoms in the area as well as to voluntary counseling and testing.</li> <li>Implement malaria, HIV/AIDS and STI education campaign targeting all workers hired, international</li> </ul>

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		and national, female and male, skilled, semi- and unskilled occupations, at the time of recruitment and thereafter pursued throughout the construction phase on ongoing and regular basis. This shall be complemented by easy access to condoms at the workplace as well as to voluntary counseling and testing.
ECoP 19: Dredging	Management	
Locations of dredging	Impact on habitats of sensitive species such dolphin and migratory birds, and fish habitats	<ul> <li>The Contractor shall</li> <li>Avoid sensitive areas (dolphin and bird habitats, fish spawning areas and char lands) identified in the EIA. No dredging will be carried out within one kilometer from these sensitive areas.</li> <li>Obtain approval from Construction Contractor (construction supervision consultant) before starting dredging from any location</li> </ul>
Preconstruction studies	Quality of river bed sediments are to be established to identify potential impacts associated with dredging and placement. Proposed dredging locations are to be studied for their ecological sensitivity	<ul> <li>AIWTDS and Construction Contractor</li> <li>Will evaluate the river bed materials for their physical, chemical, biological, and engineering properties prior to initiation of dredging activities. Sediment quality studies for nutrients and pollutants are particularly important to monitor the impacts of dredging</li> <li>Carry out survey of the area prior to dredging</li> <li>Identify any sensitive receptors/habitats (e.g., dolphin area / turtle nesting area, birds colony) at or near the proposed dredging locations.</li> <li>Determine 'no-go' areas for dredging, based upon the above survey,</li> <li>Monitor the activity to ensure that the contractor complies with requirements</li> <li>Survey the area after dredging to identify any leftover impacts</li> </ul>
Dredging - Excavation	Increased turbidity, loss of transparency and increased suspended sediment concentrations. Impact on benthic habitats.	<ul> <li>The Contractor shall</li> <li>Select dredging equipment (e.g. Cutter Suction Dredger) which are known to have a low risk of sediment dispersal. The suction action inside the Cutter Suction Dredger means that most of the sediment removed by the cutter is captured. As high dredging efficiency and low turbidity at the cutter head are closely linked, it is uncommon for turbidity generated by the cutter head to cause environmental concern.</li> <li>Monitor the dredging operation and, if necessary, change the dredge location to minimize fines or modify operations, e.g. restrict the amount of material being dredged (or the number of dredgers allowed to operate) at any one time.</li> </ul>

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		Maintain record of all sand or sediment extraction     (quantities, location shown on map, timing, any
Dredging: Lifting	The release of suspended sediments during lifting can cause mortality to fish. The re-suspension of sediments can also release toxic chemicals or nutrients such as phosphates and nitrates, which may increase the eutrophic status of the system. Release of anaerobic sediment and organic matter in high concentrations may in some cases deplete the dissolved oxygen	<ul> <li>The Contractor shall</li> <li>Select dredging equipment (e.g. Cutter Suction Dredger) which are known to have a low risk of sediment releases from lifting.</li> <li>Reduce the suspended material released into the water column by adjusting the ratio of cutter revolutions to pump velocity to ensure that the cutter advancement rate is not greater than the ability of the suction pump to remove the material</li> <li>Monitor the lifting operations and if required use techniques (e.g. silt curtains) to minimize adverse impacts on aquatic life from the re suspension of sediments</li> </ul>
Dredging: Transportation	Leakages and spillage from the hydraulic pipeline	<ul> <li>The Contractor shall</li> <li>Regularly inspect and maintain equipment in order to prevent leaks.</li> <li>Develop and implement a spill prevention plan to prevent and contain accidental spills</li> </ul>
Dredging: Placement	Dispersion of sediments and release of high sediment laden runoff from the placement sites.	<ul> <li>The Contractor</li> <li>Shall directly place the sediments for filling the proposed disposal areas. Prior to filling commencing, the areas being filled will be subdivided into compartments by construction of temporary containment bunds of suitable material (e.g. dredged sand). Filling will be achieved by progressively pumping a slurry of sand and water into the bunded areas, allowing the surplus water to drain away to artificial and natural waterways in a controlled manner through the pipeline, without affecting floodplains.</li> <li>Control the discharge of site runoff, including excess dredge water, by the installation and correct use of containment walls, bunds and weirs.</li> <li>Monitor the quality of water (e.g. sediment content) in site runoff to confirm that the design and operation of the bunds and weirs, and the retention time for dredge waters which facilitates the settlement out of fine sediments prior to discharge off site, is adequate. If required, additional siltation ponds are to be provided to divert the runoff water before discharging in to the river.</li> </ul>
River Traffic	The presence of barges and associated vessels and discharge pipelines will pose a risk to local river traffic. There is also risk of collision of construction boats with	<ul> <li>The Contractor shall</li> <li>Provide proper navigational lighting for the barges and associated vessels</li> <li>Provide appropriate lighting to all floating pipelines and buoys</li> <li>Check all navigational lights routinely to ensure that they are working properly.</li> </ul>

Project Activity/	Environmental Impacts	Mitigation Measures/ Management Guidelines
Impact Source	-	
	dolphins.	• Limit the motor boat speed to 15 km/h in accordance with best international practices and to avoid any collision with dolphins. Pingers will be used to chase away dolphins form the construction areas thus minimizing the chances of any collision
Noise from dredging activities	Noise and vibration under water: Disruption to fish migration and disturbance to dolphins Noise and vibration above water: Nuisance to local community, disturbance to birds	<ul> <li>The Contractor shall</li> <li>Reduce the dredger noise at source by isolation of exhaust systems, by keeping engine room doors shut and by additional measures such as shielding.</li> <li>Limit the noisy dredging to daylight hours, where possible, rather than at sunrise or sunset (significant for wildlife) or during night time hours. Where unavoidable, the contractor should ramp up the levels of engines or other noise producing sources, so that the noise slowly increases. This will encourage riverine and terrestrial fauna to move away from the source area prior to significant noise emissions</li> <li>Inspect and maintain equipment in good working condition</li> </ul>
Exhaust emissions	Air pollution and release of greenhouse gases from construction equipment	<ul> <li>The Contractor shall</li> <li>Inspect and maintain equipment in good working condition. Proper maintenance of engines ensures full combustion with low soot emissions.</li> <li>Select and operate equipment and manage operations to reduce engine emissions.</li> <li>Use low-Sulphur heavy fuels to reduce noxious emissions.</li> <li>Provide Exhaust filtering.</li> </ul>
Oil spills	Oil spills	<ul> <li>The Contractor shall</li> <li>Refuel of barges and boats with a proper care to avoid any spills.</li> <li>Make available spill kits and other absorbent material at refueling points on the barges</li> </ul>
Bilge water	Waste water disposal from the barges and associated vessels	<ul> <li>The Contractor shall</li> <li>Properly collect, treat and dispose the bilge water from of barges, and boats.</li> <li>Empty barge or hopper from rest load by washing or mechanical cleaning before moving between different dredging areas to prevent distribution of contaminated material through residual loads</li> </ul>

## Annexure - 2

## Annexure 2: Environmental Screening Requirement

Name of the project Ghat	
Date of Visit	
Duration	
Does the proposal relate to new project Expansion/ modernization	
Ferry / Ghat Name:	
River Name: River Bank:	
Team:	
Purpose of Site Visit	
Length in kilometres from one Bank to other (South and North or Vice versa)	
Daily Passengers Group Number Purpose	
Site Description	
Connectivity: By Road / Rail / Ferry	
Approach Road	
Existing Facilities / infrastructure	
Proposed Facilities / infrastructure	
Proposed locations for workshops / boat manufacturing units	
Geographical information Latitude: Longitude:	
G.T. Sheet No. (Survey of India Map No.) if available	
Elevation above Mean Sea Level (meters) Min.: Max.:	
Total Area proposed for the Project (in ha.)	
Nature of Terrain	
Nature of Soli (clayey, sandy, slity, loam etc)	
Current Land Use of the Proposed Project Site Area (in ha.)	

Agricultural	Irrigated		
Agricultural			
	Un-Irrigated		
Homestead			
Forest			
Notified Industrial Area/Estate			
Grazing			
Fallow			
Orchards			
Sand dunes			
No development zone			
Marshes			
National Park/Sanctuary			
Alternate Routes Considered			
Reason for selecting the propo	osed Route		
Alternative Sites considered	Alternative Sites considered		
Details of Alternative sites duri	ng site visit		
Land Use Plan			
Does the proposed project of	onform to the approved land use?		
If not clearly indicate whic	h of the stretches are not as per		
approved land use			
Ownership			
Does it conform to the Regional Development Plan?			
RRZ Details			
What is the categorization of the RRZ area			
Does the proposed activity qualify under the category of			
If ves, under what provision it is permitted			
Fourier mental consitiuity details within 40 km from the boundary of the mariest for			
applicability of "General Condition (GC)" as per EIA notification dated 14.9.2006 and amendments as on date			

S.No	Item	Name		Aerial Distand (in Km)	ce
a.	Protected areas notified under the wild life (Protection) Act, 1972				
b.	Critically polluted areas as identified by the CPCB				
C.	Eco-sensitive areas as notified under section 3 of the E (P) Act 1986				
d.	Inter-state boundaries and international boundaries				
Enviror Note: T Elephar / Wildlif Breedin	mental sensitivity areas as me he details shall also include Nation t Reserve / Turtle resting ground e habitat / Habitat of endangere g site / Nesting site	entioned at colu onal park / Marin I / Core zone of E ed / exotic spec	<b>mn 9(III) of</b> le park / Sar Biosphere re ies / Lakes	<b>EIA Notification 20</b> hctuary / Tiger rese serve / Reserved fo / Reservoirs / Dar	006. rve / prest ms /
S.No	Item		Name / Identity	Aerial distance (within 15 km) Proposed project location boundary	
a.	Areas protected under conventions, national or local their ecological, landscape, cu related value	international legislation for ultural or other			
b.	Areas which are important or s ecological reasons – watercourses or other wat coastal zone, biospheres, forests	sensitive for Wetlands, er bodies, mountains,			
C.	Areas used by protected, sensitive species of flora breeding, nesting, foraging, wintering, migration	important or or fauna for resting, over			
d.	Inland, coastal, marine or unde	rground waters			
e.	State, National boundaries				
f.	Routes or facilities used by access to recreation or other areas	the public for tourist, pilgrim			
g.	Defence installations				
h.	Densely populated for built-up a	area			
i.	Areas occupied by sensitive r uses (hospitals, schools, plac community facilities)	nan-made land es of worship,			

j. Areas cor scarce res surface	Areas containing important, high quality or scarce resources (ground water resources, surface resources, forestry, agriculture,				
fisheries, to	fisheries, tourism, minerals)				
k. Areas alr environme legal enviro	eady subjected to pollution on the pollution of the pollu	r g			
I. Areas sus could ca environme subsidence extreme or	Areas susceptible to natural hazard which could cause the project to present environmental problems (earthquakes, subsidence, landslides, erosion, flooding or extreme or adverse climatic conditions)				
Baseline data					
Ambient air quality c	lata				
Noise data					
Human Settlement		I			
Human Settlement	Within the Project area	Within 500 r	nt of ROW		
Population					
No. of Houses					
Does the proposed nesting ground? If yes, provide the	Does the proposed project site involve any breeding or nesting ground? If yes, provide the following details				
Name of the aquatic	; organism				
Type of Habitat					
Period of year in which activity takes place					
Independent report of bio-habitat study may be furnished					
Does the Proposed Route Involve Migratory Path of Animals? If yes, please provide the following:					
Name of fauna					
Type of Habitat					
Period of year in which activity takes place					
Site Preparation					
Is the proposed area in low-lying area?					
Level before filling (above MSL in m)					
Level after filling (above MSL in m)					

Details of fill material required			
Quantity of fill material required (in cu.m)	Source		
Would the above filling result in complete/ par Bodies?	tial filling of water		
Does the site involve stripping / dredging? If yes, provide the following details: ✓ Size of the area to be stripped / dredge	ed		
✓ Location			
✓ Soil Type			
✓ Volume & Quantity of Earth to be remo	oved		
✓ Location of Dumpsite			
<ul> <li>✓ Proposal for utilization of removed topsoil</li> <li>✓ Management plan / location for dumping of dredged material</li> </ul>			
Does it involve cutting?			
$\checkmark$ Size of the area to be cut			
✓ Depth of Cut			
✓ Location			
✓ Soil Type			
✓ Volume & Quantity of Earth & other materials to be removed			
✓ Location of Dumpsite			
Does the site preparation require cutting of trees?			
✓ How many trees are to be cut?			
✓ Species of the above trees			
<ul> <li>Are there any protected/endangered s</li> <li>provide details</li> </ul>	pecies? If yes,		
In case the approach road passes through	a flood plain of a		
river following details are required:			
✓ Detailed micro-drainage			
<ul> <li>✓ Flood passages</li> <li>✓ Flood pariodicity in the area</li> </ul>			
Does the proposed project involve construction on any sandy stretch?         If yes, please furnish detail         Does the project involve extraction of sand, levelling or digging of sandy stretches within 500 meters of high tide line?         If yes, mention the activity involved and area.         Stretch         Area in sq.m         Does the project involve any dredging?         If yes, extent of dredging, disposal of dredged material etc)         Does the project involve any land reclamation?         If yes, please provide the following details         ✓ Activity for which land to be reclaimed         ✓ Area of land to be reclaimed (Hectares)         Does the Project have any Adverse Effect on			
--			
stretch?         If yes, please furnish detail         Does the project involve extraction of sand, levelling or digging of sandy stretches within 500 meters of high tide line?         If yes, mention the activity involved and area.         Stretch         Area in sq.m         Does the project involve any dredging?         If yes, extent of dredging, disposal of dredged material etc)         Does the project involve any land reclamation?         If yes, please provide the following details         ✓ Activity for which land to be reclaimed         ✓ Area of land to be reclaimed (Hectares)         Does the Project have any Adverse Effect on			
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digging of sandy stretches within 500 meters of high tide line?         If yes, mention the activity involved and area.         Stretch         Area in sq.m         Does the project involve any dredging?         If yes, extent of dredging, disposal of dredged material etc)         Does the project involve any land reclamation?         If yes, please provide the following details         ✓ Activity for which land to be reclaimed         ✓ Area of land to be reclaimed (Hectares)         Does the Project have any Adverse Effect on			
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<ul> <li>✓ Activity for which land to be reclaimed</li> <li>✓ Area of land to be reclaimed (Hectares)</li> </ul> Does the Project have any Adverse Effect on			
✓ Area of land to be reclaimed (Hectares) Does the Project have any Adverse Effect on			
Does the Project have any Adverse Effect on			
Biodiversity?			
If so, details of flora and fauna so affected:			
Natural resource conservation and optimization			
The use of alternative materials for construction such as fly ash,			
quarry over burden etc should be furnished			
Water requirements during construction (cu.m./day)			
S.No Purpose Demand Source			
1. Approach Road making			
2. Intrastructure Constriction			
3. Dust Suppression			
3. Dust Suppression       4. Drinking			
3. Dust Suppression       4. Drinking       5. Others (Please specify)			
3. Dust Suppression       4. Drinking       5. Others (Please specify)       Total			
3. Dust Suppression       4. Drinking       5. Others (Please specify)       Total			
3. Dust Suppression       4. Drinking       5. Others (Please specify)       Total   Solid Waste management			
3. Dust Suppression       4. Drinking       5. Others (Please specify)       Total   Solid Waste management			
3. Dust Suppression         4. Drinking         5. Others (Please specify)         Total         Solid Waste management         An additional information and adopt relevant queries/practices for environmental screening			
3.       Dust Suppression         4.       Drinking         5.       Others (Please specify)         Total    Solid Waste management An additional information and adopt relevant queries/practices for environmental screening and scoping under proposed project.			

## Desk Review of Screening Parameters after Site Visit for each Location

Sr.No	Screening Questions	Yes / No / ? . Briefly
	-	describe
1.	Will construction, operation or decommissioning of the	
	Project involve actions which will cause physical	
	changes in the locality (topography, land use, changes	
	in water bodies, etc.)?	
2.	Will construction or operation of the Project use natural	
	resources such as land, water, materials or energy,	
	especially any resources which are non-renewable or in	
	short supply?	
3.	Will the Project involve use, storage, transport, handling	
	or production of substances or materials which could be	
	harmful to human health or the environment or raise	
	concerns about actual or perceived risks to human	
	health?	
4.	Will the Project produce solid wastes during	
	construction or operation or decommissioning?	
5.	Will the Project release pollutants or any hazardous,	
	toxic or noxious substances to air?	
٥.	Will the Project cause noise and vibration of release of	
7	Nill the Draiget lead to ricks of contemination?	
7.	will the Project lead to fisks of contamination of land of	
	water from releases of pollutants onto the ground of into	
	surface waters, groundwater, coastar wasters of the	
8	Will there be any risk of accidents during construction or	
0.	operation of the Project which could affect human health	
	or the environment?	
9.	Will the Project result in social changes for example, in	
	demography, traditional lifestyles, employment?	
10.	Are there any other factors which should be considered	
	such as consequential development which could lead	
	to environmental effects or the potential for cumulative	
	impacts with other existing or planned activities in the	
	locality?	
11.	Are there any areas on or around the location which are	
	protected under international or national or local	
	legislationfor their ecological, landscape, cultural or	
	other value, which could be affected by the project?	
12.	Are there any other areas on or around the location	
	which are important or sensitive for reasons of their	
	ecology e.g. wetlands, watercourses or other	
	waterbodies, the coastal zone, mountains, forests or	
	woodlands, which could be affected by the project?	
13.	Are there any areas on or around the location which are	
	used by protected, important or sensitive species of	
	iauna or nora e.g. for preeding, nesting, foraging,	
	resung, overwintening, migration, which could be	
1 /	Ane there any inlend accepted marine or underground	
14.	ALE MELE ANY IMANU. COASIAL MAINE OF UNDEROFOUND	1

	waters on or around the location which could be affected by the project?	
15.	Are there any areas or features of high landscape or	
	scenic value on or around the location which could be	
	affected by the project	
16.	Are there any routes or facilities on or around the	
	location which are used by the public for access to	
	recreation or other facilities, which could be affected by	
	the project?	
17	Are there any transport routes on or around the location	
	which are susceptible to congestion or which cause	
	any ironmontal problems, which could be affected by the	
	environmental problems, which could be allected by the	
10	project?	
10.	is the project in a location where it is likely to be highly	
40	visible to many people?	
19.	Are there any areas or features of historic or cultural	
	importance on or around the location which could be	
	affected by the project?	
20.	Is the project located in a previously undeveloped area	
	where there will be loss of greenfield land?	
21.	Are there existing land uses on or around the location	
	e.g. homes, gardens, other private property, industry,	
	commerce, recreation, public open space, community	
	facilities, agriculture, forestry, tourism, mining or	
	quarrying which could be affected by the project?	
22.	Are there any plans for future land uses on or around	
	the location which could be affected by the project?	
23.	Are there any areas on or around the	
	location which are densely populated or built-up, which	
	could be affected by the project?	
24.	Are there any areas on or around the location which is	
	occupied by sensitive land uses e.g. hospitals, schools,	
	places of worship, community facilities, which could be	
	affected by the project?	
25.	Are there any areas on or around the location which	
	contain important, high quality or scarce resources e.g.	
	groundwater, surface waters, forestry, agriculture,	
	fisheries, tourism, minerals, which could be affected by	
	the project?	
26.	Are there any areas on or around the location which are	
	already subject to pollution or environmental damage	
	e.g. where existing legal environmental standards are	
	exceeded, which could be affected by the project?	
27.	Is the project location susceptible to earthquakes,	
	subsidence, landslides, erosion, flooding or extreme or	
	adverse climatic conditions e.g. temperature inversions,	
	fogs, severe winds, which could cause the project to	
	present environmental problems?	

## Annexure - 3

Development Site Location	Site Specific Findings	Advantages	Disadvantages	Remarks
North Guwahati (On North Bank of Brahmaputra)	<ul> <li>Ghat is muddy flat land.</li> <li>As per record observed at office of Ghat, Daily average 1000 Passenger travel from Ghat.</li> <li>Visual observation on water quality is turbid and contaminated.</li> <li>Basic Infra is lacking for passengers like ramp, approach paved roads, ticket house, security, toilet facilities, waiting area, parking area etc.</li> <li>Passenger has to go on pontoons by temporary bamboo ramps / structures which are big problem during rainy season.</li> <li>Ghat is highly eroded due to flood with silt deposits.</li> <li>Solid waste is dumped and scattered on site.</li> <li>Water-pollution might harm the water-born diseases but only those which move or stay close to the jetty.</li> </ul>	<ul> <li>Environment Considerations:</li> <li>No tree cutting is associated.</li> <li>Site is open sandy with no development</li> <li>Site is with WRD.</li> <li>Site is accessible by Barpeta Hajo Guwahati Road which is District Road No. 2 and city roads which are already developed.</li> <li>Settlements located are at app. 500 m from site thus minimal impact due to project activities.</li> <li>Locally available raw material (sand) for transportation</li> <li>Site is not part of or close to any eco-sensitive location</li> <li>Design Considerations:</li> <li>Availability of land required for berthing and supportive infrastructure.</li> </ul>	<ul> <li>Environment Considerations:</li> <li>Gangatic Dolphins which is Schedule 1 species as per Wildlife Act, 1972 are existing in this stretch of river 2.5 km upstream of the site in North east direction near Umananda Ghat and 3 km near Kacheri Ghat</li> <li>Total 20 dolphins are recorded</li> <li>Approach from city roads to the Ferry Ghat is not developed. In rainy season the passengers face problem.</li> <li>Site not directly connected to any public paved road at present.</li> <li>Design Considerations:</li> <li>River banks and bed are required to be protected from erosion &amp; scouring.</li> <li>Availability of sufficient depth for berthing &amp; movement of ships and thus minimum dredging is required</li> </ul>	<ul> <li>No alternatives assessed as site already selected and land already with WRD. Anticipated impact on Dolphins and Aquatic ecology due to barge movement is analysed to be low as boat movement will be regulated at speed of 5kmph.</li> <li>No major environment, social or design issue associated</li> <li>All the negative impacts listed are manageable with proposed environment &amp; social management plans thus no major drawbacks associated with the site</li> </ul>

## Annexure 3 - Screening Exercise for Currently Identified Ghats



Development Site Location	Site Specific Findings	Advantages	Disadvantages	Remarks
Lachit Ghat (On South Bank of Brahmaputra)	<ul> <li>Ghat is muddy flat land.</li> <li>As per record observed at office of Ghat, Daily average 800 Passenger travel from Ghat.</li> <li>Infrastructure facility like passenger waiting area, toilets, parking area at Ghat is provided.</li> <li>Small area for security, toilet facilities, waiting area is accounted</li> <li>Toilet facility provided to passenger but toilet waste not treated directly release into river</li> <li>Visual observation on water quality is turbid and contaminated.</li> <li>Basic Infra is lacking for passengers like ramp, approach paved roads</li> <li>Passenger has to go on pontoons by temporary bamboo ramps / structures which are big problem during rainy season.</li> <li>Ghat is highly eroded due to flood with silt deposits.</li> <li>Solid waste is dumped and scattered on site.</li> <li>Water-pollution might harm the water-born diseases but only those which move or stay close to the ports</li> </ul>	<ul> <li>Environment Considerations:</li> <li>No tree cutting is associated.</li> <li>Site is open sandy with no development upto 400mts</li> <li>Small encroachments are seen on Ghats</li> <li>High siltation is recorded</li> <li>Site is with WRD.</li> <li>Site is accessible by MG Road and city roads which are already developed.</li> <li>Settlements located are at app. 400 m from site thus minimal impact due to project activities.</li> <li>Locally available raw material (sand) for transportation</li> <li>Site is not part of or close to any eco-sensitive location</li> <li>Design Considerations:</li> <li>Availability of land required for berthing and supportive infrastructure.</li> </ul>	<ul> <li>Environment Considerations:</li> <li>Gangatic Dolphins which is Schedule 1 species as per Wildlife Act, 1972 are existing in this stretch of river 1.5 km upstream of the site in North east direction near Umananda Ghat and 2 km near Kacheri Ghat</li> <li>Total 20 dolphins are recorded</li> <li>Approach from city roads to the Ferry Ghat is not developed. In rainy season the passengers face problem.</li> <li>Site not directly connected to any public paved road at present.</li> <li>Design Considerations:</li> <li>River banks and bed are required to be protected from erosion &amp; scouring.</li> <li>Availability of sufficient depth for berthing &amp; movement of ships and thus minimum dredging is required</li> </ul>	<ul> <li>No alternatives assessed as site already selected and land already with WRD. Anticipated impact on Dolphins and Aquatic ecology due to barge movement is analysed to be low as boat movement will be regulated at speed of 5kmph.</li> <li>No major environment, social or design issue associated</li> <li>All the negative impacts listed are manageable with proposed environment &amp; social management plans thus no major drawbacks associated with the site</li> </ul>



Development Site Location	Site Specific Findings	Advantages	Disadvantages	Remarks
Rajaduar Ghat (On South Bank of Brahmaputra)	<ul> <li>Rajaduwar Ghat shifts to a maximum distance of half a kilometer during January till mid April. Villagers say that this is caused by frequent sand deposits. It can be easily assumed from the time that a boat takes to cross over during the summer and the winter months. During May till early October a mechanized boat normally takes 15–20 minutes to cross over while between January and April a boat takes 10 minutes to reach the other Ghat.</li> <li>As per record observed at office of Ghat, Daily average 1200 Passenger travel from Ghat.</li> <li>Very much sloppy muddy approach to Ferry Location</li> <li>Basic Infra is lacking for passengers like ramp, approach paved roads, ticket house</li> <li>Small area for security, toilet facilities, waiting area is accounted</li> <li>No parking area</li> <li>Passenger has to go on pontoons by temporary bamboo ramps / structures which are big problem during rainy season.</li> <li>Ghat is highly eroded due to flood with silt deposits.</li> <li>Solid waste is dumped and scattered on site.</li> <li>Water-pollution might harm the water – born diseases but only those which move or stay close to the ports</li> </ul>	<ul> <li>Environment Considerations:</li> <li>No tree cutting is associated.</li> <li>Site is open sandy with no development upto 200mts</li> <li>Small encroachments are seen on Ghats</li> <li>High siltation is recorded</li> <li>Site is with WRD.</li> <li>Site is accessible by AmingaonDoulGobinda Road and city roads which are already developed.</li> <li>Settlements located are at app. 500 m from site thus minimal impact due to project activities.</li> <li>Locally available raw material (sand / concrete / steel) for transportation</li> <li>Site is not part of or close to any eco-sensitive location</li> <li>Design Considerations:</li> <li>Availability of land required for berthing and supportive infrastructure.</li> </ul>	<ul> <li>Environment Considerations:</li> <li>Gangatic Dolphins which is Schedule 1 species as per Wildlife Act, 1972 are existing in this stretch of river 2.0 km upstream of the site in North east direction near Umananda Ghat and 2.5 km near Kacheri Ghat.</li> <li>Total 20 dolphins are recorded</li> <li>Approach from city roads to the Ferry Ghat is not developed. In rainy season the passengers face problem.</li> <li>Site not directly connected to any public paved road at present.</li> <li>Pesign Considerations:</li> <li>River banks and bed are required to be protected from erosion and scouring.</li> <li>Availability of sufficient depth for berthing and movement of ships and thus minimum dredging is required</li> </ul>	<ul> <li>No alternatives assessed as site already selected and land already with WRD. Anticipated impact on Dolphins and Aquatic ecology due to barge movement is analysed to be low as boat movement will be regulated at speed of 5 kmph.</li> <li>Major environment, social or design issue associated due to siltation Ghat shifting</li> <li>All the negative impacts listed are manageable with proposed environment management plans thus no major drawbacks associated with the site</li> </ul>



Development Site Location	Site Specific Findings	Advantages	Disadvantages	Remarks
Aphalamukh and Kamalabari Ghat (On North Bank of Brahmaputra)	<ul> <li>Erosion hazard posed by the river Brahmaputra is very serious in Majuli and a large chunk of the Majuli Island i.e. about 35.00 % of its present area has already been lost to the river in the last few decades.</li> <li>Heavy pressure exerted by high flood water on the embankment, washed away the weaker portion of the embankment and inundated the nearby area with consequent effect of heavy silt and sand deposition on the fertile cultivated fields. Besides, due to high rate of erosion, the locations of the jetty are changed.</li> <li>Deposition of sand due to flood caused loss of agricultural land to some extent by diminishing the fertility of soil. At the riverbank areas it has been a severe problem that hundreds hectare of land including a huge area of agricultural land is submerged by the sands and silts carried by the floods. At the Jetty areas too, a huge area is submerged by the sands and silts carried by the floods. At the Jetty areas too, a huge area is submerged by the sands and silts carried by the floods. At the Jetty areas too, a huge area is submerged by the sands and silts carried by the floods and river water.</li> <li>It is leading to the degradation of soil quality which ultimately hampers in agricultural production of hundreds families. In some places the available paddy fields have become completely barren due to heavy siltation. Besides, deposition of sands and silts in many ponds hampering fish cultivation and submersion of roads connected to the jetty is leading to communication problem.</li> <li>Several inhabitants have displaced from their original habitation to suitable places. Cultivation and farmers are hampered to a great extent.</li> <li>Ghat has existing infrastructure facility on IWT Pontoon for Ticket counter, administration; passenger waiting area, maintenance, vehicle parking area for two wheelers &amp; 4 wheelers and has access to the public road system. Ghat is connected through unpaved road. There are shops around the approach road to the Ghat. Existing Ghat has land avai</li></ul>	<ul> <li>Environment Considerations:</li> <li>No tree cutting is associated.</li> <li>Site is open sandy with no development upto 200mts</li> <li>Agricultural land parcels are existing surrounding both the Ghats</li> <li>High siltation is recorded</li> <li>Site is with WRD.</li> <li>Kamalabari Ghat Site is accessible by NLK Road and village roads which are already developed.</li> <li>However Aphalamukh has poor connectivity</li> <li>Settlements are located on Ghat along of Aphalamukh with small shops. Hence major impacts are anticipated.</li> <li>Settlements are far away from Kamalabari Ghat</li> <li>Locally available raw material (sand / concrete / steel) for transportation</li> <li>Site is not part of or close to any eco-sensitive location</li> <li>Design Considerations:</li> <li>Availability of land required for berthing and supportive infrastructure.</li> </ul>	<ul> <li>Environment Considerations:</li> <li>Gangatic Dolphins which is Schedule 1 species as per Wildlife Act, 1972 are existing in this stretch of river. Total 6 dolphins are counted by the ecologist in the area near Neamati Ghat area</li> <li>Approach from city roads to the Ferry Ghat is not developed. In rainy season the passengers face problem.</li> <li>Site not directly connected to any public paved road at present.</li> <li>Highly eroded ghats with silt deposits</li> <li>Design Considerations:</li> <li>River banks and bed are required to be protected from erosion and scouring.</li> <li>Availability of sufficient depth for berthing and movement of ships and thus minimum dredging is required</li> </ul>	<ul> <li>No alternatives assessed as site already selected and land already with WRD. Anticipated impact on Dolphins and Aquatic ecology due to barge movement is analysed to be high</li> <li>Major environment, social or design issue associated due to siltation Ghat shifting</li> <li>All the negative impacts listed are manageable with proposed environment management plans thus no major drawbacks associated with the site</li> <li>River training and erosion control measures are required very much in priority</li> </ul>

Development Site Location	Site Specific Findings	Advantages	Disadvantages	Remarks
	ramps / structures which are big problem during rainy			
	season.			
	• Ghat is highly eroded due to flood with silt deposits.			
	<ul> <li>Solid waste is dumped and scattered on site.</li> </ul>			
	<ul> <li>Water-pollution might harm the water – born diseases but</li> </ul>			
	only those which move or stay close to the ports			
	Aph	alamukh Ghat		
			Uterityd frai (red crai	





Development Site Location	Site Specific Findings	Advantages	Disadvantages	Remarks
	<ul> <li>carried by the floods. At the Jetty areas too, a huge area is submerged by the sands and silts carried by the floods and river water. It is leading to the degradation of soil quality which ultimately hampers in agricultural production of hundreds families. In some places the available paddy fields have become completely barren due to heavy siltation. Besides, deposition of sands and silts in many ponds hampering fish cultivation and submersion of roads connected to the jetty is leading to communication problem.</li> <li>Several inhabitants have displaced from their original habitation to suitable places. Cultivation and farmers are hampered to a great extent.</li> <li>Ghat is located in sandy and flat terrain area.</li> <li>Land is owned by Department of WRD, Jorhat. Ghat has existing infrastructure facility for Ticket counter, administration; passenger waiting area, maintenance, parking area at berth, toilet, vehicle parking area for two wheelers and 4 wheelers has access to the public road system.</li> <li>Ghat has also facilities like Safety jackets and rescue team with rescue boat. Ghat is connected through paved road which connects to Jorhat. There are shops along the approach road to the Ghat. Existing Ghat has land available for future development.</li> <li>Small area for security, toilet facilities, waiting area is accounted</li> <li>No parking area</li> <li>Passenger has to go on pontoons by temporary bamboo ramps / structures which are big problem during rainy season.</li> <li>Ghat is highly eroded due to flood with silt deposits.</li> <li>Solid waste is dumped and scattered on site.</li> <li>Water-pollution might harm the water – born diseases but only those which move or stay close to the ports</li> </ul>	<ul> <li>anticipated.</li> <li>Locally available raw material (sand / concrete / steel) for transportation</li> <li>Site is not part of or close to any eco-sensitive location</li> <li>Design Considerations:</li> <li>Availability of land required for berthing and supportive infrastructure.</li> </ul>	<ul> <li>Site not directly connected to any public paved road at present.</li> <li>Highly eroded Ghats with silt deposits</li> <li>Design Considerations: <ul> <li>River banks and bed are required to be protected from erosion and scouring.</li> </ul> </li> <li>Availabilityof sufficient depth for berthing and movement of ships and thus minimum dredging is required</li> </ul>	<ul> <li>All the negative impacts listed are manageable with proposed environment management plans thus no major drawbacks associated with the site</li> <li>River training and erosion control measures are required very much in priority</li> </ul>



Development Site Location	Site Specific Findings	Advantages	Disadvantages	Remarks
(On South Bank of Brahmaputra)	<ul> <li>flocking to the riverside region. The Kacharighat is the best place to enjoy some panoramic views of the river.</li> <li>Erosion hazard posed by the river Brahmaputra is not serious.</li> <li>Deposition of sand on the riverbank areas is a severe problem</li> <li>At the Jetty areas less area is available on landside</li> <li>Garden area is existing on the Ghat land side of Ghat</li> <li>Several shops and famous area based market is situated on the bank</li> <li>Ghat is muddy flat land.</li> <li>Kacheri Ghat is mainly used for the ferry to Umananda Ghat which is a main holy place of Assam.</li> <li>Daily 200 person travel from this Ghat to Umananda Ghat.</li> <li>Toilet facility for staff and passenger is provided but waste is not treated.</li> <li>Ghat is close to the road, no parking facility is available.</li> <li>Basic Infra is lacking for passengers like ramp, approach paved roads, ticket house, security, toilet facilities, waiting area</li> <li>No parking area</li> <li>Passenger has to go on pontoons by temporary bamboo ramps / structures which are big problem during rainy season.</li> <li>Ghat is highly eroded due to flood with silt deposits.</li> <li>Solid waste is dumped and scattered on site.</li> <li>Water-pollution might harm the water – born diseases but only those which move or stay close to the ports</li> </ul>	<ul> <li>Tree cutting is associated.</li> <li>Site is closed sandy with no development just within 5 to 10 meters</li> <li>Garden and market place just abutting the site</li> <li>High siltation is recorded</li> <li>Site is with WRD.</li> <li>Very good connectivity to Ghat location By Kacheri Road, MG Road</li> <li>Settlements are located on Ghat along with small shops. Hence major impacts are anticipated.</li> <li>Locally available raw material (sand / concrete / steel) for transportation</li> <li>Site is not part of or close to any eco-sensitive location but is near the Umananda Island which is the extended part of Urvashi Island which is archaeologically important site</li> <li>Site is main attraction of tourism due to the migratory birds and Umananda Island where religious Uma Shankar Temple is Situated</li> <li>Design Considerations:</li> <li>Availability of less land for berthing and supportive infrastructure.</li> <li>Hence design should be considered in without disturbing the environmental setting</li> </ul>	<ul> <li>Considerations:</li> <li>Gangatic Dolphins which is Schedule 1 species as per Wildlife Act, 1972are existing in this stretch of river. Total 20 dolphins are recorded by the ecologist in the area</li> <li>Site not directly connected to any public paved road at present.</li> <li>Highly eroded Ghats with silt deposits</li> <li>Design Considerations:</li> <li>River banks and bed are required to be protected from erosion and scouring.</li> <li>Availability of sufficient depth for berthing and movement of ships and thus minimum dredging is required</li> <li>Non Availability of land for Ghat development and other facilities</li> <li>Hence every facility is to be proposed on pontoons</li> </ul>	assessed as site already selected and land already with WRD. • Anticipated impact on Dolphins and Aquatic ecology due to barge movement is analysed to be high • Anticipated impact on the surrounding environment is expected high • Special development and design considerations is expected from tourism development point of view • Major environment, social or design issues associated due to siltation Ghat shifting • All the negative impacts listed are manageable with proposed environment management plans thus no major drawbacks associated with the site • River training and erosion control measures are required very much in priority



Development Site Location	Site Specific Findings	Advantages	Disadvantages	Remarks
	Kachari Ghat           Kachari Chat	e 2018 Google c 2018 DigitalGlobe	Google E	arth
Umananda Ghat	<ul> <li>Umananda Island is identified as Cultural heritage that attracts tourists from all across the clobe</li> </ul>	• Tree cutting is associated	Environment Considerations:	<ul> <li>No alternatives assessed as site</li> </ul>
(Island in	• Umananda Island is the home to the species of Golden	<ul> <li>Site is closed sandy with no</li> </ul>	<ul> <li>Gangatic Dolphins which is</li> </ul>	already selected and
Brahmaputra	Langur.	development just within 5 to 10	Schedule 1 species as per	land already with
River)	<ul> <li>The Island is dotted with Tamarind tree.</li> <li>Winter time sees a large variety of migratery and rare birds</li> </ul>	Garden and market place just	existing in this stretch of	<ul> <li>Anticipated impact on</li> </ul>
	flocking to the riverside region. The Kacheri Ghat is the	abutting the site	river. Total 20 dolphins are	Dolphins and Aquatic
	best place to enjoy some panoramic views of the river.	<ul> <li>High siltation is recorded</li> </ul>	recorded by the ecologist in	ecology due to barge
	• Erosion hazard posed by the river Brahmaputra is not	• Site is with WRD.	The area	movement is
	<ul> <li>Serious.</li> <li>Denosition of sand on the riverbank areas is a source</li> </ul>	<ul> <li>very good connectivity to Ghat</li> <li>location By Kacheri Road, MG</li> </ul>	to any public paved road at	<ul> <li>Anticipated impact on</li> </ul>
	problem	Road	present.	the surrounding

Development Site Location	Site Specific Findings	Advantages	Disadvantages	Remarks
	<ul> <li>At the Jetty areas less area is available on landside</li> <li>Garden area is existing on the Ghat side of land</li> <li>Several shops and famous area based market is situated on the bank</li> <li>Basic Infra is lacking for passengers like ramp, approach paved roads, ticket house, security, toilet facilities, waiting area</li> <li>No parking area</li> <li>Passenger has to go on pontoons by temporary bamboo</li> </ul>	<ul> <li>Settlements are located on Ghat along with small shops. Hence major impacts are anticipated.</li> <li>Locally available raw material (sand / concrete / steel) for transportation</li> <li>Umananda Island which is the extended part of Urvashi Island which archaeologically important site</li> <li>Site is main attraction of tourism due to the migratory birds and Umananda Island where religious Uma Shankar Temple is Situated</li> <li>Umananda Temple is identified as Cultural heritage structure</li> <li>Design Considerations:</li> <li>Availability of less land for berthing and supportive infrastructure.</li> <li>Hence design should be considered without disturbing the environmental setting</li> </ul>	<ul> <li>Highly eroded Ghats with silt deposits</li> <li>Design Considerations: <ul> <li>River banks and bed are required to be protected from erosion and scouring.</li> </ul> </li> <li>Availabilityof sufficient depth for berthing and movement of ships and thus minimum dredging is required</li> <li>Non Availability of land for Ghat development and other facilities</li> <li>Hence every facility is to be proposed on pontoons</li> </ul>	<ul> <li>environment is expected high</li> <li>Special development and design considerations is expected from tourism development point of view</li> <li>Major environment, social or design issues associated due to siltation Ghat shifting</li> <li>All the negative impacts listed are manageable with proposed environment management plans thus no major drawbacks associated with the site</li> <li>River training and erosion control measures are required very much in priority</li> </ul>



Developme Site Location	on Site Specific Findings	Advantages	Disadvantages	Remarks
		Panda Ghat	Google E	arth
Sonaram Ghat	Sonaram Ghat is just near Lachit Ghat at maximum     distance of balt a km	Environment Considerations:	Environment Considerations:	No alternatives
(On sou	th • Mainly used for Kamakhya Pilgrimage by passengers and	<ul> <li>Site is open sandy with no</li> </ul>	<ul> <li>Gangatic Dolphins which is</li> </ul>	as site already
bank	of for cargo facility and for Bamboo sailing	development upto 100mts	Schedule 1 species as per	selected
Brahmaputr	• Very much sloppy approach to Ferry Location	<ul> <li>Small encroachments are seen</li> </ul>	Wildlife Act, 1972are	and land already with
	Basic Infra is lacking for passengers like ramp, approach	on Ghats	existing in this stretch of	WRD.
	paved roads, ticket house, Small area for security, toilet	High siltation is recorded	river 3.0 km upstream of the	<ul> <li>Anticipated impact on Delphine and Agustic</li> </ul>
	racilities, waiting area	• Site is with WRD.	near Umananda Ghat and	ecology due to barge
	<ul> <li>No parking area</li> <li>Passenger has to go on pontoons by temporary hamboo</li> </ul>	<ul> <li>Site is accessible by AT Road and city roads which are</li> </ul>	3.5 km near Kacheri Ghat.	movement is
	ramps / structures which are big problem during rainv	already developed.	<ul> <li>Total 20 dolphins are</li> </ul>	analysed to

Development Site Location	Site Specific Findings	Advantages	Disadvantages	Remarks
	<ul> <li>season.</li> <li>Ghat is highly eroded due to flood with silt deposits.</li> <li>Solid waste is dumped and scattered on site.</li> <li>Water-pollution might harm the water – born diseases but only those which move or stay close to the ports</li> </ul>	<ul> <li>Settlements located are at app.100 m from site thus minimal impact due to project activities.</li> <li>Locally available raw material (sand / concrete / steel) for transportation</li> <li>Site is not part of or close to any eco-sensitive location</li> <li>Design Considerations:</li> <li>Non Availability of land required for berthing and supportive infrastructure.</li> </ul>	<ul> <li>recorded in this stretch of Guwahati</li> <li>Approach from city roads to the Ferry Ghat is not developed.</li> <li>Site not directly connected to any public paved road at present.</li> <li><b>Design Considerations:</b></li> <li>River banks and bed are required to be protected from erosion and scouring.</li> <li>Availabilityof sufficient depth for berthing and movement of ships and thus minimum dredging is required</li> <li>Availability of land for Ghat development and other facilities</li> <li>Hence some facility is to be protected of protected from erosion and scouring.</li> </ul>	<ul> <li>be low</li> <li>Major environment, social or design issue associated due to siltation</li> <li>All the negative impacts listed are manageable with proposed environment management plans thus no major drawbacks associated with the site</li> </ul>



Development Site Location	Site Specific Findings	Advantages	Disadvantages	Remarks
		Sonaram Sonaram	h oliversion of the left of the sector	THUE THUE Earth Las kn
Dhubri Ghat	<ul> <li>Dhuburi Ghat is near Bangladesh Border at maximum 12</li> </ul>	Environment	Environment	No alternatives
(On North	km distance		Considerations:	assessed
Bank of	• Mainly used for Fakirganj, Medartary and Jaleshwar on	• Sile is closed with no space	<ul> <li>Gangatic Dolphins which is Schedule 1 species as por</li> </ul>	as site aiready
Brahmaputra	for cargo facility and for Ramboo sailing	side	Wildlife Act 1972 are	and land already with
River)	• Ghat is muddy flat land and is in close vicinity to District	Highly populated area	existing in this stretch of	IWT.
	Judicial Court.	• Small traders / shopkeepers	river	<ul> <li>Anticipated impact or</li> </ul>
	Ghat is also near to BSF Camp.	are seen on Ghats	Total 7 dolphins are	Dolphins and Aquation
	• There are temporary shops along the approach road to the	<ul> <li>High siltation is recorded</li> </ul>	recorded in this stretch of	ecology due to barge
	Ghat. Existing Ghat has very limited land for future	<ul> <li>Site is with IWT.</li> </ul>	Dhuburi	movement
	development. Availability of land is an issue for	<ul> <li>Site is accessible by NH127B</li> </ul>	<ul> <li>Approach from city roads to</li> </ul>	analysed to

Development Site Location	Site Specific Findings	Advantages	Disadvantages	Remarks
	<ul> <li>development of this Ghat.</li> <li>Soil type in the area is sandy and clayey.</li> <li>Turbid water was observed at Ghat. Sandy soil is observed at Ghat.</li> <li>Automatic weather station (AWS) installed near to Ghat</li> <li>200 m upside of Ghat fishing activity is observed.</li> <li>Visual observation on water quality is turbid and contaminated.</li> <li>Basic Infra is lacking for passengers like ramp, approach paved roads, ticket house, Small area for security, toilet facilities, waiting area</li> <li>No parking area</li> <li>Passenger has to go on pontoons by temporary bamboo ramps / structures which are big problem during rainy season.</li> <li>Ghat is highly eroded due to flood with silt deposits.</li> <li>High Development on Ghat side</li> <li>Solid waste is dumped and scattered on site.</li> <li>Water-pollution might harm the water – born diseases but only those which move or stay close to the ports</li> </ul>	<ul> <li>and SH 28 and city roads which are already developed.</li> <li>Settlements located are at app.10 m from site thus maximum impact due to project activities.</li> <li>Locally available raw material (sand / concrete / steel) for transportation</li> <li>Site is not part of or close to any eco-sensitive location</li> <li>Design Considerations:</li> <li>Non Availability of land required for berthing and supportive infrastructure.</li> </ul>	<ul> <li>the Ferry Ghat is well developed.</li> <li>Site is directly connected to any public paved road at present.</li> <li>Design Considerations: <ul> <li>River banks and bed are required to be protected from erosion and scouring.</li> <li>Availabilityof sufficient depth for berthing and movement of ships and thus minimum dredging is required</li> <li>Non Availability of land for Ghat development and other facilities</li> <li>Hence every facility is to be proposed on pontoons</li> </ul> </li> </ul>	<ul> <li>be high</li> <li>Major environment, social or design issue associated due to siltation</li> <li>All the negative impacts listed are manageable with proposed environment management plans thus no major drawbacks associated with the site</li> </ul>





Development Site Location	Site Specific Findings	Advantages	Disadvantages	Remarks
	<ul> <li>to Phulbari, a commercial town in Meghalaya.</li> <li>There are temporary shops along the approach road to the Ghat.</li> <li>Existing Ghat has very limited land for future development. Availability of land is an issue for development of this Ghat.</li> <li>Soil type in the area is clayey.</li> <li>Passenger has to go on pontoons by temporary bamboo ramps / structures which are big problem during rainy season.</li> <li>Ghat Shifting is a major problem. During site visit no Ghat was existing on place. Ghat is highly eroded due to flood with silt deposits.</li> <li>Very low Development on Ghat side due to flood problem</li> <li>Water-pollution might harm the water – born diseases but only those which move or stay close to the ports</li> </ul>	<ul> <li>app.10 m from site thus maximum impact due to project activities.</li> <li>Locally available raw material (sand / concrete / steel) for transportation</li> <li>Site is not part of or close to any eco-sensitive location</li> <li>Design Considerations:</li> <li>Non Availability of land required for berthing and supportive infrastructure.</li> </ul>	<ul> <li>moderatelydeveloped.</li> <li>Site isnot directly connected to any public paved road at present.</li> <li>Design Considerations: <ul> <li>River banks and bed are required to be protected from erosion and scouring.</li> <li>Availabilityof sufficient depth for berthing and movement of ships and thus minimum dredging is required</li> <li>Non Availability of land for Ghat development and other facilities</li> <li>Hence every facility is to be proposed on pontoons</li> <li>Special care is to be taken during flood season</li> </ul> </li> </ul>	<ul> <li>Major environment, social or design issue associated due to siltation</li> <li>All the negative impacts listed are manageable with proposed environment management plans thus no major drawbacks associated with the site</li> </ul>



Development Site Location	Site Specific Findings	Advantages	Disadvantages	Remarks
	Paimara Pt.II Taltar Pt.gt	dartary/south salmara artary/south salmara	Energie de la constant de	arth
Jaleshwar Ghat	Jaleshwar Ghat is near Bangladesh Border at maximum 50 km distance Meiden Berke Medartere and	Environment Considerations:     Tree cutting during     development is opvised.	Environment Considerations:	No alternatives     assessed     as aits already
Bank of	Fakirganj on south bank of Brahmaputra by passengers,	<ul> <li>Site is open with lessspace for</li> </ul>	Schedule 1 species as per	as site already selected
Brahmaputra	<ul> <li>vehicles and for cargo facility and bamboo sailing</li> <li>Ghat is muddy flat land and no existing infrastructure is</li> </ul>	<ul> <li>development on landward side</li> <li>Highly populated area</li> </ul>	Wildlife Act, 1972 are existing in this stretch of	and land already with WRD.
River)	available for Ticket counter, administration, passenger	<ul> <li>Small traders / shopkeepers are</li> </ul>	river near Fakirganj, Dhubri,	<ul> <li>Anticipated impact on</li> </ul>
	waiting area, maintenance, parking area at berth, toilet and	seen on Ghats	Medartary	Dolphins and Aquatic
	• No infrastructure like pontoon, is seen on the Chat	High siltation is recorded	<ul> <li>recorded in this stretch of</li> </ul>	movement
			River	analysed to

Development Site Location	Site Specific Findings	Advantages	Disadvantages	Remarks
	<ul> <li>Ghat is connected through unpaved road. There are temporary shops along the approach road to the Ghat. Existing Ghat has very limited land for future development. Availability of land is an issue for development of this Ghat.</li> <li>Soil type in the area is clayey.</li> <li>Passenger has to go on pontoons by temporary bamboo ramps / structures which are big problem during rainy season.</li> <li>Ghat Shifting is a major problem. During site visit no Ghat was existing on place. Ghat is highly eroded due to flood with silt deposits.</li> <li>Very low Development on Ghat side due to flood problem</li> <li>Water-pollution might harm the water – born diseases but only those which move or stay close to the ports</li> </ul>	<ul> <li>Site is accessible by SH 46 and Gaurnagar Peerbari Road and city roads which are already developed.</li> <li>Settlements located are at app.100 m from site thus maximum impact due to project activities.</li> <li>Locally available raw material (sand / concrete / steel) for transportation</li> <li>Site is not part of or close to any eco-sensitive location</li> <li>Design Considerations:</li> <li>Non Availability of land required for berthing and supportive infrastructure.</li> </ul>	<ul> <li>Approach from city roads to the Ferry Ghat is moderately developed.</li> <li>Site isnot directly connected to any public paved road at present.</li> <li>Design Considerations:</li> <li>River banks and bed are required to be protected from erosion and scouring.</li> <li>Availabilityof sufficient depth for berthing and movement of ships and thus minimum dredging is required</li> <li>Non Availability of land for Ghat development and other facilities</li> <li>Hence every facility is to be proposed on pontoons</li> <li>Special care is to be taken during fload coacen</li> </ul>	<ul> <li>be high</li> <li>Major environment, social or design issue associated due to siltation</li> <li>All the negative impacts listed are manageable with proposed environment management plans thus no major drawbacks associated with the site</li> </ul>



Development Site Location	Site Specific Findings	Advantages	Disadvantages	Remarks
	<ul> <li>road system.</li> <li>Ghat is connected through unpaved road and further it has connectivity through metalled road to Meghalaya.</li> <li>There are temporary shops along the approach road to the Ghat.</li> <li>Existing Ghat has very limited land for future development. Availability of land is an issue for development of this Ghat.</li> <li>Soil type in the area is clayey.</li> <li>Passenger has to go on ferry by temporary bamboo ramps / structures which are big problem during rainy season.</li> <li>Ghat Shifting is a major problem. During site visit no Ghat was existing on place. Ghat is highly eroded due to flood with silt deposits.</li> <li>Very low Development on Ghat side due to flood problem</li> <li>Water-pollution might harm the water – born diseases but only those which move or stay close to the ports</li> </ul>	<ul> <li>Site is accessible by SH 46 and city roads which are already developed.</li> <li>Settlements located are at app.500 m from site thus maximum impact due to project activities.</li> <li>Locally available raw material (sand / concrete / steel) for transportation</li> <li>Site is not part of or close to any eco-sensitive location</li> <li>Design Considerations:</li> <li>Non Availability of land required for berthing and supportive infrastructure.</li> </ul>	<ul> <li>Approach from city roads to the Ferry Ghat is moderately developed.</li> <li>Site isnot directly connected to any public paved road at present.</li> <li>Design Considerations:</li> <li>River banks and bed are required to be protected from erosion and scouring.</li> <li>Availabilityof sufficient depth for berthing and movement of ships and thus minimum dredging is required</li> <li>Non Availability of land for Ghat development and other facilities</li> <li>Hence every facility is to be proposed on pontoons</li> <li>Special care is to be taken during flood season</li> </ul>	<ul> <li>be high</li> <li>Major environment, social or design issue associated due to siltation</li> <li>All the negative impacts listed are manageable with proposed environment management plans thus no major drawbacks associated with the site</li> </ul>

Development Site Location	Site Specific Findings	Advantages	Disadvantages	Remarks
VILES	या थी योग्या थी पाद्ध ! Chogment Pert !	Ghagmari Pt.II	Sun	derpare Pt.II
	Choto Fakt	kalla Pt.II gant Fakirgant	Sunderp	bara Pt.III
	Chotokalla Pt.III Porokoka Bt.I. Porokoka Bt.I. Polodimoro Tructu	Curdenar		43
	Bulukalla PUI Balaulilara 441744	© 2018 Coogle Current par © 2018 DigitalGlobe © 2018 CNES - Airbus	Google	e Earth
Anapurna Ghat (On South Bank of Barak River)	<ul> <li>Ghat is located on Barak River bank which famous for Annapurna Mata Temple situated from long period say from 100 years</li> <li>IWT office and Hydrology Department office for flood management is located on the Ghat</li> <li>Ghat is sandy particularly khas / patta land</li> <li>No Basic infrastructure is available for Ticket counter, administration, passenger waiting area, maintenance, parking area at berth, toilet, and vehicle parking area for</li> </ul>	<ul> <li>Environment Considerations:</li> <li>Tree cutting during development is envisaged</li> <li>Site is closed with lessspace for development on landward side</li> <li>Highly populated area</li> <li>Small traders / shopkeepers are seen on Ghats</li> <li>High siltation is recorded</li> </ul>	<ul> <li>Environment</li> <li>Considerations:</li> <li>Gangatic Dolphins which is Schedule 1 species as per Wildlife Act, 1972 are not recorded in this stretch of river</li> <li>Approach from city roads to the Ferry Ghat is</li> </ul>	<ul> <li>No alternatives assessed</li> <li>as site already selected</li> <li>and land already with</li> <li>WRD.</li> <li>Anticipated impact or</li> <li>Dolphins and Aquatic</li> <li>ecology due to barge</li> </ul>

Development Site Location	Site Specific Findings	Advantages	Disadvantages	Remarks
	<ul> <li>two wheelers and has access to the public road system.</li> <li>There are shops and small market place on the upper side of the ghat and some shops along the approach road to the Ghat.</li> <li>Next to the Annapurna Ghat Railway Department office and small workshop is situated.</li> <li>Bridge project of PWD is in planning in the vicinity of the Ghat</li> <li>Small Ghats are existing near Annapurna Ghat mainly dealing with the wood and bamboo import and transport from Tripura and to rest part o Assam respectively</li> <li>Many Carpenters are seen working as part of their livelihood</li> <li>Existing Ghat has very limited land for future development as the area is surrounded by settlements.</li> <li>Availability of land is an issue for development of existing Ghat.</li> <li>Paved Road upto Ghat for passengers but it is very steep and approach to Pontoon is temporary bamboo arrangement</li> <li>Existing Ghat has very limited land for future development. Availability of land is an issue for development of this Ghat.</li> <li>Soil type in the area is clayey.</li> <li>Passenger has to go on ferry by temporary bamboo ramps / structures which are big problem during rainy season.</li> <li>Ghat Shifting is a major problem here also.</li> <li>During site visit no Ghat was existing on place. Ghat is highly eroded due to flood with silt deposits.</li> <li>Approach Road is shifted because WRD and Railway department had taken up erosion measures</li> <li>Very low Development on Ghat side due to flood problem</li> <li>Water-pollution might harm the water – born diseases but only those which move or stay close to the ports</li> </ul>	<ul> <li>Dumping of solid waste is observed on the ghat</li> <li>WRD and Railway department is taking the measures for bank erosion</li> <li>Site is with WRD.</li> <li>Site is accessible by NH 53 and city roads which are already developed.</li> <li>Settlements located are at app.10 m from site thus maximum impact due to project activities.</li> <li>Locally available raw material (sand / concrete / steel) for transportation</li> <li>Site is not part of or close to any eco-sensitive location</li> <li>Design Considerations:</li> <li>Non Availability of land required for berthing and supportive infrastructure.</li> </ul>	<ul> <li>Design Considerations:</li> <li>River banks and bed are required to be protected from erosion and scouring.</li> <li>Availability of sufficient depth for berthing and movement of ships and thus minimum dredging is required</li> <li>Non Availability of land for Ghat development and other facilities</li> <li>Hence every facility is to be proposed on pontoons</li> <li>Special care is to be taken during flood season</li> </ul>	analysed to be very low • Cumulative impact assessment is required due to the upcoming bridge project in the vicinity • Major environment, social • or design issue associated due to siltation • All the negative impacts listed are manageable with proposed environment management plans thus no major drawbacks associated with the site



Dudhpatil         Chat is located on Barak River bank which famous for Milk         Environment Considerations: Considerations:         Considerations: Considerations:         Considerations: Considerations:         Considerations: Considerations:         Environment Considerations: Considerations:         Environment Considerations: Considerations:         Considerations: Considerations:         Considerations: Considerations:         Considerations: Considerations:         Considerations: Considerations:         Considerations: Considerations:         Considerations: Considerations:         Considerations: Considerations:         No         alternatives assessed           Miking is a major part of passenger system:         Files with WRD.         Site is sold WRD.         Site is considerations:         Site is considerations:         No         Approach from city roads to the Every Ghat is sery lenved arrangement         Site is considerations:         No         Approach from city roads to the eveloped.         No         Approach from city roads to the eveloped.         No         Approach from city road	Development Site Location	Site Specific Findings	Advantages	Disadvantages	Remarks
	Dudhpatil Ghat 5 (On North Bank of Barak River)	<ul> <li>Ghat is located on Barak River bank which famous for Milk Pot sail</li> <li>IWT office and Hydrology Department office for flood management is located on the Ghat</li> <li>Ghat is sandy particularly khas / patta land</li> <li>No Basic infrastructure is available like Pontoon for Ticket counter, administration, passenger waiting area, maintenance, parking area at berth, toilet, and vehicle parking area for two wheelers and has access to the public road system.</li> <li>Bridge project of PWD is in planning in the vicinity of the Ghat</li> <li>Existing Ghat has good land for future development as the area is surrounded by settlements.</li> <li>Paved Road upto Ghat for passengers but it is very steep and approach to Pontoon is temporary bamboo arrangement</li> <li>Existing Ghat has very limited land for future development. Availability of land is an issue for development of this Ghat.</li> <li>Soil type in the area is clayey.</li> <li>Passenger has to go on ferry by temporary bamboo ramps / structures which are big problem during rainy season.</li> <li>Ghat Shifting is a major problem here also.</li> <li>During site visit Ghat did not exist on place.</li> <li>Ghat is highly eroded due to flood with silt deposits.</li> <li>Approach Road is shifted because WRD and Railway department had taken up erosion measures</li> <li>Very low Development on Ghat side due to flood problem</li> <li>Water-pollution might harm the water – born diseases but only those which move or stay close to the ports</li> </ul>	<ul> <li>Environment Considerations:</li> <li>Tree cutting during development is envisaged</li> <li>Site is open with good space for development on landward side</li> <li>Less populated area near Ghat</li> <li>High siltation is recorded</li> <li>Site is with WRD.</li> <li>Site is accessible by small village roads which are already developed.</li> <li>But Site to main approach road is not developed and very steep without support</li> <li>Settlements located are at app.800 m from site thus minimum impact due to project activities.</li> <li>Locally available raw material (sand / concrete / steel) for transportation</li> <li>Site is not part of or close to any eco-sensitive location</li> <li>Design Considerations:</li> <li>Good Availability of land required for berthing and supportive infrastructure.</li> </ul>	<ul> <li>Environment Considerations:</li> <li>Gangatic Dolphins which is Schedule 1 species as per Wildlife Act, 1972 are not recorded in this stretch of river</li> <li>Approach from city roads to the Ferry Ghat is not developed.</li> <li>Design Considerations:</li> <li>River banks and bed are required to be protected from erosion and scouring.</li> <li>Availability of sufficient depth for berthing and movement of ships and thus minimum dredging is required</li> <li>Availability of land for Ghat development and other facilities</li> <li>Hence some facility is to be proposed on land</li> <li>Special care is to be taken during flood season</li> </ul>	<ul> <li>No alternatives assessed as site already selected and land already with WRD.</li> <li>Anticipated impact on Dolphins and Aquatic ecology due to barge movement is analysed to be very low</li> <li>Cumulative impact assessment is required due to the upcoming bridge project in the vicinity</li> <li>Major environment, social</li> <li>or design issue associated due to siltation</li> <li>All the negative impacts listed are manageable with proposed environment management plans thus no major drawbacks associated with the site</li> </ul>


Development Site Location	Site Specific Findings	Advantages	Disadvantages	Remarks
Ghat 4 (On North Bank of Barak River)	<ul> <li>Pot sail</li> <li>Ghat is sandy particularly khas / patta land</li> <li>No Basic infrastructure is available like Pontoon for Ticket counter, administration, passenger waiting area, maintenance, parking area at berth, toilet, and vehicle parking area for two wheelers and has access to the public road system.</li> <li>Bridge project of PWD is in planning in the vicinity of the Ghat</li> <li>Existing Ghat has good land for future development as the area is surrounded by settlements.</li> <li>Paved Road upto Ghat for passengers but it is very steep and approach to Pontoon is temporary bamboo arrangement</li> <li>Existing Ghat has very limited land for future development. Availability of land is an issue for development of this Ghat.</li> <li>Soil type in the area is clayey.</li> <li>Passenger has to go on ferry by temporary bamboo ramps / structures which are big problem during rainy season.</li> <li>Ghat is highly eroded due to flood with silt deposits.</li> <li>Approach Road is shifted because WRD and Railway department had taken up erosion measures</li> <li>Very low Development on Ghat side due to flood problem</li> <li>Water-pollution might harm the water – born diseases but only those which move or stay close to the ports</li> </ul>	<ul> <li>Tree cutting during development is envisaged</li> <li>Site is open with good space for development on landward side</li> <li>Less populated area near Ghat</li> <li>High siltation is recorded</li> <li>Site is with WRD.</li> <li>Site is accessible by small village roads which are already developed.</li> <li>But Site to main approach road is not developed and very steep without support</li> <li>Settlements located are at app.100 m from site thus maximum impact due to project activities.</li> <li>Site is accessible by L. B. Road</li> <li>Locally available raw material (sand / concrete / steel) for transportation</li> <li>Site is not part of or close to any eco-sensitive location</li> <li>Design Considerations:</li> <li>Non Availability of land required for berthing and supportive infrastructure.</li> </ul>	<ul> <li>Considerations:</li> <li>Gangatic Dolphins which is Schedule 1 species as per Wildlife Act, 1972 are not recorded in this stretch of river</li> <li>Approach from city roads to the Ferry Ghat is not developed.</li> <li>Design Considerations:</li> <li>River banks and bed are required to be protected from erosion and scouring.</li> <li>Availability of sufficient depth for berthing and movement of ships and thus minimum dredging is required</li> <li>Non Availability of land for Ghat development and other facilities</li> <li>Hence many facility is to be proposed on Pontoons</li> <li>Special care is to be taken during flood season</li> </ul>	assessed as site already selected and land already with WRD. • Anticipated impact on Dolphins and Aquatic ecology due to barge movement is analysed to be very low • Cumulative impact assessment is required due to the upcoming bridge project in the vicinity • Major environment, social • or design issue associated due to siltation • All the negative impacts listed are manageable with proposed environment management plans thus no major drawbacks associated with the site

Development Site Location	Site Specific Findings	Advantages	Disadvantages	Remarks
Gandhi Ghat	Ghat is sandy particularly khas / patta land	Environment Considerations:	Environment Considerations	No alternatives
Bank of Barak River)	<ul> <li>administration, passenger waiting area, maintenance, parking area at berth, toilet etc.</li> <li>Old Ghat was shifted to this location. Temporary vehicle parking area is available for two wheelers and has narrow access to the public road system.</li> <li>Ghat is connected through paved road which connects to village.</li> <li>There are shops along the approach road to the Ghat.</li> <li>Existing Ghat has very limited land for future development. Availability of land is an issue for development of this Ghat.</li> <li>No Paved Road upto Ghat for passengers but it is very steep and approach to Pontoon is temporary bamboo arrangement</li> <li>Soil type in the area is clayey.</li> <li>Passenger has to go on ferry by temporary bamboo ramps / structures which are big problem during rainy season.</li> <li>Ghat Shifting is a major problem here also.</li> <li>During site visit Ghat did not exist on place.</li> <li>Ghat is highly eroded due to flood with silt deposits</li> </ul>	<ul> <li>not envisaged</li> <li>Site is closed with less space for development on landward side</li> <li>Highly populated area</li> <li>Small traders / shopkeepers are seen on Ghats</li> <li>High siltation is recorded</li> <li>Dumping of solid waste is observed on the Ghat</li> <li>Site is with WRD.</li> <li>Site is accessible by NH 54 and Malugram Road roads which are already developed.</li> <li>Settlements located are at app.10 m from site thus maximum impact due to project activities.</li> <li>Locally available raw material (sand / concrete / steel) for transportation</li> </ul>	<ul> <li>Gangatic Dolphins which is Schedule 1 species as per Wildlife Act, 1972 are not recorded in this stretch of river</li> <li>Approach from city roads to the Ferry Ghat is moderately developed.</li> <li>Design Considerations:</li> <li>River banks and bed are required to be protected from erosion and scouring.</li> <li>Availability of sufficient depth for berthing and movement of ships and thus minimum dredging is required</li> </ul>	<ul> <li>as site already selected and land already with WRD.</li> <li>Anticipated impact on Dolphins and Aquatic ecology due to barge movement is analysed to be very low</li> <li>Major environment, social or design issue associated due to siltation</li> <li>All the negative impacts listed are manageable with proposed environment</li> </ul>
	<ul> <li>Very low Development on Ghat side due to flood problem</li> <li>Water-pollution might harm the water – born diseases but only those which move or stay close to the ports</li> </ul>	<ul> <li>Site is not part of or close to any eco-sensitive location</li> <li>Design Considerations:</li> <li>Non Availability of land required for berthing and supportive infrastructure.</li> </ul>	<ul> <li>Non Availability of land for Ghat development and other facilities</li> <li>Hence every facility is to be proposed on pontoons</li> <li>Special care is to be taken during flood season</li> </ul>	management plans thus no major drawbacks associated with the site



Development Site Location	Site Specific Findings	Advantages	Disadvantages	Remarks
Beranga Ghat (On North Bank of Barak River)	<ul> <li>Ghat is sandy particularly khas / patta land</li> <li>No infrastructure is available lie pontoon for Ticket counter, administration, passenger waiting area, maintenance, parking area at berth, toilet etc.</li> <li>Old Ghat was shifted to this location. Temporary vehicle parking area is available for two wheelers and has narrow access to the public road system.</li> <li>Ghat is connected through paved road which connects to village.</li> <li>There are temporary shops along the approach road to the Ghat.</li> <li>Existing Ghat has very limited land for future development. Availability of land is an issue for development of this Ghat.</li> <li>Erosion Control Measures by WRD are noted on site</li> <li>Existing Ghat has very less land for future development</li> <li>No Paved Road upto Ghat for passengers but it is very steep and approach to Pontoon is temporary bamboo ramps / structures which are big problem during rainy season.</li> <li>Ghat shifting is a major problem here also.</li> <li>During site visit Ghat did not exist on place.</li> <li>Ghat is highly eroded due to flood with silt deposits.</li> <li>Very low Development on Ghat side due to flood problem</li> <li>Water-pollution might harm the water – born diseases but only those which move or stay close to the ports Ghat is not connected through paved road which connects to village.</li> </ul>	<ul> <li>Environment Considerations:</li> <li>Tree cutting during development is envisaged</li> <li>Site is closed with lessspace for development on landward side</li> <li>Highly populated area</li> <li>Small traders / shopkeepers are seen on Ghats</li> <li>High siltation is recorded</li> <li>Dumping of solid waste is observed on the Ghat</li> <li>WRD and Railway department is taking the measures for bank erosion</li> <li>Site is accessible by Old Lakhipur Road and city roads which are already developed.</li> <li>Settlements located are at app.10 m from site thus maximum impact due to project activities.</li> <li>Locally available raw material (sand / concrete / steel) for transportation</li> <li>Site is not part of or close to any eco-sensitive location</li> </ul>	<ul> <li>Environment Considerations:</li> <li>Gangatic Dolphins which is Schedule 1 species as per Wildlife Act, 1972 are not recorded in this stretch of river</li> <li>Approach from city roads to the Ferry Ghat is moderately developed.</li> <li>Design Considerations:</li> <li>River banks and bed are required to be protected from erosion and scouring.</li> <li>Availabilityof sufficient depth for berthing and movement of ships and thus minimum dredging is required</li> <li>Non Availability of land for Ghat development and other facilities</li> <li>Hence every facility is to be proposed on pontoons</li> <li>Special care is to be taken during flood season</li> </ul>	<ul> <li>No alternatives assessed as site already selected and land already with WRD.</li> <li>Anticipated impact on Dolphins and Aquatic ecology due to barge movement is analysed to be very low</li> <li>Major environment, social or design issue associated due to siltation</li> <li>All the negative impacts listed are manageable with proposed environment management plans thus no major drawbacks associated with the site</li> </ul>

Development Site Location	Site Specific Findings	Advantages	Disadvantages	Remarks
Kanakpur	Ghat is located on Barak River bank	Environment Considerations:	Environment	No alternatives
Ghat (On South Bank of Barak River)	<ul> <li>Ghat is sandy particularly khas / patta land</li> <li>No Basic infrastructure is available like Pontoon for Ticket counter, administration, passenger waiting area, maintenance, parking area at berth, toilet, and vehicle parking area for two wheelers and has access to the public road system.</li> <li>Existing Ghat has good land for future development</li> <li>No Paved Road upto Ghat for passengers but it is very steep and approach to Pontoon is temporary bamboo arrangement</li> <li>Soil type in the area is clayey.</li> <li>Passenger has to go on ferry by temporary bamboo ramps / structures which are big problem during rainy season.</li> <li>Ghat is highly eroded due to flood with silt deposits.</li> <li>Very low Development on Ghat side due to flood problem</li> <li>Water-pollution might harm the water – born diseases but only those which move or stay close to the ports</li> <li>Ghat is not connected through paved road which connects to village.</li> </ul>	<ul> <li>Tree cutting during development is envisaged</li> <li>Site is open with good space for development on landward side</li> <li>Less populated area</li> <li>High siltation is recorded</li> <li>WRD and Railway department is taking the measures for bank erosion</li> <li>Site is with WRD.</li> <li>Site is accessible by city roads which are already developed.</li> <li>Settlements located are at app.1km from site thus minimum impact due to project activities.</li> <li>Locally available raw material (sand / concrete / steel) for transportation</li> <li>Site is not part of or close to any eco-sensitive location</li> <li>Design Considerations:</li> <li>Availability of land required for berthing and supportive infrastructure.</li> </ul>	<ul> <li>Considerations:</li> <li>Gangatic Dolphins which is Schedule 1 species as per Wildlife Act, 1972 are not recorded in this stretch of river</li> <li>Approach from city roads to the Ferry Ghat is moderately developed.</li> <li>Design Considerations:</li> <li>River banks and bed are required to be protected from erosion and scouring.</li> <li>Availabilityof sufficient depth for berthing and movement of ships and thus minimum dredging is required</li> <li>Availability of land for Ghat development and other supportive facilities</li> <li>Hence some facilities is to be proposed on land</li> <li>Special care is to be taken during flood season</li> </ul>	<ul> <li>assessed</li> <li>as site already</li> <li>selected</li> <li>and land already with</li> <li>WRD.</li> <li>Anticipated impact on</li> <li>Dolphins and Aquatic</li> <li>ecology due to barge</li> <li>movement is</li> <li>analysed to</li> <li>be very low</li> <li>Major environment,</li> <li>social</li> <li>or design issue</li> <li>associated due to</li> <li>siltation</li> <li>All the negative</li> <li>impacts listed are</li> <li>manageable with</li> <li>proposed</li> <li>environment</li> <li>management plans</li> <li>thus no major</li> <li>drawbacks associated</li> </ul>



# Annexure - 4

## Annexure 4a: News Paper Advertisement for Stakeholder Consultation on 08<sup>th</sup> Oct 2018 (Screening and Scoping Workshop)

## অসম আভ্যন্তৰীণ জল পৰিবহন উন্নয়ন সমিতি

অসম চৰকাৰে বিশ্ববেংকৰ সাহায্যৰে অসমৰ আভ্যন্তৰীণ জল পৰিবহণ ব্যৱস্থা আধুনিকীকৰণ আৰু উন্নতকৰণৰ বাবে পদক্ষেপ হাতত লৈছে। এই উদ্দেশ্যে 'পৰিৱেশ তথা সামাজিক প্ৰভাৱ মূল্যাংকন প্ৰতিবেদন (EIA/SIA)' প্ৰস্তুত কৰিবলৈ 'M/s Arkitechno' (আৰ্কিটেক্লো') (M/s EQMS India Pvt. Ltd. ৰ সহযোগত) নামৰ সংস্থাটিক দায়িত্ব দিয়া হৈছে। ইয়াৰ লগত সংগতি ৰাখি উক্ত সংস্থাটোৱে ইতিমধ্যে প্ৰস্তুত কৰা 'Screening & Scoping' প্ৰতিবেদনৰ ওপৰত অসম আভ্যন্তৰীণ জল পৰিবহন উন্নয়ন সমিতিৰ সহযোগত এখন এদিনীয়া কৰ্মশালাৰ আয়োজন কৰিব বিচাৰিছে যাতে অসমৰ আভ্যন্তৰীণ জল পৰিবহন ব্যৱস্থাৰ লগত প্ৰত্যক্ষ আৰু পৰোক্ষভাৱে জড়িত সকলোৰে পৰামৰ্শ আৰু মতামতবোৰ উল্লেখিত 'Screening & Scoping' প্ৰতিবেদনত অন্তৰ্ভুক্ত কৰিব পৰা যায়।

আপোনালোকৰ বহুমূলীয়া পৰামৰ্শ আৰু মতামতসমূহ গ্ৰহণ কৰিবলৈ অহা ৮ অক্টোবৰ, ২০১৮ সোমবাৰে ৰাতিপুৱা ১০ (দহ) বজাৰ পৰা গুৱাহাটীৰ উলুবাৰীস্থিত অসম আভ্যন্তৰীণ জল পৰিবহন সঞ্চালকালয়ৰ তৃতীয় মহলাত অনুস্থিত হ'বলগীয়া উক্ত কৰ্মশালাত উপস্থিতি কামনা কৰিলো।

সঞ্চালক, অসম আভ্যন্তৰীণ জল পৰিবহন সঞ্চালকালয়

তথা অতিৰিক্ত ৰাজ্যিক প্ৰকল্প-সঞ্চালক, অসম আভ্যন্তৰীন জল পৰিবহন উন্নয়ন সমিতি

News Paper Advertisement in Local Assamees Language

#### ASSAM INLAND WATER TRANSPORT DEVELOPMENT SOCIETY INVITATION FOR WORKSHOP

The Government of Assam has proposed to modernize and upgrade the Assam Inland Water Transport System with financial assistance from World Bank.

In according with that 'Environment & Social Impact Assessment studies are being carried out by engaging Consultants M/s. Arkitechno (In sub consultancy with EQMS).

A consultation workshop of stakeholders will be held for integrating valuable suggestions and opinions to improve the framework of the project and will also set to present the findings and recommendations to a wider range of stakeholders.

All stakeholders are required to kindly make it convenient to attend the one day workshop to be held on 08.10.2018 (Monday) from 10.00 am in the Office of Directorate of Inland Water Transport (3<sup>rd</sup> Floor), Ulubari, Near Flyover, Guwahati - 781007 and share their valuable suggestions.

> Director Assam Inland Water Transport And Addl. State Project Director Assam Inland Transport Development Society

News Paper Advertisement in Local English Language

#### Annexure 4b: Invitation Letter Submitted to Stakeholder



অসম চৰকাৰ অসম আভ্যন্তৰীণ জল পৰিবহন উন্নয়ন সমিতি Government of Assam Assam Inland Water Transport Development Society 3<sup>rd</sup> floor, Directorate of Inland Water Transport, Ulubari, Guwahati– 7::email: <u>dir.iwtds-as@gov.in::Tel:+91361-2526421</u>

#### WORKSHOP ON INTEGRATED STARTEGIC DEVELOPMENT PLAN MODULE IV AND SCREENING AND SCOPING REPORT OF EIS/SIA STUDY

TIME: 10 AM, MONDAY, 8<sup>TH</sup> OCTOBER 2018 VENUE: DIRECTORATE OF INLAND WATER TRANSPORT, ULUBARI GUWAHATI, 781007

10.00 – 10.30 am	Registration	
10.30-10.35am	Lighting of Lamp	
10.35 - 10.50 am	Inaugural Address	Mr. Ashutosh Agnihotri, IAS Commissioner and Secretary to the Govt. of Assam, Transport Department & SPD, AIWTDS
10.50 -11.00 am	Welcome Note Background to the Assam Inland Waterways Transport Project and Workshop Objective	Mr. B. B Dev Choudhury, ACS Director, IWT & ASPD, AIWTDS
11.00 -11.15 am	Participant Introductions	
11:15 - 11:45 am	Overview of the Study Objectives, Findings and necessary suggestions	EIA & SIA Consultant (Arkitechno)
11:15 - 11:45 am	Overview of the EIA/ SIA Screening Scoping Study objectives, findings.	EIA & SIA Consultant (Arkitechno)
11.45-12.00 pm	Tea/Coffee	
12.00 – 12.30 pm	Small Group discussions for	Open Discussion
	feedback. Each group to discuss the recommendations and validate/revise/add	Facilitated by: EIA & SIA Consultant (Arkitechno)
12.30 – 1.00 pm	Conclusions and Summary of Recommendations for Screening Scoping of EIA/ SIA	Inros Lackner
1.00-1.30 pm	Lunch	
1.30 - 2.00 pm	Overview of the Study Objectives, Findings and necessary suggestions	ISDP Consultant, (Inros Lackner)
2:00 pm – 2:30 pm	Small Group discussions for	Open Discussion
	feedback. Each group to discuss the recommendations and validate/revise/add	Facilitated by: Inros Lackner
2.30 – 3.00 pm	Conclusions and Summary of Recommendations for ISDP	ISDP Consultant, (Inros Lackner)
3.00-3.30 pm	Miscellaneous discussions and feedbacks	Representative of World Bank
3.30 pm	Vote of thanks	AIWTDS



অসম চৰকাৰ অসম আভ্যন্তৰীণ জল পৰিবহন উন্নয়ন সমিতি Government of Assam Assam Inland Water Transport Development Society

3rd floor, Directorate of Inland Water Transport, Ulubari, Guwahati- 7::email: dir.iwtds-as@gov.in::Tel:+91361-2526421

#### WORKSHOP ON INTEGRATED STARTEGIC DEVELOPMENT PLAN MODULE IV AND SCREENING AND SCOPING REPORT OF EIS/SIA STUDY

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2:00 pm – 2:30 pm	Small Group discussions for	Open Discussion
ум — 102.	feedback. Each group to discuss the recommendations and validate/revise/add	Facilitated by: Inros Lackner
2.30 – 3.00 pm	Conclusions and Summary of Recommendations for ISDP	ISDP Consultant, (Inros Lackner)
3.00-3.30 pm	Miscellaneous discussions and feedbacks	Representative of World Bank
3.30 pm	Vote of thanks	AIWTDS
		•

**ARKITECHNO**<sup>®</sup>

ate: 08.1	ASSA:	M INLAND WATER TRANSPORT WORKSHOP ON IS	DEVELOPMENT SOCIETY (AIWTD DP and EIA/ SIA	S) Venue: Directorate, IWT, Assam
SI. No	Name of Participant	Designation/ Organisation	Contact Details (Phone no/ email ID)	Signature
1	Netanja Duti	Project Manager North East Network	SELL 023657 milanjin @ novtheastretwork.ag	lelejo.
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4	Kruetulsh Rakshit	Jr. Tech. Sup, 11TG	9 43500 9229 ac. in	Krakshit
5	Dr. Deepmoni Deka.	Technical officer,	1435011658 deepmoni @ritg.ac. in	Deepmont.
6	A.Harsha Vasalhan	Knowledge Partner, ASTC	7738830613 hassbaradhan.ampili@komm.com	Hach-
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11	Rule Phukan	Research Fellow, NEN	70862 73395 role purchan agmail 100	Julee Phukan
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13	Soutosh Ku. Mahaupa	Emecutive ARKITECHNO	9438831946	Sent .
14	Digijoti Phutan	Admithe Same Kakyon Drity (Pargicat Manager)	9613654693	Odelen
15	BIKRAM SINGH CHECKI	PROJECT ENGINEER ADARJHIA SAHAJRAHAN	9954245969	But.

## Annexure 4c: Attendance of Workshop

SI. No	Name of Participant	Designation/ Organisation	Contact Details (Phone no/ email ID)	Signature
45	DR-JAIDBEP BERUGH	Headle, BAN. ASTEC	9435102089 jourdouit.in	AA
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50	Dr. Abolul Culakid	Aasamak.	8811023545	plad
51	Dr. A. Sarma	GC	(Wakios. abdul @gmail.com) 97067-68066	(launt) 10
52	Ravikumm	Urban Planner. GISCL PML.	8680902566. Baritumar @ teens.in.	I bensong
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No	Name of Participant	Designation/ Organisation	Contact Details (Phone no/ email ID)	Signature
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17	Stepona Barman	SSMS, ARIAS Society	9864021018	
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20	Hitakhi Kalita	Student (HISS)	8399841363	St.
22	R. Sam.	Dy. C.E. W.R. Dept.	9435700812	6
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23	AGUNI RIOV	PROJECT	9435140250	, Au
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SI. No	Name of Participant	Designation/ Organisation	Contact Details (Phone no/ email ID)	Signature
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38	Musfigur Rahman	Jt. Director, last		Munt
39	Manik Ch. Sarma, ACS,			Newscience
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SI. No	Name of Participant	Designation/ Organisation	Contact Details (Phone no/ email ID)	Signature
61	A.H.B.I. MAZUMOF	e M.O(ASAMB)	9957290926	Man
62	Shabham M. Raj	CEO Volumbry Assoc	ation 94351-49695	BP.
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# Annexure - 5

#### Annexure - 5

## **Baseline Environment**

## **1.1 Physical Environment**

#### 1.1.1 Introduction

This section includes the potential impacts of the proposed harbor works on a range of environmental parameters. For each environmental parameter, the existing environmental baseline conditions are described, followed by an identification of potentially significant environmental effects. Accordingly Terms of Reference to be followed for EIA studies are prepared. This section describes work that will need to be undertaken during the subsequent stages of the EIA process to ensure that a sufficiently detailed ES is produced. Here we have covered all the 11 Identified Terminal / Landing point / Ghats location or sites Study Area – Primary and Secondary Data Collection

The study area is defined as the area over which the potential direct and indirect impacts of the proposed development under the Master Plan are predicted to be detectable offshore and onshore.

#### 1.1.2 Offshore Study Area

Direct impacts offshore are defined as physical effects in the river environment arising from the development. Therefore, the study area for direct impacts includes the footprints and immediate vicinities of the harbor works and capital dredging areas in activity area (where required) and offshore disposal of dredged material if any.

Indirect impacts offshore may arise as a consequence of the development's effect on, for example, hydrodynamic and sediment transport processes (e.g. erosion and accretion of inter-tidal sediments), noise disturbance or changes to the rivers cape (e.g. presence of new infrastructure in the water). Therefore, the study area for indirect impacts extends beyond the study area for direct impacts and, for the purposes of this Screening and Scoping Study, is taken into consideration. By taking this approach, the offshore study area encompasses the areas covered by a number of management plans including:

- River / Aquatic Management Plan
- Sediment Management Plan
- Shoreline Management Plan / River training / Erosion Control Measures

#### 1.1.3 Onshore Study Area

Direct impacts onshore are defined as physical effects in the terrestrial environment arising from the development. Therefore, the study area for direct impacts includes the footprints and immediate vicinities of the harbor works within the existing land holding at the project sites.

Indirect impacts onshore may arise as a consequence of the development's effect on, for example, road transportation (e.g. traffic on the local highway network / approach road to proposed sites / parking area / access bridge), noise disturbance (e.g. to local residents) or changes to the landscape (e.g. presence of new infrastructure on land). Therefore, the study area for indirect impacts extends beyond the study area for direct impacts and, for the purposes of this Screening and Scoping Study, is taken into consideration the properties neighboring to the project sites, the main road corridors providing access to the jetty and

the settlements around jetties. By taking this approach, the onshore study area encompasses the areas covered by a number of management plans including:

- Environment management plan as per the environmental resources
- Air modelling, Noise modelling as per the activities
- Sediment dumping area Management plan
- Land use management plan as per the impacts of project components
- Risk Management Plan

The study area of 500mt radius from project site of direct impact zone and study area of 10km radius from project site of indirect impact zone are shown below. Primary baseline data will be collected from direct impact zone and secondary baseline data will be collected for indirect impact zone.

#### 1.1.4 Climate, Hydrometeorology and Air

The climate of the project area as well as the rest of Assam are sub-tropical in nature and are dominated by monsoon elements. There are four, more or less distinct seasons. The monsoon and the dry seasons are the main forces of weather, separated by transitional seasons. The southwest monsoon lasts approximately from June to September, and produces the most prominent periods of precipitation. Almost 90% of the annual rainfall total in the study area occurs during this timeframe (~1,500 cm >3,000 cm), when both temperature and the relative humidity are high. The northeast monsoon: extending from November through to March defines the cool dry season of winter. Only occasional rainfall occurs, associated with weak cyclonic disturbances producing occasional scattered showers. The transition from monsoon to the dry season of October-November is fairly smooth, marked by declining temperatures, humidity and storm frequency. The start of the transition period at the end of the dry season is also uniform, but the short hot season preceding the southwest monsoon from April to May is characterized by fairly unstable atmospheric conditions. The highest recorded temperatures normally occur at this time. This season is associated with variable convectional storm activity that occasionally produces severe cyclonic storm events. Mean daily temperatures in the project area are fairly constant between the months of April to September in the order of 250C. From October onwards, temperatures begin to decline, and

Mean daily temperatures reach a minimum of about 180C in January, occasionally dropping in some cold years below 100C. In April, maximum daily temperatures can often exceed 350C. Increased cloud cover during the southwest monsoon period prevents extremes of temperature when the sun is at its maximum declination. Relative humidity is high throughout the year. Maximum values occur in July, when the mean is of the order of 88%. March generally produces the lowest values of 40%. In an average year potential evapotranspiration exceeds rainfall between the months of October and April. Rainfall in the early and late monsoon periods is highly variable however, and the average conditions do not give a representative indication of water availability of the area. No measurements exist of the air quality at the Project sites. Depending on the location within the Brahmaputra Valley, air quality conditions can presumably be highly variable. Adjacent to urban center such as Guwahati with its dense population, heavy volumes of vehicular traffic congestion, particularly in the evenings, open burning of refuse and the contribution of various industries, air quality can be expected to be poor. Alternately, in rural locales with very little industry in the surrounding area, and contrasting traffic in general considered to be relatively light, air quality appears to be good.

## 1.2 Physiography

The Brahmaputra Valley is a well-defined physiographic unit. It is mainly a uniform level alluvial Plain interspersed with low elevated hillocks scattered along the banks of the Brahmaputra River. These hillocks are the outliers of the Meghalaya or Shillong plateau and extend from the Tezpur and Karbi Hills

of the Central Assam Plain as far west as Dhubri. Aside from these isolated hillocks that expose Archaen gneisses and occasional outcrops of Tertiary sandstones along the northern periphery, the entire region is covered by alluvial deposits of recent and Sub-Recent origin... There is a marked physiographic difference between the North Brahmaputra plain and the South Brahmaputra plain of the Valley. In the North Brahmaputra plain, innumerable tributaries coming down from the Himalayan ranges of Arunachal Pradesh and Bhutan debauch to the Valley and form a series of alluvial fans that obstruct the courses of the tributaries near the foothills. As a result, the tributaries branch out into different channels until they form permanent channels downstream. Before finding their way into the Brahmaputra they run in an almost parallel course to the main stream until they encounter its levees. Consequently, the tributaries have conspicuous meandering courses leading to the formation of beels or oxbow lakes and significant marshy tracts. The alluvial fans formed by the coarse alluvial debris in the northern fringe of the Valley have given rise to semi-tame conditions where water percolates down resulting in wet soil and dense forest. In the South Brahmaputra plain the meandering course of the tributaries is conspicuous only in the eastern part where there are numerous beels and oxbow lakes. The most physical characteristic of the Brahmaputra is that the river itself is highly braided due to its gradient. As a result, there are innumerable Chars or riverine islands. Majuli with an area of 929 sq. km. is the world's largest river island. Structurally, Majuli is part of the Jorhat-Sibsagar plain, separated by a channel of the river.



Figure 1: Physiography of the Valley of the Brahmaputra River



#### 1.2.1 Geology

The Brahmaputra plain, with a few exceptions, is covered by young alluvial terrain, deposit from the large sediment load carried by the Brahmaputra River and its tributaries. The geological formations range in age from Palace-Proterozoic to Recent. The Palace-Proterozoic group comprises a metamorphic complex of gneiss to schist. The Neo-Proterozoic group consists of quartzite and phyletic, overlain by the lower Tertiary continental shelf sediments of Eocene age, the upper Tertiary Oligo- Mio-Pliocene constitutes the shelf sediments and unclassified older and newer alluvium of Quaternary age. The areas in the northern side of the Brahmaputra River are fed with sediments carried by the northern tributaries draining the geologically younger Himalayan mountain ranges of unconsolidated sedimentary rocks while the sediments deposited in the southern part of the basin are derived from the tributaries draining the hill ranges that are geologically much older (Datta and Singh, 2004). The topographic gradient of the northern tributaries, together with more easily eroded bedrock and larger river discharge, result in a higher sediment load from this part of the drainage area.

## 1.3 Hydrology

#### **1.3.1** Rivers and Drainage Systems

The Ganges-Brahmaputra River system has the third largest discharge of the world's rivers: approximately 1,086,500 cu.ft./sec (30,770 cu.m. /sec.). It is estimated that 700,000cu.ft. /sec. (19,800 cu.m. /sec.) is contributed by the Brahmaputra alone. (Bania, 2016). The Brahmaputra River is fed by as many as 52 tributaries. The discharge of the Brahmaputra River comes mostly from snowmelt in China on the other side of the Himalayas before it enters the state of Arunachal Pradesh. Average depth of the river is 38 m. and maximum depth is 120 m. During the monsoon season all these watercourses contribute to the volume of water from their upper reaches and converge with the flow down the main river. During the low flow periods in winter, the Brahmaputra becomes a multiple channel stream with sand bars in between and the channels shift back and forth between the main stream banks that can range from 6 to 12 km. apart. The Brahmaputra combined with these tributaries also carry massive amounts of silt that augment the bed load capacity of the aquatic systems and compound the annual inundation of adjacent lands. A notable characteristic of the North Bank tributaries is that they have migrated considerably eastward from their previous courses. In the case of the South Bank Plain of the Valley, the tributaries are considerably larger. Here however, the number of streams joining the tributaries is less in comparison to the North Bank. In the eastern section of the South Bank, the tributaries are characterized by extensive head ward erosion and meandering courses, whereas in the western section the tributaries rarely follow meandering courses. Also the South Bank tributaries exhibit a tendency of shifting westward.

#### **1.3.2** Floods and Water Logging

During the monsoon season (June–October), floods are a very common occurrence in Assam. Deforestation in the Brahmaputra watershed has resulted in increased siltation levels, flash floods, and soil erosion in critical downstream habitat, such as the Kaziranga National Park. Periodic flooding is a natural phenomenon which is ecologically important because it helps maintain the lowland grasslands and associated wildlife. Periodic floods also deposit fresh alluvium, replenishing the fertile soil of the Brahmaputra River Valley. Thus flooding, agriculture, and agricultural practices are closely connected. However occasionally, the effects of flooding can be devastating and cause significant damage to crops and houses, serious bank erosion with consequent loss of homesteads, schools and land, and the loss of many lives, livestock and fisheries. During such periods the river contains considerable volumes of

detritus and vegetation and the water overflows the banks of the main stream as well as the tributaries. The flood prone areas along the Brahmaputra and its tributaries impose a natural restriction upon the growth of settlements in such areas. Waterlogging is a common and often serious problem after many monsoon rainfall events. Rapid urbanization and the corresponding increase in the expansion of impervious and hard surfaces in centers such as Guwahati decreases infiltration capacity of the land resulting in flash flood scenarios. Unplanned urban encroachment has eliminated natural reservoir features such as wetlands, marshes and low lying areas. The situation is further exacerbated as the denudation of hills and forest cover tracts leads to erosion. The resultant silt runoff from these areas clogs up drains resulting in flooded streets

## 1.4 Meteorology

The available climatologic data concerning winds, rainfall/precipitation, temperature and humidity in Guwahati were evaluated in the period from 2009 to 2018.

Name Of District	Wind	Rainfall/Precipitation	Air Temperature And Humidity
Guwahati Corridor	<ul> <li>At Guwahati Corridor prevailing moderate wind conditions (breeze conditions)</li> <li>with average Wind velocities of 5 m/s and average gusts up to 10 m/s (comp. to Figure 2). The seasonal variations are limited to slightly increased velocities during the 2nd quarter.</li> <li>It should be noted that higher gusts and wind velocities can occur (2018 in Figure 4.4.3) but due to the given data This could be deemed to be exceptional conditions.</li> </ul>	<ul> <li>The monthly precipitation depends on the season with a monthly precipitation from 0 mm to750 mm.</li> <li>During the rainy season from May to October the precipitation surpasses 700 mm And in exceptional cases 1200 mm (2018) per month.</li> <li>The dry season lasts from November to April with a monthly precipitation between 200 mm and 0 mm.</li> <li>The detailed distribution of the Precipitation over the years is shown in Figure 3</li> </ul>	<ul> <li>The temperature in Guwahati (comp. Figure 4) is characterized by seasonal variations over</li> <li>The year and average temperatures between approx. 20°C and 30°C. During summer, the</li> <li>Temperature easily exceeds 35°C and does not fall below 25°C. During winter or rather dry</li> <li>Season, the temperature ranges between 12°C and 25°C. The average humidity(figure 5) variations are Similar to the variations of temperature. The average humidity is approx. 40 % during the dry</li> </ul>

#### Table 1:Mateorological data

			• season and exceeds 75 % during the rainy season
Dibrugarh Corridor	The available clima temperature and humid in the period from 2009	tologic data concerning wind ity in Dibrugarh Corridor or rather to 2018.	ls, rainfall/precipitation, r Neamati were evaluated
Dibrugarh Corridor	<ul> <li>At Neamati prevailing moderate wind conditions (breeze conditions) with average wind velocities of 4-5 m/s and average gusts up to 7.5 m/s (comp. to Figure 6).</li> <li>The seasonal variations are limited to slightly increased velocities during the 2nd quarter.</li> <li>It should be noted that higher gusts and wind velocities can occur (2018 and 2017 in Figure 4.4.3.5) but due to the given data This could be deemed to be exceptional conditions.</li> </ul>	<ul> <li>The monthly precipitation depends on the season with a monthly precipitation from 0 mm to750 mm.</li> <li>During the rainy season from May to October the precipitation surpasses 500 mm and in exceptional cases 1000 mm (2016) per month.</li> <li>The dry season lasts from November to April with a monthly precipitation between 200 mm and 0 mm. The detailed distribution of the precipitation over the years is shown in (Figure 7)</li> </ul>	<ul> <li>The temperature in Neamati (comp. Figure 8) is characterized by seasonal variations over</li> <li>The year and average temperatures between approx. 20°C and 30°C. During summer, the</li> <li>Temperature can exceed 35°C and does not fall below 20°C. During winter or rather dry season,</li> <li>The temperature ranges between 10°C and 25°C. The average humidity variations are</li> <li>Similar to the variations of temperature. The average humidity is approx. 40 % during the dry(Figure 9)</li> <li>Season and exceeds 75 % during the temperature the rainy season</li> </ul>
Silchar	• At Silchar prevailing moderate wind conditions (breeze conditions) with average wind velocities	<ul> <li>The monthly precipitation depends on the season with a monthly precipitation from 0 mm to 750 mm.</li> <li>During the rainy season from May to October the precipitation surpasses 500 mm</li> </ul>	<ul> <li>The temperature in Stinchar (comp. Figure 12) is characterized by seasonal variations over</li> <li>The year and average</li> </ul>
	• Of 3.5 m/s and average gusts up to 7.5 m/s (comp.	<ul> <li>And in exceptional cases 1000 mm (2010) per month.</li> <li>The dry season lasts from</li> </ul>	temperatures between approx. 20°C and 30°C.

to Figure 10). The seasonal variations are limited to slightly increased velocities during the 2nd quarter. It should be noted that higher gusts and wind velocities can occur but due to the given data this could be deemed to be exceptional conditions	<ul> <li>November to April with a monthly precipitation between 200 mm and 0 mm.</li> <li>The detailed distribution of the Precipitation over the years is shown in (Figure 11)</li> </ul>	•	During summer, the Temperature easily exceeds 35°C and does not fall below 25°C. During winter or rather dry season, the temperature ranges between 10°C and 23°C. The average humidity variations are similar to the variations of temperature. The average humidity is approx. 40 % during the dry season and exceeds 75 % during the
			75 % during the rainy season (comp.
			Figure 13).

## Figure 2: Wind Conditions Guwahati



Figure 3: Precipitation Guwahati



## Figure 4: Temperatures Guwahati



#### Figure 5: Humidity Guwahati



#### Figure 6: Wind Conditions Neamati



## Figure 7: Precipitation Neamati



#### Figure 8: Temperatures Neamati



#### Figure 9: Humidity Neamati



## Figure 10: Silchar Wind Conditions



Figure 11: Silchar Precipitation Condition



## **Figure 12: Temperatures Silchar**



Figure 13: Humidity Silchar



## **Chemical Environment**

## 2.1 Water Quality

The surface water regime of the Brahmaputra River is primarily monsoon dependent, although trunk channels receive significant contribution from groundwater during the dry season. Pollution as a result of recreational activities may not have the potential to be as great as from other sources but the number of recreational users in the Harbor mean that cumulative effects may be significant. Sources include antifouling paints, discharge of untreated sewage from toilets, anthropogenic activities on the river bank and litter. The deterioration of surface water quality is a major concern as clean water is essential to life. A lack of wastewater treatment plants is a dominant factor in this undesirable situation. The following receptors are likely to be affected by the proposed development:

- River water quality
- Ground water quality
- Areas where Sediment may be deposited

Selected water quality parameters of surface and ground water resources within the study area will be studied for assessing the water environment and evaluating the impact due to the proposed project. The water quality of Brahmaputra River may get affected due to activities of proposed terminals/ jetty

/ landing points. It is proposed that sediment sampling both at the surface and at depth is undertaken and sample locations will cover all elements of the proposed Master Plan that require dredging or could lead to sediment disturbance

Assessment of baseline data on water environment includes;

- identification of surface water sources
- Identification of ground water source.
- Identification of point sources of pollution
- Collection of water samples
- Analyzing water samples for physio-chemical and biological parameters
- Comparison of water samples with CPCB prescribed water quality standards for designated use and IS for its quality.
- Water quality of Brahmaputra River and Barak River will be studied through secondary and primary information.
- Consideration of the results in relation to potential impacts on aquatic ecology, water quality, river bank quality and bathing waters.
- The potential impacts of the development both during the construction and operational phase will then be assessed in relation to the existing background environment and the potential for exceeding Environmental Quality Standards
- Suggestion of mitigation measures for impacts identified
- Preparation of Environment Management plan and Monitoring Plan for Water during construction and operation phase

The surface water quality and ground water quality will be monitored in the influence area to get the representative water quality data. The environmental influence due to the project is likely to be restricted to Ghat location and 2 km radius around the project activity site. Therefore, the study area for monitoring of water quality includes 500 m and 2 km region around the project Ghat site. Influence area will be 500 m and 2 km radius from proposed each Ghat/ ferry location/ Terminals.

Sediments around the jetty in the turning basin found variable components of sand, silt and gravel depending on the location with silty sediments tending to be located in northern and southern part of the tidal basin. The majority of the Little Channel comprised of varying layers of sand and silt with silty sediments tending to be located to the eastern side of the Channel. It would therefore appear that sandier sediments are located in the near vicinity of the Jetty.

#### 2.1.1 Groundwater Quality and Potential

Assam is one of India's wealthiest states in terms of ground water development potentiality. The entire Brahmaputra Valley, covering more than 70 per cent of the total geographical area of the state, contains a prolific aquifer system with the water table lying within 5m of the land surface. The present stage ground water development in the Brahmaputra Valley, the most populous part of the state, is in a nascent stage.

Based on the recommendation of the Ground Water Estimation Committee, Ministry of Irrigation, March 1984, the recoverable recharge of ground water in Assam calculated by the Central Ground Water Board, to about 2 million hectare meter per year. With the present ground water resource available to be utilized, it is estimated that an additional area of about 14 lakh hectares of net area sown can be brought under irrigation. Besides the irrigational use, ground water forms the most common form source of domestic drinking water in the state. The lifting of ground water through dug wells, tube wells, shallow tube wells and deep tube wells for irrigation, domestic and industrial use is very common in the state. **Table 4.4** shows the Ground water distribution in Assam.

#### 2.1.2 Brahmaputra River Water Quality based on Secondary Data

Bramhputra river water quality monitored by Central Pollution control Board (CPCB) in 2011 at different locations in Assam state is shown in table below.

Central pollution Control Board guidelines are available to evaluate the water quality of river for its best designated Use. Water can be divided in to five class as per below CPCB standards

Designated-Best-Use	Class of water	Criteria	
Drinking Water Source without	А	Total Coliforms Organism MPN/100ml shall be 50 or less	
conventional treatment but after		pH between 6.5 and 8.5	
disinfection		Dissolved Oxygen 6 mg/l or more	
		Biochemical Oxygen Demand 5 days 20°C 2mg/l or less	
Outdoor bathing (Organized)	В	Total Coliforms Organism MPN/100ml shall be 500 or less pH between 6.5 and 8.5 Dissolved Oxygen 5 mg/l or more	
		Biochemical Oxygen Demand 5 days 20°C 3mg/l or less	
Drinking water source after conventional treatment and disinfection	C	Total Coliforms Organism MPN/100ml shall be 5000 or less pH between 6 to 9 Dissolved Oxygen 4mg/l or more	
		Biochemical Oxygen Demand 5 days 20 <sup>o</sup> C 3mg/l or less	
Propagation of Wild life and	D	pH between 6.5 to 8.5 Dissolved Oxygen 4mg/l or more	
Fisheries		Free Ammonia (as N) 1.2 mg/l or less	
Irrigation, Industrial Cooling,	Е	pH betwwn 6.0 to 8.5	
Controlled Waste disposal		Electrical Conductivity at 25°C micro mhos/cm Max.2250	
		Sodium absorption Ratio Max. 26	
		Boron Max. 2mg/l	
	Below-E	Not Meeting A, B, C, D & E Criteria	

 Table 2 -CPCB Best Designated use Standards (CPCB)

#### Table 3- Brahmaputra River water quality at different locations in Assam

Parameters / Locations		Brahmaputra at Kherghat	Brahmaputra at Dibrugarh	Brahmaputra at Nimatighat	Brahmaputra at Dhenukhapahar	Brahmaputra at Pandu	Brahmaputra at Jogijhoga	Brahmaputra at Kacharighat	Brahmaputra at Chandrapur	Brahmaputra at Sualkuchi	Brahmaputra at Dhubri
Temp	Min	18	18	17	19	18	18	19	19	20	21
	Max	28	28	28	29	30.2	32	30	31	29	32
	Mean	23.3	23.2	23.8	24.3	25.4	26.8	25.3	26.4	26	27.4
D.O mg/l	Min	6.8	6.2	4.4	7.1	6.4	5.7	5.9	6	6.5	6.5
	Max	9	8.8	7.5	8.9	8.8	8.2	8.4	9	8.6	7.2
	Mean	7.9	8.4	6.4	7.7	7.3	7	7	7.4	7.8	6.9

Parameters / Locations		Brahmaputra at Kherghat	Brahmaputra at Dibrugarh	Brahmaputra at Nimatighat	Brahmaputra at Dhenukhapahar	Brahmaputra at Pandu	Brahmaputra at Jogijhoga	Brahmaputra at Kacharighat	Brahmaputra at Chandrapur	Brahmaputra at Sualkuchi	Brahmaputra at Dhubri
pН	Min	7	6.7	6.1	6.8	6.9	6.6	7.2	7.1	7	6.7
	Max	7.6	7.7	7.6	8.5	7.9	7.6	7.9	7.8	7.8	7.8
	Mean	7.3	7.3	7.1	7.5	7.3	7.2	7.5	7.4	7.3	7.2
Conductivity	Min	91	94	71	112	108	68	206	202	209	188
	Max	175	197	205	210	238	194	156	153	169	147
	Mean	128	148	151	152	159	194	156	153	169	147
BOD mg/l	Min	0.3	0.5	0.3	0.8	0.5	1	0.7	0.4	0.8	1.1
	Max	9.2	3.8	3	4.1	2.7	4.1	3.8	3.4	1.6	2
	Mean	2.6	2.1	1.5	2.1	1.5	2.3	17	1.9	1.1	1.6
Nitrate mg/l	Min	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	Max	0.21	0.3	0.2	0.3	0.3	0.3	0.17	0.17	0.3	0.1
	Mean	0.13	0.14	0.12	0.16	0.15	0.13	0.12	0.12	0.16	0.1
Fecal	Min	0	0	0	0	0	0	0	0	0	0
Coliform	Max	360	360	700	1100	1100	730	360	300	1500	300
MPN/100ml	Mean	180	142	124	160	386	154	220	200	600	200
Total	Min	300	300	1	0	300	300	360	0	300	300
Coliform	Max	2800	9300	3500	2900	3500	15000	1500	730	4300	1500
MPN/100ml	Mean	1149	1561	780	982	1545	2225	740	363	1837	720

As per Monitoring data of CPCB, pH, DO and Total Coliforms meet the water quality criteria (C) for Drinking water source after conventional treatment and disinfection at most of the monitoring locations *except samples* at Jogijhoga . The BOD ranges from 0.3 to 9.2 mg/l. the maximum BOD was recorded at Brahmaputra at Kherghat. Fecal Coliform ranges from 0 to 1500 MPN/100 ml . total coliform ranges from 0 to 15000 MPN/100 ml.

#### Table 4-The Ground Water Quality/Surface Water Quality Distribution in Assam.

Sr.No.	Environmental	Surface Water Quality	- •	Ground water Quality
	feature			

		-				
1.	Parameters	Surface Water Quality at 2 to three locations	Ground water Quality at 2 to			
	Recorded	at each Ghat for following parameters	3 locations at each ghat for			
		1. pH value	following parameters			
		2. Conductivity	1. pH value			
		3. Turbidity	2. Conductivity			
		4. Total dissolved solid (TDS)	3. Turbidity			
		5. Total Suspended Solid (TSS)	4. Total dissolved solid			
		6. Dissolved Oxygen (DO)	(TDS)			
		7. BOD (27oC, 3 days)	5. Total Suspended Solid			
		8. COD	(TSS)			
		9. Chloride as Cl	6. Dissolved Oxygen (DO)			
		10. Sulphate as SO4	7. BOD (27oC, 3 days)			
		11. Potassium	8. COD			
		12. Nitrate	9. Chloride as Cl			
		13. Phosphate	10. Sulphate as SO4			
		14. Fluoride	11. Potassium			
		15. Cadmium	12. Nitrate			
		16. Chromium as Cr	13. Phosphate			
		17. Selenium 18 Iron as Fe	14. Fluoride			
		18. Zinc	15. Cadmium			
		19. Boron	16. Chromium as Cr			
		20. Mercury	17. Selenium 18 Iron as Fe			
		21. Lead as Pb	18. Zinc			
		22. Arsenic	19. Boron			
		23. Total Hardness as CaCO3	20. Mercury			
		24. Total Alkalinity	21. Lead as Pb			
		25. Calcium	22. Arsenic			
		26. Magnesium	23. Total Hardness as			
		27. Sodium	CaCO3			
		28. Oils and grease	24. Total Alkalinity			
		29. Free ammonia	25. Calcium			
		30. Cyanide	26. Magnesium			
		31. Phenol	27. Sodium			
		32. Sodium Absorption ratio	28. Oils and grease			
		-	29. Free ammonia			
			30. Cyanide			
			31. Phenol			
			32. Sodium Absorption ratio			
2.	Duration and	• One time for two season i.e. dry and	• One time for two			
	Frequency	wet	season i.e. dry and			
			wet			
3.	Apparatus used	• Relevant apparatus used as per codes	• Relevant apparatus			
	11		used as per codes			
4.	Remark	• From each water sampling station	• Grab samples shall			
		grab samples shall be collected and	be collected from			
		transported to laboratory for	wells / bore wells /			
		physicochemical analysis.	hand pumps			
		• Parameters like pH temperature and	P =P =			
		dissolved oxygen will be measured				
		in situ.				
		<ul> <li>Analysis of the samples was carried out as per the standard methods for examination of water and wastewater published by APHA et.al. and relevant IS codes (IS:2488 :Part I to V)</li> </ul>				
----	-------------	---				
5.	Observation	<ul> <li>As per Monitoring data of CPCB in 2011, pH, DO and Total Coliforms meet the water quality criteria (C) for Drinking water source after conventional treatment and disinfection at most of the monitoring locations.</li> <li>The BOD ranges from 0.3 to 9.2 mg/l.</li> <li>Fecal Coliform ranges from 0 to 1500 MPN/100 ml. Total coliform ranges from 0 to 15000 MPN/100 ml</li> <li>During site visits almost at all location water quality is very much deteriorated with high turbidity</li> </ul>				

### 2.2 Air Quality

During survey it was found that all terminals or Ghats do not possess any industrial point source nearby. Whereas the source air pollution is, fugitive dust generated from unpaved road and vehicular pollution. As per the data received from APCB Ambient air quality for all parameters are well within permissible limits as prescribed by CPCB.

Following steps are carried out for air quality analysis-

Collection of meteorological data and preparation of wind rose diagram:-

- Micrometeorological data will be collected by using the mechanical instrument near the project site as per CPCB guideline.
- Wind rose diagram will be prepared by using daily average wind velocity and dominant wind direction.
- Selection of ambient air quality monitoring stations at Ghat area and carrying out ambient air quality monitoring:-
- Ambient air monitoring locations will be selected in all the directions looking towards the possibility of change in wind pattern during the study period.
- Ambient Air Quality Monitoring will be carried out as per CPCB guidelines.
- Comparison of ambient air quality results with CPCB standards.

Sr.No.	<b>Environmental feature</b>	Air Quality
1.	Parameters Recorded	Suspended Particulate Matter(SPM)
		• Respirable particulate matter(RPM) PM 10 and PM 25
		• Sulphur dioxide (SO2)
		• Oxides of nitrogen (NOX)
		Carbon Monoxide (CO)
2.	Duration and Frequency	• At 3 to 4 locations at each Ghat within study area for dry
		and wet season.
		• Sampling locations will be decided as per the wind
		direction and activities
		• Sampling to be done at each location twice a week for 45

### Table 5: The Air Quality Distribution in Assam

		days (Gaseous sample 8 hour duration and SPM /RPM sample 24 hour duration)
3.	Apparatus used	• High volume samples Mylar bags / Bladder
4.	Remark	<ul> <li>SPM was estimated as per IS-5182 (Part V) – 1975,</li> <li>SO2 was estimated as per IS-5182) (Part – II) – 1969.</li> <li>NOX estimated as per IS-5182 (Part VI)-1975.</li> <li>CO estimated as per IS-5182 (Part X) 1975 Lead estimated as per IS: 12074</li> </ul>
5.	Observation	<ul> <li>During survey it was found that all terminals or Ghats do not possess any industrial point source nearby.</li> <li>As per the data received from APCB Ambient air quality for all parameters are well within permissible limits as prescribed by CPCB.</li> </ul>

### Table 6- AIR QUALITY MONITORING DATA YEAR 20161

State	City	Location	No. of Monitoring	Minimum	Maximum	SO2 Annual average
			Days			
1.	Guwahati	Head Office,	212	4	14	8
		Bamunimaidam				
		Boragaon,	201	4	16	8
		IASST, Kamrup				
		Guwahati	218	3	31	8
		University,				
		Kamrup				
		ITI Building,	220	4	15	8
		Gopinath Nagar				
		Khanapara,	220	4	20	8
		Central Dairy,				
		Kamrup				
		Near Pragjyotish	219	4	14	8
		College, Santipur				
	Dibrugarh	Dibrugarh Office	93	5	14	8
		Building				
	Silchar	Janiganj Govt.	84	5	10	4
		Boys HS School				
		campus				
		Janiganj Govt.	24	4	10	4
		Boys HS School				
2.	Nitrogen D	ogen Dioxide (NO2) in μg/m3				
1.	Guwahati	Head Office,	212	9	26	17
		Bamunimaidam				
		Boragaon,	201	12	24	17
		IASST, Kamrup				
		Guwahati	218	11	29	19

<sup>&</sup>lt;sup>1</sup> NATIONAL AMBIENT AIR QUALITY MONITORING PROGRAMME DATA FOR THE YEAR 2016 Module 4

State	City	Location	No. of Monitoring Days	Minimum	Maximum	SO2 Annual average
		University, Kamrup				
		ITI Building, Gopinath Nagar	220	18	29	19
		Khanapara, Central Dairy, Kamrup	220	9	35	18
	-	Near Pragjyotish College, Santipur	219	10	23	17
3.	Dibrugarh	Dibrugarh Office Building	93	12	23	17
4.	Silchar	Janiganj Govt. Boys HS School campus	84	9	19	13
		RLO, Ithkola Market, Ghaniwala Road	84	8	20	12
3.	Particulate	e Matter (≤10 μg/m3	3 ) in μg/m3			
1.		Head Office, Bamunimaidam	212	42	328	98
2.	Guwahati	Boragaon, IASST, Kamrup	201	39	267	96
3.		Guwahati University, Kamrup	218	32	279	105
4.		ITI Building, Gopinath Nagar	219	51	392	122
5.		Khanapara, Central Dairy, Kamrup	220	37	311	109
6.		Near Pragjyotish College, Santipur	218	42	250	102
2.	Dibrugarh	Dibrugarh Office Building	93	31	233	80
3.	Silchar	Janiganj Govt. Boys HS School campus	84	29	108	58
		RLO, Ithkola Market, Ghaniwala Road	84	29	97	58

### 2.3 Noise Quality

The noise environment within and surrounding the project site is generally characterized by low medium noise levels depending on location. For example, certain areas of the project site are remote from human influence and have low levels of background noise. Background noise levels are higher in the northern

and eastern areas of the project area as such areas are more influenced by human activity. There are a number of noise sources at the jetty locations; including noise generated from shipping activity, passenger vessel operations, and commercial fishing activity, infra facilities and road traffic. Noise sensitive receptors can be divided into four areas: residents and visitors and properties, humans and properties along the roads leading to and from the jetty, and the humans and properties in the wider area of jetty area.

Sr.No.	Environmental	Noise Quality	
	feature		
1.	Parameters	Maximum Noise Level (L max)	
	Recorded	• Minimum noise level (Limn)	
		Maximum hourly Leq	
		Minimum hourly Leq	
		• Day time Leq value (6 am10 pm)	
		• Leq value 9 hourly (10 p.m. – 6 am)	
2.	Duration and	• At 2 to 3 locations in the study area at each Ghat	
	Frequency	• Each location, noise monitoring should be conducted	
		continuously over a period of twenty four hours at uniform time	
		intervals of 1 hour In each hourly time interval Leq values at	
		uniform time interval of 30 seconds	
3.	Apparatus used	Noise level meter	
4.	Remark	• The following criteria adopted for measuring noise level:	
		• Measurement of "A weighted" sound level continuously using	
		noise level meter at one minute interval for one day in each	
		survey locations as per the CPCB approved method IS: 4954.	
5.	Observation	• Vibration from on-site construction may affect the	
		listed/heritage buildings on, or close to the site.	
		• The assessment will examine the extent, duration and	
		proximity of those works likely to create significant levels of	
		ground borne vibration (i.e. piling).	
		• Assessment of the likelihood of building damage will be	
		assessed against relevant criterion vibration levels provided in	
		appropriate British Standards and other information, as	
		appropriate	

Table 7: The Noise Quality distribution in Assam

### 2.4 Sediments and Soils

Physiographically the project sites can be divided into three units; i.e. the hilly region in the south, the alluvial plain in the central and western part and the swampy areas along Brahmaputra plains.

The distinguishable geomorphic units are as follows.

- Flood plain of river Brahmaputra and its tributaries.
- Younger alluvial plain which occupies major part of the area, having slightly higher elevation than flood plain.
- Older alluvium/valley fill, gently sloping plain, having higher elevation than the younger alluvial plain.

- Piedmont, gently sloping plain along the foothills.
- Inselberg occurs as very small isolated hills.
- Denudation hills considering of granite, gneissic rocks

The different rock formation occurring in the district has been subjected to various soil forming processes through agents of weathering and transportation during different geological ages. Soils comprising various projections of sand, silt, clay and organic material in the district are grouped into three broad categories –

- newer alluvial soil,
- valley fill/older alluvial soil, and
- Soils over forest and hilly terrain.

Given that little disturbance to soils and ground is expected to occur, a standard Phase of Desk Study and site walkover and surveys are proposed to get information.

This work will include the following tasks:

- Soil sample collection and quality analysis
- Suggestion of mitigation measures as per the identified and featured impacts during construction and operation phase
- Suggestion of suitable implementation measures for the soil management in EMP and monitoring plan preparation
- Soil treatment if necessary
- Review of historical maps to determine potential sources of historical contamination;
- Site walkover to determine potential sources of current contamination;
- Review of licensed activities and recorded pollution events;

Sr.No.	Environmental	Noise Quality		
	feature			
1.	Parameters	2 to 3 soil samples in the study area at each Ghat location		
	Recorded	• Texture		
		• Grain size distribution a) Sand (%) b) Silt (%) c) Clay (%)		
		• pH 910% w/v slurry)		
		• Conductivity		
		Organic carbon		
		• Nitrogen		
		• Phosphate		
		• Sodium		
		Potassium		
		• 10. Lead		
5.	Sediment	• 2 to 3 samples in the study area at each ghat location in the river		
		• Texture		
		• Carbon		
		• Benthos		

### Table 8 : The Noise Quality distribution in Assam

		Micro organisms
2.	Duration and Frequency	• One time in one season
3.	Apparatus used	• Analysis done in Atomic Absorption Spectrophoto-meter (AAS)
4.	Remark	<ul> <li>Sampling and analysis was conducted as per standard methods and procedures prescribed in IS:2720 and ASTM</li> </ul>
5.	Observation	<ul> <li>The baseline information about the nature and/or quality of the soils at the Jetty comprises reclaimed land and, therefore, some o the soils will comprise made ground.</li> <li>All districts of the state of Assam lie in Zone V.</li> </ul>

### 2.5 Climate Change

The Brahmaputra River creates flood problems in its basin areas during the monsoon season almost every year. Climate change has the potential to alter the distribution and quality of Brahmaputra River basin water resources. Some of the possible impacts include occurrence of more intense rains, changed spatial and temporal distribution of rainfall, high runoff generation, lower groundwater recharge, melting of glaciers resulting in increased, then eventually diminished spring recharge volumes, changes in evaporation demands and water use patterns in agricultural, municipal and industrial sectors. These impacts have the potential to lead to severe influences on agricultural production and food security, human and animal health and sea level rise. The current rate of deforestation and degradation of primary forests will make this state even more susceptible to climate change in coming years.

### **Biological Environment**

### **3.1** General Ecosystem and Biodiversity

### 3.1.1 Ecology

The Northeast part of India and Assam in particular, is rich in biodiversity because of its diverse topographic, aquatic and climatic features. Different varieties of mammalian, avian, and herpeto fauna are endemic to this region. Unfortunately, the future of this dynamic flora and fauna is in jeopardy due to serious anthropogenic and climate change pressures. In the recent past, a large number of globally important species were resident in the Brahmaputra and Barak Valleys. However, with increasing human population, subsequent demand on natural resources and development pressures, many of the species have been extirpated. If intensified conservation action is not initiated, then the pressure on remaining species will only accelerate.

### 3.2 Aquatic Flora

The flood plains of the Brahmaputra River possess a total of 76 species of aquatic plants (macrophytes)Belonging to 36 families and 55 genera. Poaceae is the dominant family with seven species, followed by Polygonaceae, Nympheaceae, Lemnaceae and Hydrocharitaceae. A study by the Flood and River Erosion Management Agency of Assam (FREMAA) 2016, showed that there are more monocot

species than, dicots and pterydophytes. Ecologically, five types of growth forms are found among the macrophytes:

Sr no	Name of Macrophytes	Percentage
1.	anchored floating leaf	5.26 percent),
2.	obligatory submerged	15.79 per cent
3.	free floating	11.84 per cent
4.	anchored floating stem	25 per cent
5.	and emergent plant	42.10 per cent

### **Table 9 : Types of Macrophytes**

### 3.2.1 Aquatic Fauna

FREMAA (ibid) inventoried a total of 222 fish species in the Bramaputra River of which around 210 species are reported to have food value. The Brahmaputra drainage system contains a wide variety of aquatic ecosystem habitats that sustain a diverse scope of fish including torrential (hill stream) and plain water species as well as cold and warm water representatives. Research disclosed that only 50 species were found to have considerable commercial importance as food fish. In addition, 24 species have importance as game or sport fish, and around 150 species have potential ornamental value. Of the total fish species, 40 are found to be endemic to Assam. Recent reports on catch statistics indicate that there has been a drastic reduction in the abundance of fish accompanied by changes in the distribution range of several species due to habitat modification, overexploitation and other anthropogenic influences. As far as the current conservation status of the recorded fish species is concerned, it has come to light that one third of the species, i.e.41 species are Vulnerable, 40 species are at Lower Risk-near threatened; 22 are endangered, and 1 species is Critically Endangered. About 9 species fall within the category of Lower Risk-least concern. The majority of species (93) have not as yet been evaluated as to their status. Apart from fish species, the Brahmaputra contains 9 species of freshwater shrimp.

### **3.2.2** Gangatic or South Asian River Dolphin

The Gangatic or South Asian River Dolphin (*Platanista gangetica gangetica*) also locally known as Susu is one of the most notable species of the Ganges-Brahmaputra River system and its tributaries. It favors deep pools, eddy counter-currents located downstream from the convergence of rivers and of sharp meanders and upstream and downstream of mid-channel islands. It is carnivorous, its diet consisting of bottom dwelling crustaceans and catfish. However there are many aspects of knowledge of this mammal's biology and ecology that remain undocumented. Its status is considered Endangered by the World Wildlife Fund and the International Union for the Conservation of Nature. The current population is estimated at no more than 1200-1800 individuals (IUCN 1996).Existing adjacent to very densely populated land it is exposed to numerous threats including habitat destruction and alteration, population fragmentation caused by indiscriminate barrage construction, climate change, pollution from industrial

wastes, pesticides and municipal sewage discharge, noise from vessel traffic, unintentional entanglement in fishermen's nets, directed capture for dolphin oil and exploitation of prey species.

Although the Wildlife Protection Act of India mandates dolphin protection and conservation as a priority, little has been done at the government level to implement or enforce the law even though in 2009 the species was designated as the "National Aquatic Animal of India." Oil exploration activities in the Brahmaputra River and adjacent lands pose a threat to dolphins. Seismic investigations by oil companies could have serious impacts on this species.

**Figure 14 : Gangatic River Dolphin** 



### 3.3 Eco sensitivity within 10 km radius of project components:

The preliminary study reveals that there is no wildlife sanctuary, biosphere reserve, national park is present with 10 km area of the proposed terminals except Lachit, Umanand, Kachri and Rajadwar terminal where a small fringe of Amchag wild sanctuary is falling within 10 km area of proposed terminal. However the sanctuary is located more than 9 km away from all the proposed terminal site located in Guwahati division. Similarly Deepor beel is a permanent, freshwater lake, which is a Ramsar site present within the 10 km area of Lachit, Umanand, Kachri and Rajadwar terminal/ghat. Deepor beel lies in a former channel of the Brahmaputra river, now to the south of the main river south-west of Guwahati city. It is a large natural wetland having great biological and environmental importance besides being the only major storm water storage basin for the Guwahati city (Deka and Goswami, 1992). There for the aquatic sensitivity is only restricted to aquatic diversity around the terminal.

### 3.3.1 Aquatic Fauna

As all the terminal are proposed on Brahmputar, Jaljali and Barak river system. The mighty Brahmaputra, innumerable flood plain lakes, Jaljali and Barak River system constitute the major water resources, supporting over 200 species of aquatic fauna, including the endangered river dolphin. However the dolphins were not observed near proposed ghats during site visit. Though the secondary analysis<sup>2</sup> reveals

2

Reaserch study of Mohammad Abdul Baki

Conservation of Gangetic Dolphin In Brahmaputra River System, India (Gangetic Dolphin Conservation Project Assam, India) Findings of EB Expert

that Dolphins were reported in Nemati Ghat, Salmara, Nimati Hatihal Tatimara and Guwahati area. No Chelonians (turtle) nesting ground were reported and observed in and around proposed terminal site.

However the river Brahmaputra river and its sandy deposition and the wetlands are found to shelter most numbers of turtle species. As per the secondary data the fresh water turtle (endangered) is reported from the Brahmaputra flood plain especially in Kaziranga region. The species of turtles like *Nilssonia hurum*, *N. gangeticus*, *N. nigricans*, *Chitra indica*, *Lissemys punctata*, *Pangshura sylhetensis*, *P. tecta*, *P. tentoria*, *P. smithii*, *Geoclemys hamiltonii*, *Hardella thurjii*, *Cuora amboinensis*, *Melanochelys tricarinata*, *Cyclemys gemeli*, *Cuora mouhotii*, *Morenia petersi* and *Manouria emys phayrei* has been reported from the Brahmaputra plain.

### **3.3.2** Conservation status of Dolphin:

Dolphin Conservation: The Gangetic dolphin belongs to Order Cetacea of Class Mammalia and has been categorized as 'Endangered' by the International Union for Conservation of Nature (IUCN) in 1996. It is included in Appendix I of the Convention on International Trade in Endangered Species of Flora and Fauna (CITES), and in Appendix II of Convention on Migratory Species (CMS). Government of India provided legal protection to this species by including it in Schedule I of the Wildlife (Protection) Act 1972. It was declared as the National Aquatic Animal of India by Honourable Prime Minister, Dr. Man Mohan Singh, on 5 October, 2009.

### **3.3.3** Vegetation Type

The vegetation type around the proposed terminal/ghats is riparian. River's riparian zone acts as a bridge between terrestrial and aquatic habitat. In most of the terminal site there is very less vegetation observed which is mostly restricted to the shrubs and herbs. The vegetation type around most of the terminal site is are represented by a particular type of vegetation that grows all over the evergreen and semi evergreen zones along the sides of rivers under the influence of a waterway. The common tree species observed around the the proposed sites are *Dillenia indica*, *Anthocephalus indicus*, *Semecarpus anacardium*, *Albizia lebbek*, *Dalbergia stipulacea*, *Bischofia javanica*, *Duabanga grandiflora*, *Lagerstroemia speciosus and Bombax ceiba*. The middle storey are generally occupied by Altingia excels, Albizia lucida, *Artocarpus lakoocha*, *Alstonia scholaris*, *Cedrelatoona*, Species viz. *Alpinia nigra*, *Ammomum aromaticum*, *Lasia spinosa*, *Typha elephantina*, *Carex breviculmis and Zingiber zerumbet*, etc. are commonly found to cover the ground vegetation.

The annual flood submerges at proposed terminal sites by several centimetres every year leaving the new alluvium and successive deposits of silts. These are first covered by the seedlings of species like *Tamarix*, *Salicornea* which soon establish themselves in a dense form either in pure formation or mixed with different grassy species. In Majuli and adjoining areas riverine areas composed of some hydrophilous herbs and sedges viz. *Ranunculus scleratus, Anagallis arvensis, Cotula hemispherica, Ammannia baccifera, Grangea maderaspatana, Gnaphalium luteoalbum, Polygonum chinense, Cyperus rotundus, Fimbristylis dichotoma, Fimbristylis ovata, Scirpus articulates, etc.* 

### 3.3.4 Terrestrial Flora

Diverse climates support almost all types of vegetation from cultivated plants to grasslands, meadows, marshes, swamps, and scrub lands, mixed deciduous and humid evergreen forest, temperate and even alpine vegetation. The occurrence of heterogenic physiography coupled with varied climatic conditions

on and around the state has made the vegetation luxuriant and diverse and support unique flora. The forest types are mostly tropical and harbor a rich pool of biodiversity. Although Assam has been comprehensively inventoried from a floristic viewpoint, there are areas lacking definitive floristic investigation, particularly in the protected areas and river bank vegetation localities. Riparian i.e. river bank vegetation at any particular location and time results from interactions between the physical conditions created by geomorphic and hydrologic processes in the stream channel and responses by the plants. In general the vegetation of Assam is primarily tropical covering large areas and embraces evergreen, semi evergreen, deciduous forests and grass lands. Stretches of riparian forest along the bank of rivers are also very prominent. The variations in forest types and their vegetation composition in Assam occur mainly due to the varied physiographic, edaphic conditions and range of climate. As there are not much altitudinal variations in the plains particularly in the Brahmaputra Valley, it has little influence in determining the forest types of the Valley. Vegetation and forest type along the Brahmaputra River may be considered as tropical moist evergreen, tropical semi evergreen, moist deciduous forest, grass land and savannah, wetlands and swamps, riparian forest and degraded lands. The flora of the state of Assam is rich both in terms of diversity and luxuriance. It also contains a very high degree of taxonomically and ecologically valued floral species. The rich floristic diversity of Brahmaputra Valley has tremendous commercial value. Plant resources resident in the Valley yield timber, medicines, food, essential oils, gums, paper, resins, tannins, and fibers. The Brahmaputra Valley produces some of the finest and most sought after teas in the World and is also known for orchid diversity. As many as 12 species of canes and 33 species of bamboos are found in the Brahmaputra Valley, which are of great importance in sustaining forest based cottage industries. In addition, the Brahmaputra valley harbors a number of rare and threatened plant taxa.



#### Figure 15: Vegetation Map of Assam

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### 3.3.5 Terrestrial Fauna

Although the Brahmaputra River is vital to the proliferation and survival of wildlife species that inhabit the Valley, it also acts as a natural barrier restricting species to north-south sides of the river that defines this Eco region. In spite of several centuries of human exploitation and environmental degradation, the remaining forests and grasslands along the Brahmaputra River Valley remain a critical refuge for a variety of wildlife. Blocks of natural habitat remain mainly in National Parks, the largest of which are Manas, Dibru-Saikhawa and Kaziranga. Many of the mammal species are threatened or endangered. The area is a transition zone of species of Indian and Malayam origin. The area is home to rich bird life with 370 avian species recorded.

### Annexure 6: Oil and Waste Storage / Disposal Methods

Type of Material	Separation Methods	Disposal and Recovery Methods
LIQUIDS		<u> </u>
Non-emulsified oils	Gravity separation of free water Mechanical removal of separated oil.	Use of removed oil as fuel or refinery stock Separated water discharged back into the environment.
Emulsified oils	Emulsion broken to release water by :	Use of recovered oil as fuel or refinery feedstock Incineration
	Heat treatment	Return of separated sand to sources Separated water may require further
	Emulsion-breaking chemical Mixing with sand Mechanical removal of	treatment before discharge back in to the environment
	separated oil	
SOLIDS		
Oil mixed with sand	Collection of liquid oil leaching from sand during temporary storage	Use of recovered liquid oil as fuel or refinery feedstock
	Extraction of oil from sand by washing with water or solvent Removal of solid oils by sieving	Direct disposal Stabilization with inorganic material Degradation through land farming, composting on site
		Bioremediation Incineration
		Burial in well aerated sandy soils (bioremediations)
		Separate water may require further treatment before discharge back into the environment
Oil Mixed with pebbles or shingle	Collection of liquid oil leaching from beach material during temporary storage	Direct disposal Incineration Separated water may require further
	Extraction of oil from beach	treatment before discharge back into the environment
	material by washing with water or solvent	

Oil mixed with wood plastics, seaweed. sorbents	Collection of liquid oil leaching from debris during temporary storage Flushing of oil from debris with water	Direct disposal Incineration Degradation through land farming, compositing or on site Bioremediation Separated water may require further
	Mechanical removal of separated oil	treatment before discharge back into the environment
Tar balls	Separation from sand by sieving	Direct disposal Incineration

### Annexure 7: List of Units Registered with MoEF & CC and CPCB as Oil Recyclers in Assam

S. No.	Name of the unit	Waste permitted and Quantity allowed	Issued on/Renewed from
1.	M/s Modern Lube Industries, A.K. Azad Road , Barsha Para Industrial Area, Guwahati – 781 034 Assam	Used Oil - 1000 KLA	
2.	M/s Progressive Industries, Rani Industrial Area, P.O. Rani-781131, Distt. Kamrup Assam E-mail : suniltaparia123@rediffmail.com suniltaparia123@yahoo.co.in	Waste Oil - 1000 KLA Used Oil - 500 KLA	
3.	M/s Allied Industries Digboi Road PO – Makum Junction Distt.Tinsukia-786 170 Assam	Waste Oil - 720 KLA	
4.	M/s East End Petro Chemicals (P)Ltd. PO-Naoholia Dibrugarh-786 191 Assam	Used Oil - 600 KLA	

S. No.	Particular	Tel. Office	Fax No.				
1	Marine Pollution Control 8631 West Jefferson Avenue, Detroit, MI 48209 – 2651, USA	313 / 849-2333 +44(O) 62 8520408	313/849 – 1623				
2	Marine Spill Response Corporation 13501, Street N.W., Suite 300, Washington DC 20005, USA	London. 202 / 408 – 5700	202 / 371 – 0401				
3	National Response Corporation 446, Edward Avenue, P.O Box, 609, Calverton, NY 119 33, USA	516 / 369 – 8644	516 / 369 – 4908				
4	Oil Spill Response Ltd. Lower William Street, Southampton, SO 145QE, United Kingdom	+044 / 1703-331551	+44/1703-331972				
5	East Asia Response Ltd. 2Jalan Samulum Singapore 629120	65/266-1566	65/266-2312				
6	NORPOL Marine Services (A/S) OH Bangsuie 17, P.O. Box 338, Houik 1322, Norway	47/ 212-5200	47/259-1721				
7	Oil Chem Recovery Denmark, Lufthavnveji, 12 DK – 9400 Norresunding, DENMARK	45 /981 – 90822	45/981-92344				

### Annexure 8: Suppliers & Service Agencies: Oil Spill Response Contractors

Sr NO	Name of the Establishment
1.	The Chairman
	Pollution Control Board, Assam,
	Head Office, Bamunimaidam, Guwahati-21
	03612550258
	chairman@pcbassam.org
2.	Regional Office, Guwahati,
	Pollution Control Board, Assam, Assam Govt. Press Road, Guwahati-21.
	8811013013 ro_guwahati@pcbassam.org
3.	Regional Office, Dibrugarh,
	Pollution Control Board, Assam,
	Chowkidingee, Behind ASTC Bus Stand, P.O. & Dist.: Dibrugarh, Assam
	8811013006
	ro_dibrugarh@pcbassam.org
4.	Regional Laboratory cum Office, Silchar,
	Pollution Control Board, Assam,
	1st Floor of Silchar Development Authority Building P.W.D. Road, P.O. Silchar, Dist.: Cachar, Assam
	8811013011
	ro_silchar@pcbassam.org
5.	Commissioner & Secretary,
	Transport Department & State Project Director, AIWTDS

### Annexure 9: Pollution Response Agencies in the State of Assam

Annexure	10: (	Oil Spills	Internal	Reporting	Format
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1	Address / site of spill
2.	Date & time of spill
3.	Position (Lat. & Long)
4.	Incident
5.	Estimated quantity of oil spilled
6.	Source and cause (Collusion, Grounding, spills from Terminal)
7.	Wind direction and speed and / or tide
8.	Current direction and speed and / or tide
9.	Drift of pollution
10.	Action taken
11.	Photograph or samples
12.	Request for assistance
13.	Acknowledge

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### Annexure 11: Format for Oil spill report to Indian Coast Guard Organization

### Particular of Organization: IWAI, Haldia /Kolkatta

- 1. Reporting Incident:
- 2. Date / Time of spill:
- 3. Spill location:
- 4. Type and approximate quantity of oil spill:
- 5. Cause of spill:
- 6. Response to spillage, if any:
- 7. Telephone /Telex number:
- 8. Any other information:

Signature

### Annexure 12: Records of Gangatic /River Dolphin spotting in project locations during high flood in Brahmaputra River

As per the secondary data and authentic reports as listed below, in Brahmaputra River, altogether 197 dolphins (27 calves, 32 sub-adults and 138 adults) were recorded from 82 locations of the river with an encounter rate of one dolphin per 4.2 km.

- 1. Conservation of Gangatic dolphin in Brahmaputra river system, India, Dr. Abdul Wakid, 2004
- 2. Report on the initiatives to involve the major stakeholders of Assam in the conservation of Gangatic dolphin, Dr. Abdul Wakid, 2009
- 3. Protection of endangered Ganges river dolphin in Brahmaputra river, Assam, India
- 4. Final technical report to sir peter Scott fund, IUCN, Dr. Abdul Wakid, 2009

In our Study area total 25 Dolphins are recorded. Population status and distribution p	pattern of
dolphins near our Project Ghats in Brahmaputra River as per the reports are as below;	

Sr.no of	Name of	Dolphin	Name of dolphin	Location of	Dolphin No				
Dolphin	Ghats	Occurrence	sighted area	sighted area	0 1			<b>T</b> ( )	
Signted area	<b>O</b> shari	Maria	0	N00044/000//	Calf	Sub-adult	Adult	Iotal	
1.	Guwanati	Yes	Guwanati	N26011/239//;	-	-	1	1	
				E 91044/305		4	0	2	
				N26010/981//;	-	1	Z	3	
				N26010/610//·	_	1	2	3	
				F 91042/587//	-	1	2	5	
				N26010/699//·	-	_	3	3	
				E 91041/066/			0	Ũ	
2.	Umananda	No	-	-	-	-	-	-	
3.	Kacheri	No	-	-	-	-	-	-	
4.	Lachit	No	-	-	-	-	-		
5.	Sonaram	No	-	-	-	-	-	-	
6.	Rajaduar	No	-	-	-	-	-	-	
7.	Nagarbera	No	-	-	-	-	-	-	
8.	Alopatty	No	-	-	-	-	-		
	Majorchar								
9.	Pijupara	No	-	-	-	-	-	-	
10.	Jaleshwar	No		-	-	-	-	-	
11.	Dhubri	Yes	Dhubri	N26001/149//;	-	-	1	1	
				E 89059/756		-			
			Dhubri	N26001/149//;	-	1	4	5	
				E 89059/756			4	_	
			Birsing Char	N26000/503//;	-	-	1	1	
			(Birsing Char-	E 09030/797					
			Dhubri 2.75km)						
12.	Fakirganj	Yes	Fakirganj	N26002/508//;	-	-	2	2	
			- /	E 90002/877//					
13.	Medartary		Medartary	N26054/036//;	-	-	2	2	
	Salmara	Yes	Salmara	E 94016/985//					
		Yes	Patakata	N26005/124//;	-	-	1	1	
			(Patakata-	E 90011/608					
			Medartary						
			Salmara 6.21km)						
14.	Duanpatil	INO No	-	-	-	-	-	-	
15.	Appalamente	INO No	-	-	-	-	-		
10.	Aphaiamukh	INU Voo	- Noomoti	- N26054/044//-	-	-	-	2	
17.	ineaman	162	INEdITIALI	F 94014/656/	-	I	2	3	
18	Annanurna	No	_	-	-	_	-	_	
19.	Beranda	No	-	-	-	-	-	-	
20.	Gandhi ahat	No	-	-	-	-	-	_	
21	Silchar	No	-	-	-	-	-	_	
	Total					5	21	25	

### Annexure - 13: EMP Implementation Schedule (Monthly Track Chart for Monitoring of Contractor's Activities)

As per the proposed Environmental Management & Monitoring Plan (EMMP) for the Project

							Name	of the Supe	rvision Con	sultant	/ Region	al Office	(AIWTDS)	during C	Construct	on Stage :																
																													For the I	Vonth of	F	, 201
SI. No.	Location of Terminals/Ghats	Pkg No /	Sub-Project Description	Name of Environment	Is EMP part of the	Name of the Civ Work Contracto	il Date of r Signing of	Name of Environment &	Is Baseline data generated	Statut	tory Environm	ental Complia	ance Status	Land owner consent for		Personal	Protective Equ	ipments		Baricading and warning signs	Type of Labour Camps	Sanitation Facilities	Debris/M uck	Query (Yes / No)?	Borrow areas (Yes /	Water Sprinkling	Status o	of Environm	ental Moni Stage	toring at	Construction	Details of PAs & ASI
	Landing Points			al Expert of SC/RO (IWAI	contract (Ye ) / No)?	25	Contract, Date start and	of Safety Officer (ESO) of the Contractor wit	by the Project Proponent (Yes h / No)?	Consent to Establish (CTE)	PUC certificate for vehicles	Labour Licence obtained	Workmen Compensatio n Insurance	establishme nt of Plants, Site Office 8	Hard Hats (Helmet) k issued (Yes /	Safety Jackets issued (Yes /	Boots issued (Yes / No)?	Gloves issued (Yes / No)?	l Informatio n Board Displaced	(Yes / No)		such as Toilets Separate for	Disposal sites (Yes / No)		No)?	(Yes / No)	Air	Water	Noise	Soil	Aquatic Biota	Sites within 10 Km
							Date of completion as	Contact Details (Mob. No. &		obtained (Yes / No)?	obtained (Yes / No)?	(Yes / No)?	obtained (Yes / No)?	s Labour Camps	No)?	No)?			(Yes / No)?	?		women (Yes / No)									1	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
1																																
2																																
3																																
4																																
5																																

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					Monito	ring Criteria / Targe	ets /		
Phase	Objectives	What / Risks (Is the parameter to be monitored?)	Where (Is the parameter to be monitored?)	How / Actions (Is the parameter to be monitored?)	When (Define the frequency / or continuous?)	Why (Is the parameter being monitored?)	Cost (if not included in project budget)	Who (Is responsible for monitoring?)	
During activity preparation									
During activity implementation									
During activity completion									

Annexure 14: Safeguard Monitoring Consultant Report Format

### Annexure 15: Estimated Suspended Sediments Generation Standards from Dredging and Dumping operations

Estimations had been made in Assessment Manual for dredging and Reclamation, Ministry of Transport, Japan for suspended sediment generation from dredging and dumping operations is given below. These can be used for estimating the suspended sediments to be generated from dredging for construction and operation of terminal.

Activity / Type of the Bottom	SS generated by dredging or dumping of one cubic metre of sandy material	SS generated by dredging or dumping of one cubic meter of silt / clay
Pump dredging	Kg/m3	Kg/m3
Ordinary 4,000 PS1/	(2) 2.2 – 4.5	(2) 1.2 – 1.4
Ordinary 2,000 PS	(3) 0.1 – 0.3	NA
Low – pollution type 1,600 PS	NA	(3) 1.2 – 1.6
Low – pollution type 800 PS	NA	(2) 1.5 – 3.5
Grab dredging		
Ordinary 8m3 bucket	NA	(2) 10 - 89
Ordinary 3 m3 bucket	(1) 8.4	(4) 12 - 84
Water – tight type 8 m3 bucket	NA	(1) 3.5
Bucket dredger	(1) 17	(1) 56
Dumping		
By grab bucket	(11) 0.4 – 5.0	NA
From hopper barge	(2) 2.4 – 5.2	(5) 12 – 203

Note: Parentheses are the number of times of observations

NA: Not Available

1/: Capacity of pump in Horse Power

Source: Assessment of the Environmental Impact of Port Development, United Nations, New York, 1992

### Impacts Due to Maintenance Facilities for Vessel Repair and Maintenance & Its <u>Mitigation Measures</u>

It is proposed to develop the maintenance facilities for vessel/vessel repair and maintenance Pandu and Neamati Locations. Thus the location specific impact of the maintenance facilities could not be assessed. However, impacts due to such facilities in general are discussed in this section. Maintenance facilities use and store a wide range of chemicals and other materials, many of which may be hazardous. Examples include fuels, oils, alkaline and acidic solutions, cleaning solvents, disinfectants, detergents, degreasers, rust inhibitors and antifouling paints. These materials need to be used carefully and stored securely to prevent leakage and spills and pollution of soil in the area. There are fair possibilities of soil, water, noise and air pollution due to construction and operation of such facilities. Some of the activities undertaken at these facilities having potential to pollute environment are cleaning of the hulls scraping & sanding; water based pressure cleaning of hulls & exterior of boat; painting; Fiber glassing; welding& metal fabrication; engine maintenance & repair and generation of solid waste due to cleaning, repair & maintenance. All these activities may have significant impact on the environmental and social components, if not managed properly. Table below details out the activities and type of pollution resulting from it and the management required for the same.

	Mitigation measures										
S. No.	Activities	Affect	Impact on Environment	Mitigation Measures							
1	Hazardous Materials & Chemicals	Spillage and Leakage	• Soil quality deterioration	<ul> <li>Storage of these materials in contained facilities in isolated location</li> <li>These storage facilities should have</li> </ul>							
	use and storage		• Surface and ground water quality deterioration	dedicated drainage system provided with oil interceptors Training of the workers on handling of these materials and chemicals to prevent spillage							
			• Contamination of land	<ul> <li>and wastage</li> <li>Availability of the emergency response plan for handling such spillage and leakage as soon as</li> </ul>							
			• Effect on flora and fauna in nearby areas	any such spillage or leakage happen Quick clean up mechanism aftersuch spillage and leakage							
			• Air pollution due to odour	• List and quantity of the hazardous materials and chemicals should be available at the site							
			<ul> <li>Impact on society due to environmental pollution and odour</li> </ul>	MSDS for each chemical should be available at the site and all the workers should be trained and instructed about the possible hazard of each chemical stored or used in case of spillage							
			• Exposure of workers	exposure. Material should be handled as							

### Activities at Vessel Maintenance & Repair Facilities, Their Impacts and

S. No.	Activities	Affect	Impact on Environment	Mitigation Measures
			to the chemicals and hazardous materials	per MSDS • Workers should be trained to handle
			hazardous materials <ul> <li>Fire accidents may happen in this area</li> </ul>	<ul> <li>Workers should be trained to handle situations after leakage, spillage and accidental exposure of workers due to spillage/leakage</li> <li>Fire evacuation plan should be displayed everywhere in location so as it is legitimate and this plan should be explained and communicated to all workers.</li> <li>Fire mock drills should be conducted every quarter and all the workers should know how to operate fire extinguishers</li> <li>Fire alarm/hooter should be provided. Fire exits which are LED Lit should be provided Emergency assembly area should be provided and it should be closed to the exit door and should be communicated to all the worker Drivers transporting these materials should be given the induction on safe</li> </ul>
				per the Haz waste, 2016 rules Combustible waste materials should not be stored in these areas
				<ul> <li>Material should be stored as per requirement and excess piling up of materials should be avoided Store volatile and flammable solvents and other liquids in sealed containers away from heat, naked flames, direct sunlight, oil or other flammable liquids and fire hazards. Store incompatible chemicals separately (e.g., the fibre glassing catalyst methyl ethyl ketone peroxide should not be stored</li> </ul>
				anywhere near flammable liquids or other dangerous goods)
				<ul> <li>Seal and clearly label all storage containers and smaller decanting containers. Where possible, fit containers with taps or pump the liquid to minimise the potential for spills</li> <li>Place chemically compatible trays under container taps to catch spills or drips. Replace the lids on containers of solvent, resin, fibreglassing initiator and accelerator promptly after use, to reduce evaporative loss and contamination by dust.</li> </ul>
				<ul> <li>Keep and maintain spill clean-up equipment, such as absorbent materials, non-toxic dispersants boom (mechanical</li> </ul>

S. No.	Activities	Affect	Impact on Environment	Mitigation Measures
				<ul> <li>barriers for containing liquids). Sorbents can be made of peat, cotton, vermiculite, polypropylene fibre, wool or pine bark.</li> <li>Train staff in the use of spill clean up equipment Contain and clean up spills or leaks immediately if it is safe to do so. Do not hose the substances onto soil or into any inland, estuarine or coastal waters</li> <li>Do not use sawdust or other readily</li> </ul>
				combustible absorbents to clean up flammable liquid spills Dispose of contaminated clean-up materials in accordance with the Waste Management sections of these guidelines.
2	Removal of anti-fouling paint from vessels" hull through scraping and scrubbing	Generation of paint debris, sludge, dust and other particles that may contribute to water, soil and air pollution and may be harmful to aquatic life. generated	<ul> <li>Spread of the removed antifouling paint particle &amp; debris in air and soil deteriorating the soil quality</li> <li>Contamination of the run-off with these debris and sludge</li> <li>Contamination of the ground water due to leaching of the sludge generated during paint removal</li> <li>Exposure of workers to the dust</li> </ul>	<ul> <li>Usage of anti-fouling paints free from toxic material.</li> <li>Non-toxic paints which are silicon based should be used as antifoiling paints</li> <li>Proper waste management plan should be prepared to handle &amp; dispose the waste generated from this operation</li> <li>Dust suppressers like water sprinklers should be provided in this area</li> <li>Thick green belt should be developed all around the periphery to suppress dust and minimize direct exposure if people to the dust generated from these facilities</li> <li>Workers should wear gloves while using the chemicals and cleaning agents and aprons and masks to prevent inhalation of dust</li> <li>Fit sanders, grinders and other power tools with dust extraction and collection systems.</li> <li>Do not burn off antifouling coatings as this may generate highly toxic fumes, smoke and gases.</li> </ul>
3	Cleaning of vessels" exterior	<ul> <li>Generation of wastewater containing cleaning agents, solvents, chemical, detergents, grease, paints etc.</li> </ul>	<ul> <li>Generation of large quantity of washing water containing the toxic material Contamination of the soil with the wastewater generated due to washing operations</li> <li>Contamination of river water bodies, if this wastewater is allowed to enter the water bodies</li> </ul>	<ul> <li>Cleaning area should be paved area provided with drains and oil interceptor</li> <li>Use water-based or biodegradable strippers, cleaners and degreasers.</li> <li>Use phosphate-free detergents wherever possible and scrub with a soft brush to absorb the detergent.</li> <li>Use biodegradable spray-type cleaners that do not require rinsing. Wherever possible, use hot water, rags or a brush instead of chemicals</li> <li>Dilute corrosion and rust removers to the correct concentration</li> <li>Testing of the paint to be removed should</li> </ul>
S. No.	Activities	Affect	Impact on Environment	Mitigation Measures
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			<ul> <li>and may lead to eutrophication</li> <li>Biological particle stick to vessel"s exterior may be present in this washing water which may become weed on land</li> </ul>	<ul> <li>be carried out at facility prior removal</li> <li>If any removed underwater coating is contaminated with biocides or other hazardous chemicals and therefore must be handled and stored as controlled waste</li> <li>Mechanical and manual cleaning should be undertaken in place of the blast cleaning to save water as well as spread of pollutants along with the spray particles</li> <li>Prevent spray drift from escaping the work area by locating moveable waterproof</li> </ul>
				<ul> <li>screens alongside and behind the operator and avoiding pressure water blasting operations during windy conditions</li> <li>If the surface of vessel to be cleaned contains paint with more than 0.5% lead content, then the area being cleaned should be totally encapsulated with a waterproof membrane and</li> </ul>
				<ul> <li>operators working inside the encapsulating membrane should be completely protected from contact with all wastewater.</li> <li>If abrasive blast cleaning is undertaken, preferable wet and vaccum abrasive cleaning shall be undertaken</li> <li>In case dry abrasive blast cleaning is carried out then it should not be carried out during windy days and abrasive blast chamber vented to atmosphere via an effective dust collector</li> </ul>
				<ul> <li>Ensure that the screening material for outdoor/open-air blasting is tear resistant, UV resistant, fire retardant and of suitable material and construction (preferably fully enclosed) to prevent the escape of fine dust</li> <li>Avoid the use of silica sands (e.g. river sand, beach sand or quartz rock) and avoid using copper slag, zinc slag or any other abrasives that contain toxic heavy metals.</li> </ul>
				<ul> <li>Use recyclable and more environmentally benign abrasives such as garnet, ilmenite, chilled iron grit, cast steel grit or cast iron shot.</li> <li>ETP should be provided to treat the washing water generated</li> </ul>

S. No.	Activities	Affect	Impact on Environment	Mitigation Measures
				<ul> <li>STP should be provided to treat the sewage generated due to domestic use</li> <li>No-run-off from site should allow to get into rivers or accumulate at site or nearby areas</li> <li>Proper waste management plan should be developed so as to handle, store, manage and dispose the waste generated</li> <li>Treated water should be re-used for dust suppression, colling and landscaping and no treated water should be disposed off in river or in ground</li> <li>Workers should wear gloves while using the chemicals and cleaning agents and aprons</li> </ul>
4	Painting of Vessels	<ul> <li>Spillage of paints and emissions of VOC while spray or manual painting</li> </ul>	<ul> <li>Deterioration of soil quality and may be ground water due to leaching of the spillage paints Emission of VOCs from paints and deterioration of air quality which may also have health impacts Generation of fine particles while spray painting which may remain suspended in air leading to air pollution Risk to workers due to exposure to VOCs and paints containing toxic chemicals</li> </ul>	<ul> <li>Usage of Paints containing low VOCs</li> <li>Spray painting should be minimized so as to minimize the spraying of tiny particles into the air while spray painting</li> <li>Painting should be carry out on the paved surfaces which should have drains fitted with oil interceptors</li> <li>Paint storage facilities should also be paved surfaces and should have drains fitted with oil interceptors</li> <li>Painting facility should be located in isolated location so as to minimize exposure of all workers to paint area and should be surrounded by thick tree belt all around</li> <li>Mix paints in drip trays under cover and in a sealed, bunded and well ventilated paint bay. Do not mix or prepare antifouling paints in locations that are subject to floods</li> <li>Spray paint large objects on a sealed and bunded surface that is either fully enclosed (sides and top) with screening material or fully screened (sides only) to a height two metres above the structure.</li> <li>Spray paint only in calm conditions. Keep spray guns and lines clean and well maintained to reduce emissions; also spray perpendicular to the surface being sprayed and maintaining a uniform distance from the surface.</li> <li>Use efficient spray equipment (transfer efficiency &gt; 65%) such as high volume low pressure (HVLP) spray guns for all outdoor/open- air spraying.</li> <li>Use corrosion inhibitors that are compatible with surface coating requirements.</li> </ul>

S. No.	Activities	Affect	Impact on Environment	Mitigation Measures
No.	Activities	Arrect	Environment	<ul> <li>biodegradable and free from chromates, nitrates and nitrites.</li> <li>Corrosion inhibitors also commonly contain zinc that can contaminate stormwater and land.</li> <li>Use a wash station for cleaning spray equipment and scrape the paint cup free of any residual paint with a spatula before cleaning the equipment with solvent Workers should be provided with the masks to minimize inhalation of the VOCs and gloves to minimize exposure of paints to body</li> <li>Deck paints and paints used in cabin areas of boats can usually be treated like normal household paints.</li> <li>Clean up spilt paint (particularly waterbased paint) and allow the remaining paint to dry rather than washing it into the wastewater collection system</li> <li>After painting, wipe/squeeze as much paint as possible from the brushes, trays and rollers back into the paint in for future use</li> <li>Paint out excess paint onto an absorbent material such as an old rag or newspaper. Allow it to dry before disposal.</li> <li>Keep adequate supplies of rags and other absorbent materials for cleaning up small fuel and oil spills</li> <li>Clean engine parts in a properly designated wash bath or over catch pans located in a covered, sealed and bunded area that is graded to a collection pit or sump</li> <li>Where possible, clean engine parts with a brush rather than with solvents or aqueous degreasers such as alkaline or caustic soda</li> <li>Use water-based or biodegradable strippers, cleaners or degreasers wherever possible.</li> <li>Use a funnel when pouring fuel into drums or tanks or use hand pumps to remove fuel from drums.</li> <li>Drain oil filters before disposal and never place any containers or boats containing residual oil, fuel or other fluids in industrial waste bins unless</li> </ul>
				Use bilge pump/separation services at your facility.

S. No.	Activities	Affect	Impact on Environment	Mitigation Measures
				<ul> <li>When using containers filled with water to clean water-based paint from brushes and rollers, allow the paint solids to settle by leaving the container overnight.</li> <li>Pour the water out onto the garden or grassed area in the morning and use an old rag or newspaper to wipe out the solids from the bucket.</li> <li>Do not rinse paint containers into storm water drains, gutters or sewers</li> <li>Allow empty paint and thinner containers to air-dry before disposal</li> </ul>
5	Maintenanc e operations	Leakage or spillage of grease and solvents, generation of debris like metal wastes, greased cottons/clothe s, empty containers of chemicals, used oil, leftover solvents, dry paint and other waste	<ul> <li>Generation of large amount of hazardous and non hazardous solid and liquid waste Soil &amp; water quality deterioration if this waste is allowed to mix with soil and run-off</li> <li>Used oil, fuel and solvents used in cleaning may spill while maintenance operation and may lead to soil and water pollution</li> <li>Generation of odour from these waste</li> <li>Risk to workers using tools, chemicals, working on height, welding operations and other activities</li> <li>This waste if not managed properly and dumped in open may be hazard to avifauna and other animal if ingested mistakenly by them</li> <li>Odour from this waste may generate leading to ari pollution and</li> </ul>	<ul> <li>All-ory before disposal.</li> <li>Consents from state under Air Act, 1981, Water Act, 1974 and Hazardous and Other Waste Rules should be obtained prior setting up and operating such facilities</li> <li>All conditions of consents should be followed and compliance of the same should be submitted as prescribed in consents to regulatory bodies and should be maintained monthly at site</li> <li>Proper waste collection, segregation, storage, management and disposal plan for both hazardous and non-hazardous liquid and solid waste</li> <li>Storage of hazardous waste in isolated location under covered shed and in covered containers separately from other non hazardous solid &amp; liquid waste</li> <li>Inventory of the both hazardous and non-hazardous waste should be maintained. Records of hazardous waste should be maintained as per Haz. Waste Rules, 2016</li> <li>Tie-ups with vendors having hazardous waste</li> <li>SOP should be prepared for each activity to be undertaken stating the equipment to be used, instruction for using the tools and keeping them back, procedures for keeping the tools incase work is to be left in middle.</li> </ul>

S. No.	Activities	Affect	Impact on Environment	Mitigation Measures
			discomfort to the society • High noise levels may be generated in the maintenance and repair area	<ul> <li>the activity</li> <li>Proper EHS cell should be established to take care of safety procedures and safety of workers at site. This cell should conduct safety meeting on monthly basis</li> <li>Rest area for workers should be provided so as they should not have used floors of these facilities for lying down</li> <li>Kitchen area and cafeteria should be provided in separate location so as there is no exposure of food and the chemicals used at site</li> <li>Proper cleaning and washing facility should be provided at the site for cleaning up after working</li> <li>First-aid room should be provided at the site with stretcher, first-aid box containing materials as per State''s Factory law, ambulance facility and certified First Aid Trainers</li> <li>List of contact nos. of safety officers and other emergency control services like hospital, fire brigade should be displayed everywhere in the plant and should be communicated tow worke</li> <li>Proper lux levels should be maintained at site and working hours should be restricted to day time. If working in night time lux levels should be maintained as per EHS plan and SOP of each activity</li> <li>Work zone noise levels should be as per standards given in Noise Rules 2000. No noise generation activity should be as per standards given in Noise Rules 2000. No noise generation activity should be as per standards given in Noise Rules 2000. No noise generation activity should be as per standards given in the facility's design and layout. Use the natural topography and consider landscaping improvements (fencing, mounds and structures) to serve as noise barriers</li> <li>No facility should be established within 500</li> </ul>

S. No.	Activities	Affect	Impact on Environment	Mitigation Measures
S. No.	Activities	Affect	Impact on Environment	Mitigation Measures           m of habitation area/forest area/sensitive areas         like school, hospital & temple           Fit mechanical ventilation systems (e.g. air conditioners and fans) with noise-proof ducting and acoustically designed intake and exhaust openings           Enclose or acoustically screen potentially noisy equipment and undertake noisy activities         in areas where noise can be muffled.           Fit silencers and/or exhaust mufflers to air compressors, pumps, fans, blowers and other noisy machinery.         Reduce structural-borne noise and vibration by mounting equipment on isolating platforms or rubber mats.           Specify noise-reduction options when purchasing new plant and equipment         Restrict internal work to similar hours unless there is effective sound-proofing of the building.           Minimise engine idling and testing.         Regularly maintain all equipment and vehicles by attending promptly to any loose parts, rattling covers, worn bearings and broken components.           Display signs indicating noise restrictions and requirements (where relevant).         Records for accidents and near miss happened at site should be maintained.           Detailed analysis for each incident should be prepared detailing the reasons, causes, damages, loss and improvement to be taken
				<ul> <li>Emergency response plan should be available at site all the time. It should contain all the SOPs, waste management plans, emergency contact nos, list and nos. of PPEs, safety procedures at site, details of disaster management system like</li> </ul>
				<ul> <li>fire, earthquake, flood, cyclone etc. as applicable to the site. This ERP should be communicated to all the workers.</li> <li>Visitors to the site should not be allowed to enter site without proper PPE and induction training Records of training, mock drills, safety</li> </ul>
				meetings, maintenance of the equipment. O

S. No.	Activities	Affect	Impact on Environment	Mitigation Measures
				<ul> <li>&amp; M works, quantity of material used, waste generated &amp; disposed, PPE purchased &amp; discarded should be maintained</li> <li>Daily checklists should be maintained for carrying out cleaning and safety works at the site and it should be signed by the EHS head or authorized person on daily basis</li> <li>Fresh water for workers should be tested on monthly basis to assure its compliance to IS:10500</li> <li>Signage should be displayed outside cautioning the presence of hazardous material at site.</li> <li>Signage should be provided in the entire facility for adoption and implementation of EMP and EHS system</li> <li>Capacity building of EHS staff of the contractor and the client should be undertaken regularly through trainings and awareness programmes in regard to implementation of EMP, ERP and adoption of new waste management and safety techniques</li> <li>Maintenance activities should be undertaken in the bunded and sealed areas to ensure that</li> <li>Maintenance facility and work area should be minimum 1 m above the HFL of the River</li> <li>Use a drip tray or groundsheet under the engine to collect oil, grease, solvents or detargents</li> </ul>
6	Fiber glassing	Generation of VOCs during fiberglassing due to usage of solvents like acetone. Generation of dust during fibreglass trimming, grinding, sanding and drilling	<ul> <li>Generation of air pollution due to VOCs generation and dust generation during cleaning, trimming, grinding, sanding and drilling of fibreglass</li> <li>Risk to safety of workers due to inhalation of excess dust, VOCs and during drilling, trimming, grinding and such similar works sanding as</li> </ul>	<ul> <li>Contain and control all spray emissions. The recommended method is to work inside a building, keeping the doors closed while using mechanical ventilation equipment.</li> <li>Where practical, hand lay-up methods are recommended over spray gun applications as hand lay up releases less styrene.</li> <li>For spraying, use airless, air assisted, or HVLP spray guns.</li> <li>Internal mix, airless spray guns result in lower styrene emissions than other types of spray guns.</li> <li>Ensure that the spray lay-up equipment is properly maintained and periodically cleaned. This will avoid glass jamming in the spray</li> </ul>

S. No.	Activities	Affect	Impact on Environment	Mitigation Measures
			<ul> <li>much as possible by trimming with a knife or mechanical cutter when articles have solidified but not yet hardened.</li> <li>Securely wrap all sanding and grinding dusts prior to disposal.</li> <li>Workers should be provided with the masks to minimize inhalation of the dust and gloves while using the chemicals like acetone to minimize exposure</li> <li>Plantation should be developed all around the facility</li> <li>Goggles and gloves should be provided to the workers involved in cutting, trimming, grinding, sanding and drilling operations of fibreglass</li> </ul>	gun chopper mechanism and the generation of additional waste (resin and glass) when fixing it. • Use a gun wash station or similar for the cleaning of spraying equipment. • Reduce the amount of grinding and
7	Welding and Metal fabrication	Generation of dust, small metal particles, smoke, fumes which may lead to soil, water and air pollution	<ul> <li>Generation of odour, smokes and fumes leading to air pollution</li> <li>Direct exposure of workers to radiations during welding &amp; metal fabrication and chances of blast during welding operations</li> </ul>	<ul> <li>Pressure of the gas in cylinder should be checked so as to prevent explosion</li> <li>Workers should wear face shield, googles, jackets, gloves and safety shoes to prevent exposure to UV radiations</li> <li>Face masks should be provided to all workers working in the area to minimize smoke inhalation</li> <li>Conduct all metal cutting operations on a sealed surface inside a screened area to minimise the horizontal dispersion of metal fragments and allow the sweeping or vacuuming of metal scraps and filings</li> <li>Securely wrap all dusts and other grinding wastes prior to disposal in an industrial bin.</li> </ul>